

Food Hygiene in Hospitals: Evaluating Food Safety Knowledge, attitudes and Practices of Foodservice Staff and Prerequisite Programs in Riyadh's Hospitals, Saudi Arabia.

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Abstract

In global terms, Saudi Arabia is a rapidly developing country. As such, its food industries have yet to fully implement the food safety management systems common in the EU. In the hospitals sector, the Ministry of Health intends to implement Hazard Analysis Critical Control Points (HACCP) system to provide safe meals for patients, staff and hospitals visitors .

The aim of this study was to evaluate the readiness of the Saudi Arabian hospitals to implement HACCP by assessing the pre-requisites programmes in their foodservices departments. An audit form was used in four hospitals in Riyadh. Questionnaires were also used to assess self-reported behaviour, knowledge and attitudes of 300 foodservices staff. Lack of training was known to be a major omission in the pre-requisite programs (PRP's) of all hospitals. Therefore a bespoke food safety training program was developed and delivered to food handlers in the participating hospitals. An assessment was then made to determine whether this intervention had any effect on their knowledge, attitude to food safety and self-reported behaviour.

The results show that, the prerequisite programs were not implemented properly in the participating hospitals. Also, foodservices staff had a poor knowledge with regard to food safety. However, staff knowledge was significantly improved following the training (*p. value* $\leq$ 0.05) and their level of knowledge remained stable after six months. Participants' behaviours and attitudes also improved after the training. This indicates that, training has a positive impact on food handlers knowledge, practices and attitude.

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Abbreviations

CCPs: Critical Control Points

CIEH: Chartered Institute of Environmental Health

FAO: Food and Agriculture Organisation

FSA: Food Standards Agency

FSAI: Food Safety Authority of Ireland

FDA: Food and Drug Administration

GMP: Good Manufacturing Practices

GHP: Good Hygiene Practices

HACCP: Hazard Analysis Critical Control point

KPA: Knowledge, Attitude and Practices

LMD: Low Microbial Diet

MOH: Ministry of Health

NASA: National Aeronautics and Space Administration

PRPs: Pre-requisite Programs

RCH: Riyadh Central Hospital

REHIS: Royal Environmental Health Institute of Scotland

SFDA: Saudi Food and Drugs Authority

SMEs Small and Medium-Sized Food Businesses

TIVTC: Technical Institutes and Vocational Training Cooperative

WHO: World Health Organisation

WTO: World Trade Organization

Chapter 1: Introduction

1.1 Background

Food safety and hygiene issues have become important to different countries throughout the world, due to a number of factors such as increasing incidents of foodborne outbreaks affecting populations. Mass production in food processing and distribution, as well as, globalisation of the food trade may contribute to spread of outbreaks (Lindberg, 1999). The World Health Organization (WHO, 2013) has reported that, approximately 56 million people globally suffer from foodborne illnesses annually. According to the Procedural Manual - Codex Alimentarius Commission (2013) 'food hygiene' can be defined as:

> *Comprises conditions and measures necessary for the production, processing, storage and distribution of food designed to ensure a safe, sound, wholesome product fit for human consumption.*

Basically, foodborne illnesses occur due to consumption of unsafe food that is prepared under poor conditions. In food premises, unsafe handling practices can be considered to cause the majority of foodborne illnesses (Ehiri *et al.*, 1997). According to the US Food and Drug Administration (FDA) (2000), poor hygiene of staff and equipment, food coming from unsafe sources, insufficient cooking and holding food under improper temperatures are the key risk factors causing foodborne illnesses (Hertzman and Barrash, 2007). Scientifically, safe food is that food free from any microbial, chemical and physical hazards (WHO, 2002). Micro-organisms may be considered the most significant factors causing food spoilage as well as food poisoning. These risks can be reduced by preparing food properly in the premises (Acikel *et al* 2008).

Foodborne diseases surveillance is an important step to measure and control outbreaks because it provides useful data about the problem extent and its causes. In developed

countries, a systematic surveillance system is essential part of food safety systems (WHO, 2002). Those countries have an accurate database about foodborne outbreaks and its controlling methods. However, the statistics are in developing countries limited due to lack of effective surveillance systems (Malhotra *et al*., 2008).

In the healthcare sector, food hygiene subjects are of increasing importance to modern hospitals. Foodservices departments in healthcare institutions are required to provide their services under strict hygiene conditions. Most consumers in hospitals are hospitalized patients, who have a weakened immune system, so it is necessary to plan rigorous measures minimizing the hazards of food poisoning (Barrie, 1996, Guzewich, 1986 and Smith, 1999). It can be clearly seen that the vast majority of food poisoning incidences happen in collective eating-places, such as restaurants, schools, and even hospitals rather than homes (Scott, 2000).

Food handlers play an important role in the transmission of food borne disease outbreaks. Between 1927 and 2006, food handlers were responsible about 816 foodborne illness outbreaks, with a total of 80 682 cases around the world.(Greig, *et al,* 2007 and Todd, *et al,* 2007) A food handler is defined as

> "*any person who directly handles packaged or unpackaged food, food equipment and utensils, or food contact surfaces and is therefore expected to comply with food hygiene requirements*" (FAO, Codex alimentarius).

Therefore, all foodservices staff are responsible for controlling hazards during food processing and this responsibility tends to be greater in healthcare institutions, since hospitalized patients have a low immunity which could be affected by a small dose of pathogens (Carvalho, *et al*, 2000). Generally, food handlers must have an adequate knowledge and positive attitude toward food hygiene, hence, hygiene training is an essential

step in preventing food borne diseases. Despite the belief that knowledge, attitude and practice (KAP) are the main factors controlling hazards (Angelillo, *et al*, 2001; Patil, *et al*, 2005), there is an argument about the impact of training on food handlers. A number of studies have proved that there is no strong association between the level of knowledge and positive attitude or good practice (Acikel *et al*, 2008 and Askarian, *et al*, 2004). However, research in this field has been given a low attention in developing countries (Loevinsohn 1990) and that including Saudi Arabia.

At this time, a certification for food handling training is not required in Saudi Arabia even in healthcare sectors. Given the importance of food safety and hygiene matters in Saudi Arabia, the Saudi Food and Drug Authority, which specializes in the applications of food hygiene requirements in all food operators, was established newly in 2004. So far, food safety and hygiene issues in Saudi Arabia are relevant for various national agendas including; Ministry of Health (MOH), Saudi Food and Drugs Authority (SFDA), Ministry of Commerce and Ministry of Municipal Affairs. Nevertheless, there is an entanglement between those Ministries regarding the duties and tasks. In the future, the responsibilities possibly will be limited between the Saudi Food and Drug Authority and the Ministry of Health. The Saudi Food and Drugs Authority (SFDA) has drafted new regulations concerning all food safety laws and regulations. If it is adopted, it will help guarantee that all imported and national foodstuff conforms to international standards and local specifications. In additional to that, the authority supports the implementation of Analysis Critical Control Point system (HACCP) in all food businesses.

1.2 Thesis Statement

Providing safe meals daily for patients in healthcare settings can be considered a challenge as there are possible risks of hospital food from receiving to the patient's tray (Getachew, 2010). A number of foodborne outbreaks have been reported in healthcare institutes (Bolduc *et al*, 2004 and Rodriguez *et al*, 2011) and these outbreaks might be related to some issues concerning food safety and hygiene practices. The consequences of food outbreaks on the community may possibly exceed the health effects and cause other economic effects. For instance, after an outbreak the affected hospitals need several months to return to normal. Furthermore, treating the infected cases is expensive and that bed taken by a patient affected unnecessarily by infection deprives other patient who may urgently need critical medication. However, the majority of outbreaks could be prevented by adhering to good practices and Hazard Analysis Critical Control Points system (HACCP) principles.

HACCP system was introduced in Saudi Arabia in the mid-eighties of the last century. Saudi Aramco Company is the first company that has introduced this system and it was applied initially in the company's factories. In the past, the application of a HACCP system was optional, but at the beginning of this century, and as a result of joining Saudi Arabia to the World Trade Organization (WTO), the application of HACCP system became compulsory in food manufacturers, under certain circumstances. In healthcare sector, Ministry of Health (MOH) intends to implement HACCP in all Saudi hospitals which are under the supervision of MOH. This decision may face a number of barriers to implementation, however, nutrition contract terms and conditions have been amended particularly the part that related to food safety and hygiene conditions. Recently, the amended contract states that all foodservices suppliers contracted with MOH hospitals are required to adhere to HACCP principles. Those operators are also required to hire at least one HACCP coordinator in each hospital to follow up the system and other hygienic practices. They also must provide sufficient training

programs to their food handlers and that include health education and refresher courses. Furthermore, foodservices managers and supervisors who work with MOH, are required to attend development courses in food hygiene management and HACCP system. However, the previous terms have not been applied yet in most hospitals in Saudi Arabia. This may be attributed to several reasons, such as shortage of qualified people in HACCP system and lack of institutes that provide education courses in food safety and hygiene. Additionally, Saudi universities and colleges do not offer major programs focused on food safety and to meet this shortage, graduates from general food sciences and nutrition programs work as a food safety specialists.

In spite of the argument about the efficacy of food hygiene training in terms of changing behaviour and attitude to food safety (Howeset, *et al*. 1996 and Powell *et al*. 1997), food handlers, indeed, still need training before engaging in the work. The World Health Organization recommends that the food hygiene training of food handlers is essential in preventing foodborne diseases (WHO, 1999).

Food operators in Saudi Arabia bring employees from different countries around the world. It is expected that all employees are qualified and have sufficient experience in food hygiene especially those who will work in healthcare sectors. Nevertheless, some caterers companies could bring unqualified staff to reduce the cost. At the same time, the importance of food hygiene training has received little interest and no research has been conducted about this field. In addition to that, training is not compulsory hence, there are no formal institutes offering training programs in food safety and hygiene yet.

In general, implementation of HACCP system in Saudi Arabia is an advantageous step in preventing food poisoning and infection. However, implementing HACCP system particularly in healthcare institutes tends to be a complicated process and it is required to

have an accurate management plan. Pre-requisites programs (PRPs) are a significant point supporting HACCP system in any premises. PRPs include Good Manufacturing Practices (GMPs) which address operational conditions in the premises such as, facilities and structures, foodstuff preparation and storage procedures, and staff training and personal hygiene (Rippen, 2007). The MOH in Saudi Arabia has to ensure that PRPs are in place if the HACCP program is to be effective. It seems that, the decision of the MOH about HACCP needs more research prior to forcing foodservices companies to apply the amended contract terms. Food safety and hygiene status of hospitals in Saudi Arabia should be investigated to establish if the existing standards are high enough to support HACCP implementation. There are no formal studies published which considered the knowledge or duties of foodservices managers and supervisors with regard to food inspection and staff management .This study is to determine whether there are barriers to the implementation of HACCP in Saudi Arabia by evaluating pre-requisites programmes in a selected MOH hospitals in Riyadh region- Saudi Arabia. Moreover, the duties, knowledge and attitudes of foodservices staff will be assessed. Having identified barriers, hygiene training will be implemented to help overcome them. The impact of this hygiene training on foodservices staff will be demonstrated and assessed.

1.2 Research Questions, hypothesis, aims and objectives:

1.2.1 Research Questions

It is hoped that the data collected will make some contribution to answering the following research questions:

1- To what extent foodservice departments in MOH hospitals are ready to implement HACCP system?
2- Are PRPs adopted correctly in the foodservices departments?
2- Do food supervisors and handlers have an adequate knowledge about food hygiene practices and as well about HACCP system?
3- Is there any relationship between the staff demographic characteristics and their level of knowledge, practices and attitude?
4- Does the level of knowledge influence good practices and positive attitude?
5- Are the foodservices staff trained and qualified sufficiently to follow up the new contract conditions?
6- To what extent the food hygiene training program affects staff knowledge and behavior with regard to good practices?
7- Is there any variation in the level of foodservices and management provided in several MOH hospitals and how those variations well influence PPRs and HACCP systems?
8- How is the new nutrition contract conditions will be applied if there are differences between the MOH hospitals?

1.2.2 Hypothesis

1. Hospitals in Saudi Arabia have implemented the PRPs and have a sufficiently high standard of hygiene to be able to successfully implement HACCP.
2. A bespoke hygiene training programme can improve the knowledge; self-reported behaviour and attitude of food handlers working in Saudi hospital kitchens.

1.2.3 Aims

1. To establish the extent to which PRP's are implemented in hospitals in Saudi Arabia.
2. To test whether a bespoke hygiene training programme can improve the knowledge; self-reported behaviour and attitude of food handlers working in Saudi hospital kitchens.

1.2.4 Objectives

1. To carry out a survey on selected hospitals in Saudi Arabia to measure the implementation of PRPS.
2. To survey the staff working in Saudi Arabian hospitals to establish the existing level of their food hygiene knowledge, their self-reported hygiene behaviours and attitudes to hygiene
3. To design and deliver a bespoke training programme to food handlers in Saudi Arabian hospital kitchens and measure whether the intervention has any effect on their food hygiene knowledge, their self-reported hygiene behaviours and attitudes to hygiene .

1.3 Significance of the Study

Given the importance of food safety and hygiene, particularly in healthcare institutes, this study will provides the Ministry of Health in Saudi Arabia with a useful database about the current status of hospitals food hygiene. The study is important to investigate the implementation of pre-requisites programmes in selected MOH hospitals prior to enforcing caterers to apply the new contract conditions regarding HACCP system. Also, this study is significant to assess the knowledge, practices and attitude of all foodservices staff and to highlight the importance of hygiene training on food handlers. Thus, the results will help to identify of some limitations which may restrict the implementation of HACCP system in Saudi hospitals. The main benefits of this study can be summarized and listed below.

1- It will provide Ministry of Health in Saudi Arabia with significant information about the min barriers which may restrict implementation of the HACCP system.
2- It will provide baseline information for the standard of food hygiene knowledge in the selected hospitals.
3- It will enhance awareness of the policy makers and the officials in MOH about food safety issues in hospitals.
4- It will improve the awareness of foodservices staff regarding food hygiene practices.
5- It will help MOH to determine the food safety training needs of food handlers and thus to develop training programs according to their needs.
6- It can motivate Saudi Food and Drugs Authority (SFDA) and Ministry of Municipal Affairs to regulate and facilitate the establishment of private training institutes.
7- It can encourage the education sector to adopt and open new programs focused on food safety and hygiene field.
8- It will increase attention of all relevant governmental and private agencies about the effectiveness of hygiene training programs.

9- It may help MOH to determine any deficiencies in kitchens structures.

10- It will provide international hospitals with useful information about implementing food safety systems in healthcare sittings.

11- It could provide useful data to the interested national and international training bodies about the effect of training on food handlers knowledge, practices and attitude.

12- The result of the impact of training in this study could help food training institutions to develop and plan training program suitable for hospitals foodservices.

Chapter 2: Literature Review

2.1 The Main Responsibilities and Duties of Nutrition Department in Hospitals, an Overview

Nutrition services in healthcare sectors are responsible to provide patients, staff and visitors with meals which must be nutritious, balanced, attractive and safe. Providing healthy diet is a part of the medical therapy program for patients in any healthcare institution. In general, a hospital nutrition department consists of two units; the foodservices/catering unit and the dietetics unit. In general, the main tasks of the dietetics unit are to plan patients' diet and maintain good links between the catering unit and clinical teams, while the main duty of catering services is to prepare meals according to dieticians' description. Usually, both units work together under a single administration. However, in some hospitals those sections may work under separate administrations. Hospitals typically use external contractors, who provide ingredients and staff, to run foodservices under the supervision of nutrition administration. A foodservices system in the healthcare sector is different to one in commercial catering establishments. Catering for hospitals is considered one of the most complicated processes in the hospitality sector (Wilson, *et al*, 1997; Bas, *et al*, 2005). Acquiring this special feature is not only because of dealing with immune compromised groups, but also due to other considerations some of which are related to social and psychological reasons. In the UK for example, healthcare institutions contain patients who come from different cultures and need various diets. Those patients are not in hospitals because of their choice and many will not accept unfamiliar food, at the same time some of them may have weak appetite (British Dietetic Association, 2006). Some people also expect hospital food to be less attractive and unappetizing.

Nutrition department must manage all requirements carefully. For instance, some patients may have food allergy and other might require a strict diet with a calculated calories or

specific types of food. Even so, some of those who are on normal diet may need special meals such as vegetarian or religious meals. Moreover, hospital staff, and visitors who are staying with patients (e.g., relatives on intensive care) should be considered. On the part of food quality, patients' meals must meet high standards and be served properly to maintain the quality. However, sensory characteristics, which include flavour, appearance, and temperature, may tend to be more important to hospitals patients, while providing safe and healthy meals is a priority and the main goal of nutrition department. Hence, hospital food has to meet all nutritional desires and personal preferences for all consumers in that institution. Over and above, all these meals must be prepared and served under a strict hygiene conditions. Fulfilment of all these requirements is a heavy burden on a nutrition department and could affect the level of service. To avoid any problems in the service, the nutrition department must be managed by a professional and qualified staff.

According to the US Census Bureau (1997), caterers can be defined as businesses that are "engaged in providing single event-based food services" including banquet halls and operations that transport food and/or prepare food at an off-premise site (Hertzman and Barrash 2007). In general, foodservice operations can be classified into three main types :

1- *Integrated foodservice systems*: the operation provides food services and food production in the same time.
2- *Food manufacturing systems*: there is a decoupling of service from production, the meals are cooked and prepared separately and then transferred to serve, for instance flights and rail catering.
3- *Food delivery systems*: the operation focuses on the service of meals and not involved in any food production. (Jones and Lockwood,1995).

In healthcare sector, it seems to be that, *integrated foodservice systems* and *Food manufacturing systems* are more common. In some hospitals, meals are prepared and cooked

in the hospital kitchen and distributed directly to the patients or staff cafeterias (Lund and Brien, 2009). This method is called *traditional* or *conventional catering* (Barrie 1996; Edwards and Hartwell, 2006.). Ingredients here are brought in, received by the food supervisors, stored, prepared and cooked. Next, meals are plated out and transferred to the wards in trolleys, which are designed to keep the food at the suitable temperature (Barrie 1996). Alternatively, food can be delivered to the wards in bulk and then plated out there by the waiters or nurses (Barrie 1996, British Dietetic Association, 2006). The bulk system tends to be more common in children's and elderly wards (Barrie 1996). The *conventional catering system* preserves the food's sensory characteristics as it can be cooked close to the time required (Edwards and Hartwell, 2006.). However, meals may arrive to the patients late as some wards are often located a far away from the hospital kitchen, (Edwards and Hartwell, 2006), such as in large hospitals.

Hospitals kitchens consist usually of several units some of which are totally separated from other. Kitchen units include:

1- Receiving area: ingredients are received, inspected and sorted in this area which is usually located outside the kitchen;
2- Store rooms: include dry stores, cold rooms and refrigerators, freezers, utensils room and chemical store;
3- Cooking area: it is the main area in kitchens where food is processed and prepared. This area is located in the centre of the kitchen. It contains cooking equipment in addition to some refrigerators;
4- Quick spoilage food room: it is an isolated room with a low temperature. Quick spoilage food such as salad, sandwiches and custard are prepared in this room.
5- Special diets preparation room: it is an isolated room as well. Meals for patients who suffer food allergy or need special diets are prepared in this room;

6- Staff offices: it is located usually in kitchens corner outside cooking area. In some hospitals supervisors offices is located near the receiving area to view all supplies;
7- Cafeterias: it is offering meals for hospital employees and visitors. It is located near of the kitchen;

Other facilities for food services staff: such as toilets, washing hand sinks, eating area and cloth cabinets.

Obviously, foodservices department is not just a kitchen for cooking food, but it can be considered as a small food manufacturer. A massive amount of food processing is conducted within its units such as receiving, cooling, freezing, storage, cleaning, distribution and even packaging (diagram 2.1). Consequently, a lot of chemical, physical and microbial hazards threaten patients' meals and those hazards can be considered as a challenge facing catering services in healthcare sectors. Moreover, processing and handling food through kitchen units, or even during meals distribution in the hospital wards, could be a contributing factor to the occurrence of contamination. Food safety and hygiene in healthcare settings is a critical issue as the consumers have a less immunity and the foodservices department required to provide a wide range of dietary items, so it is significant that good hygiene practices are maintained (Grintzali and Babatsikou, 2010).

Typically, food operators provide staff responsible for catering services in hospitals kitchens such as chefs, waiters, and sometimes nutritionists. Hospitals employ food supervisors and nutritionists to supervise on catering services and hygiene practices. The hospital domestic staff must be given responsibility for ensuring that the caterer complies with the contract standards especially in hygiene subjects. All the important terms and conditions in relation to hygiene standards should be described clearly in the contract. The chain of procedures between the diet plan and the meal preparation to the patient eating the food is too complex.

This food chain needs efforts of several individuals and skilled groups to link together in a coordinated approach at each phase. Food safety and hygiene management in the hospitals is an integrated process between the chief catering officer and the nutrition administration. Foodservice practice includes all the process and practices that are associated to the provision of meals to the patient, as well as the terms under which food is served. The foodservice operator has a significant duty in maintaining a correlation with the nutrition administration. The effective cooperation is based on two factors; providing appropriate training in food and personal hygiene for food handlers; and understanding and complying with the legal requirements by catering and hospital management (Getachew, 2010). Lack of the coordination between dietary staff and catering staff may affect the service negatively. Some countries require that, all food operators are required to fulfil a full risk assessment of their food production, and to set up management systems and control measures to prevent contamination (British Dietetic Association, 2006). In healthcare sector, catering staff are the main food handlers, although nurses and other domestic staff could serve meals (Tokuç, *et al*, 2009). As a consequence, they represent a potential cause of foodborne outbreaks by poor practices (Angelillo, *et al,* 2001; Lo *et al.,* 1994) or by ignoring personal hygiene. Therefore, control measures should include staff training and education.

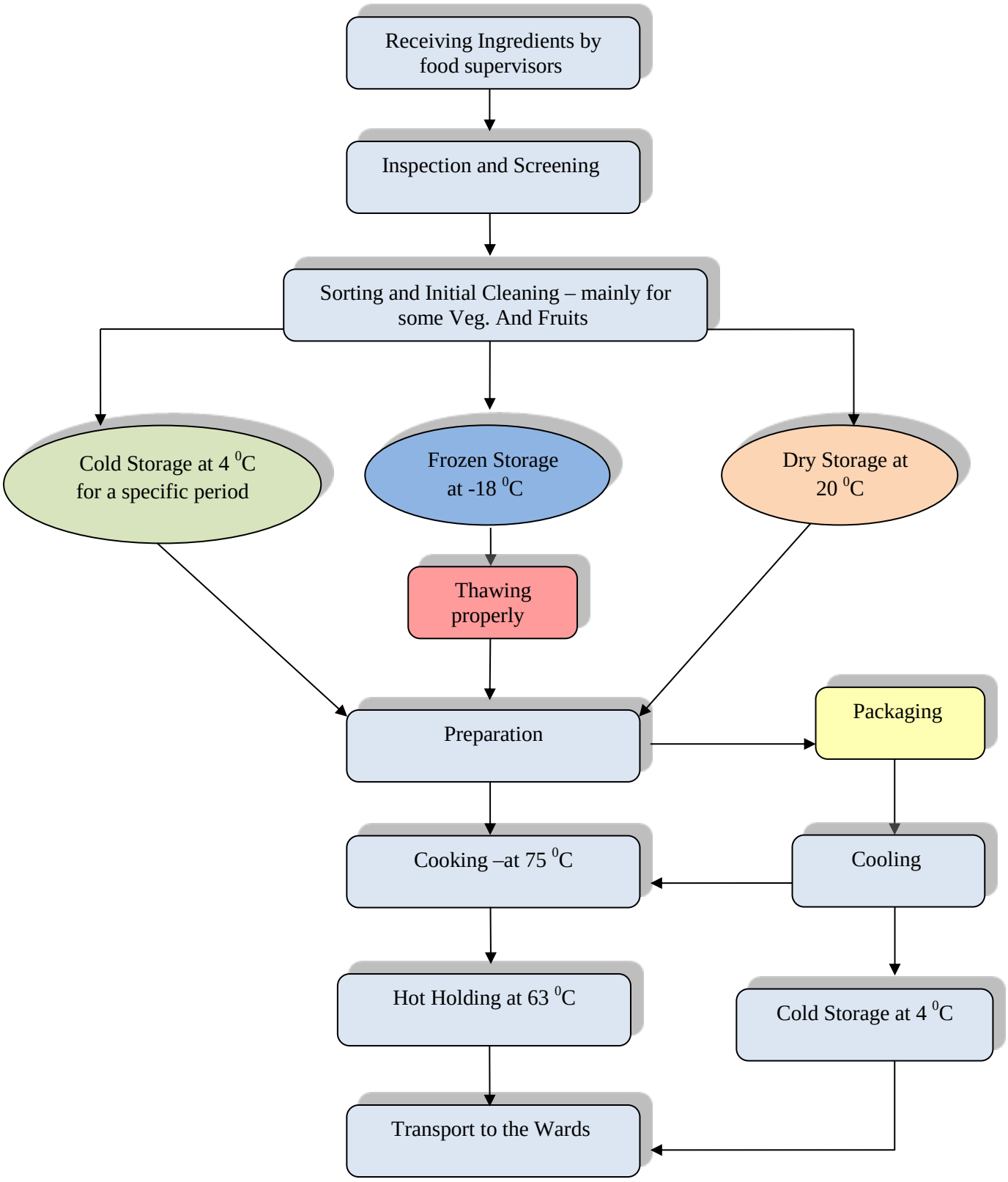


Figure 2-1 Food Processing in Hospitals Kitchens

2.2 Food Services in Saudi Hospitals

2.2.1 Saudi Arabia – Background:

Kingdom of Saudi Arabia is a vast dry desert and was established in 1932 by King Abdul-Aziz AL- Saud. It represents the major part of the Arabian Peninsula with an area of about 2250,000 sq kms. Administratively, Saudi Arabia consists of thirteen provinces managed by five main regions and the capital city is Riyadh. Its economy is mainly based on oil production which was discovered in 1938 (Royal Embassy of Saudi Arabia, 2009). Saudi Arabia is considered the faster growing population in the six Gulf Cooperation Council (GCC) countries (Colliers International, 2012). The population was estimated in 2012 to be about 29 million. Saudis represented about 20 million while resident foreigners about 9 million (Central Department of Statistics and Information, 2012). The expats come from several countries around the world and mostly from India, Pakistan, Bangladesh, Indonesia and Philippine. It has been observed that the factors contributing to the increase of expats in the Kingdom include: the discovery of oil, cheap salaries serving non-Saudis and the emergence of many fictitious institutions that trade in visas employment. The growing population, besides rising average income, will increase the demand for main services, particularly in, housing, health and education (Colliers International, 2012). However, health and education are totally free for all population. The majority of healthcare services of in Saudi Arabia are provided by the Ministry of Health.

2.2.2 Ministry of Health

Healthcare sector in the Saudi Arabia is managed by the government through the Ministry of Health (MOH), addition, a number of semi-public organisations, such as universities, military sectors and private sector, run hospitals and medical services. However, the operation services in private sector are under the MOH supervision and regulations. The total number of hospitals owned and operated by the MOH is 249 which represent about 60% of hospitals in Saudi Arabia (MOH, 2010). The annual budget for the MOH requires huge amounts of funds from the state budget. As an example, for 2010 the budget was about 35 SR billion (about 6 GBP billion) (MOH, 2010). There are several sectors and administrations in the MOH which supervise the healthcare services in the hospitals such as, Pharmaceutical Care department, Medical Research unit, Nursing administration, Medical Rehabilitation department, Parasitic & Infectious Diseases department and general administration of Nutrition. The MOH communicate with the hospitals through its directorates. There are about 20 general directorates across the country each one includes a branch of the MOH departments.

2.2.3 Foodservices in Saudi's Hospitals

Foodservices in Saudi's hospitals are operated by catering companies under the supervision of the general administration of Nutrition in the MOH. The directorate general of Nutrition consists of three main departments; support services, clinical nutrition services and foodservices. The foodservices department is divided into four divisions each one has its tasks. These divisions are:

1- Division of nutrition tenders: it is responsible for studying nutrition tenders and contracts specifications.

2- Division of catering services: it responsible for ensuring the caterers comply with the contract standards via visiting hospitals kitchens.

3- Division of catering companies classification: its main task is to evaluate and rank the catering companies before applying to the nutrition tenders.
4- Division of food safety and quality: it is opened recently and responsible for applying food safety and hygiene standards in the hospitals kitchens and planning strategies and recommendations for food control systems (General Administration of nutrition, 2011)

The government of Saudi Arabia spend a lot of money on the foodservices sector in healthcare institutes. According to the Health Statistical Year Book , the total number of meals served in the MOH hospitals in 2010 was 19.2 million with an average of 53,952 meals/ day (each meal consists of breakfast, lunch and dinner) (MOH, 2010). These meals include patients and their relatives or people accompanying them and medical staff who were on duty. There are more than 25 national foodservice companies in Saudi Arabia specialized in healthcare catering.

As a general rule, foodservices system in Saudi hospitals operates on a tenders system. It depends on contracts with food catering companies to provide food, materials, detergents, equipment and staff. The nutrition administration departments in the hospitals supervise on catering services and link between the catering companies and the directorate general of Nutrition in the MOH (diagram 2.2).

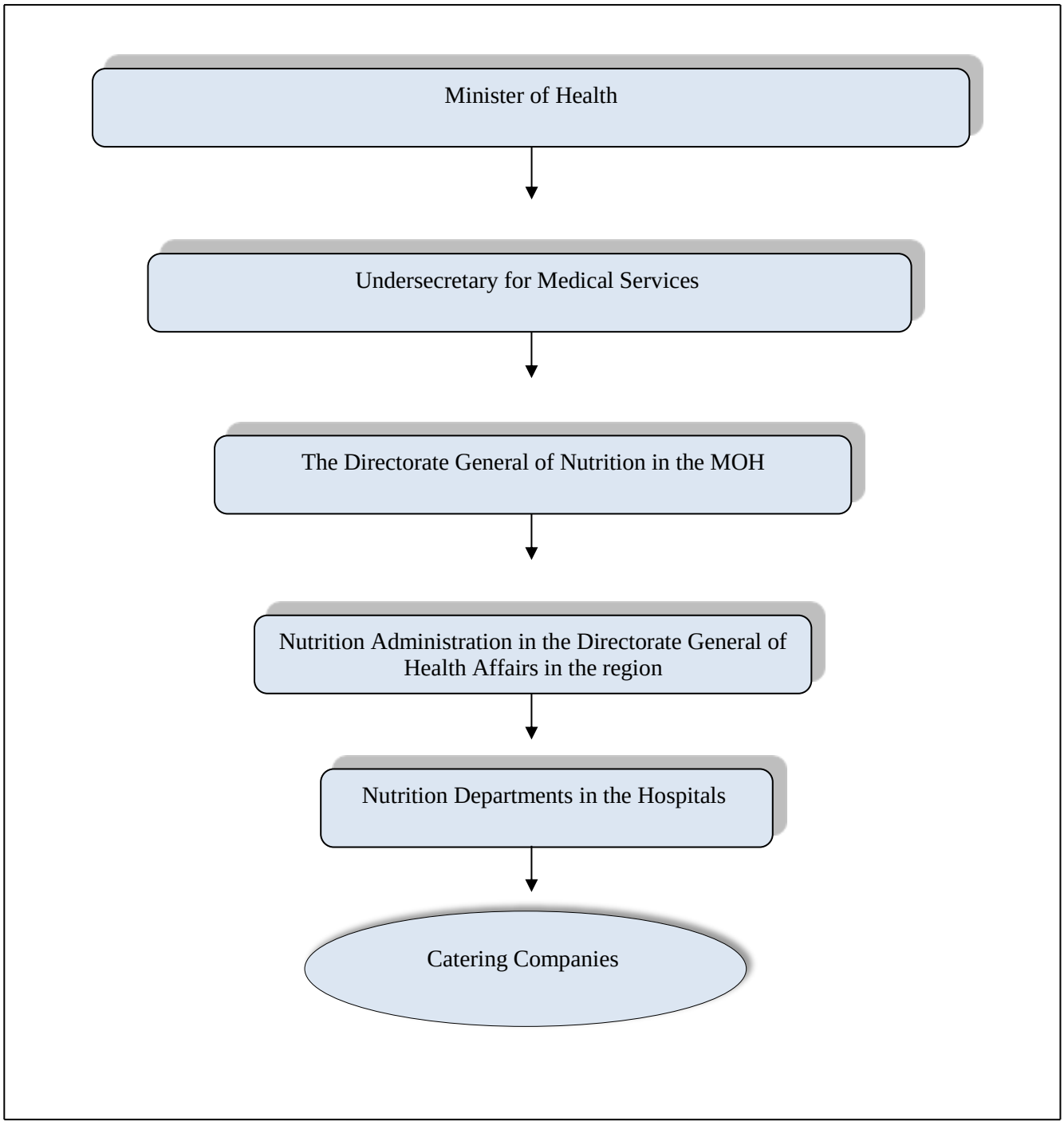


Figure 2-2 The Administrative Hierarchy of Nutrition services in Saudi Health sector (General Administration of nutrition, 2011)

The food catering companies bring employees, including chief catering officers, nutritionists, cooks, waiters and waitress, food technicians, storekeepers and cleaners, from different countries around the world such as; Egypt, India , Bangladesh and Philippines. It is expected that all employees are qualified and have sufficient experience in food hygiene. The catering staff also are required to obtain a health licence which is renewed every 6 months. The health licence is given to an employee who is free from any infectious diseases. Examinations of nose and faecal specimens are necessary. Hospitals kitchens require a number of staff depending on the beds and number of meals served. Staff qualifications must be checked and accepted by the nutrition administration in the hospital before starting work. The overall company staff number in foodservices departments ranges between 10 in small hospitals to 200 in large hospitals. According to the latest statistics, the total numbers of catering staff in the MOH hospitals exceed 6000 people, most of them non-Saudis (MOH, 2010). Those staff are responsible for all food processing and preparation. The responsibilities and duties in the foodservices departments are divided between staff according to the jobs classification. Usually, the catering company in any hospital hires a chief catering officer or a "location manager", who is responsible for managing the supplies and company's staff. In addition to that, the location manager is the responsible person in front of the hospital administration to order and supply the required materials according to the contract conditions. The location manager should have a suitable degree in hospitality or food and nutrition sciences. Chief cook or sometimes "assistant manager" is the leader of cooks and he is responsible for food quantity, controlling and processing together with the other cooks. Nutritionists and food technicians are asked to plan diet and meals and supervise the trays line during meals preparation and distribution. Waiters and waitress distribute the meals for patients and, as well, serve the hospital visitors and staff in the main cafeteria. Store keepers are responsible about purchasing orders for supplies, cleanness of store areas and cold rooms. Recently, the

MOH require caterers to employ a food safety specialist and HACCP coordinator in each hospital. Table 2.1 illustrates the jobs description for catering staff (MOH nutrition contract).

On the other hand, nutrition departments' directors, food supervisors and dieticians, who all work for the MOH, are public servants and employed by the government. These employees are responsible for the implementation of contract terms, for food inspection, and for controlling the staff of catering companies regarding hygiene practices in hospitals kitchens. However, dieticians may be involved in patients care, and be responsible for nutritional therapy. The overall ministry's employees number in nutrition departments ranges between 1 in small hospitals to 20 in large hospitals. The total number of dieticians and food supervisors who work in the MOH hospitals is about 1192, and the majority of them are Saudis (MOH, 2010). In each hospital, the director of the nutrition administration has the main role in managing the department and reporting to the MOH monthly about the caterer performance. Furthermore, staff timetabling, dividing duties, food menus and issuing monthly invoices are some of the director's roles. Food supervisors are responsible for technical duties which includes; food receiving, inspection and processing under hygienic terms, good practices among staff and the other hygiene and cleanness issues in kitchen areas. Dieticians contact directly with patients in hospital wards. Their responsibility is in planning menus, nutrition education and food complaints. *Traditional* or *conventional catering* methods are used in all hospitals under the MOH. Ingredients are received daily, stored, prepared, cooked, plated and then distributed by the caterers staff in trolleys which are divided in to two parts; hot part and cold part. Formally, if there is any contravention committed by company's staff, sanctions will be applied on the company according to contract terms. The sanctions vary according to the violation. For instance, an employee who does not care about his personal hygiene may be expelled from the location (Ministry of Health, 2011). If the company supplied an expired foodstuff, penalty will be deducted from the monthly bills and the amount will be determined

depending on the contract terms. It is observed that the main objective of catering companies' staff is to reduce cost as much as possible although this manner can affect hygiene practices, while the main goal of the ministry's employees is to provide patients with healthy and safe meals.

Catering contracts are for a specified period and lay down certain conditions required by the MOH. Contracts are usually for a three years period and meet the needs of patients, employees and visitors. However, the MOH tends to extend the contract period for up to five years. Items and food must be of a high quality. The contract conditions are modified to meet the needs of each site, indicates the number of meals required daily. Operational policies for food qualities, quantities and processing, food handling and hygiene, are stipulated. In addition to foodstuffs, contractors are required to supply sanitation and materials, utensils and any required equipment. It is assumed that all food processing are under hygiene conditions. Recently, the foodservices contracts require caterers to implement HACCP system in hospitals kitchens. However, the effective control systems, such as HACCP, should be adopted by the hospital nutrition management team but after staff training and kitchens rehabilitation.

Jobs	Required Qualifications	Experiences	Responsibilities
chief catering officer *	BSc in food sciences and nutrition	5 years in hospitals and literacy in Arabic and English	Controlling, and evaluating food service; managing budget resources; establishing standards of sanitation, safety, and security, staff management
Assistant Chief *	BSc in food sciences and nutrition	2 years in hospitals and literacy in Arabic and English **	Helping and assisting the chief
Dietician *	BSc in dietetics or MSc in human nutrition	2 years in hospitals and literacy in Arabic and English**	Plan the patients diets, participates in health team rounds and serves as the consultant on nutritional care
Nutritionists *	BSc in food sciences or human nutrition	2 years in hospitals and literacy in Arabic and English **	Evaluating food service systems ,developing menus and evaluating client acceptance
Food safety specialist	BSc in food safety/ microbiology or food sciences	2 years in hospitals and literacy in Arabic and English	Inspecting and receiving supply, follow up all hygiene procedure in the kitchen, staff training.
Food technician *	An appropriate diploma in food and nutrition	3 years in hospitals**	Assisting and helping the dieticians and supervising on the food distribution
Chief cook	BSc/diploma in hospitality	3 years in hospitals	Food quantity, controlling and processing together with the other cooks
Cooks (general, diet, assistances, and butchers	Intermediate literacy in Arabic and English	3 years in hospitals	Preparing and cooking food
Waiters/waitresses	Intermediate literacy in Arabic and English	1 year in a hospital	Serving and delivering patients meals
Cleaners		-	Cleaning

Table 2-1 Jobs description for catering staff

***Only for Saudis**

**** No experience required for Saudis**

2.3 Food Control Systems

2.3.1 Hazard Analysis and Critical Control Point (HACCP)

The HACCP system was established in 1960 in the United States by the Pillsbury Company in collaboration with the National Aeronautics and Space Administration (NASA) (The Food and Agriculture Organization of the United Nations FAO 1998). This technique is the internationally recommended and documented system of food safety management for most food companies (Food Standards Agency, n. d.). Fundamentally, the HACCP system identifies the critical points during food processing thus controlling and preventing any future hazard (Food Standards Agency, n. d.). Adopting the HACCP system in premises produces food which is safe to eat because it is as free as possible from physical, microbiological and chemical hazards (The Food and Agriculture Organization of the United Nations FAO, 1998). To meet this objective, seven basic principles have been developed to implement HACCP plans in any given premises. These are:

1- Identify any hazards that must be prevented eliminated or reduced.

2- Identify the critical control points (CCPs) at the steps at which control is essential.

3- Establish critical limits at CCPs .

4- Establish procedures to monitor the CCPs .

5- Establish corrective actions to be taken if a CCP is not under control.

6- Establish procedures to verify whether the above procedures are working effectively.

*7- Establish documents and records to demonstrate the effective application of the above measures (*Codex standard, 1969*).*

Implementation of the HACCP system is required now in several countries around the world. For instance, in the European counties all food businesses are required to implement HACCP from 2006 except primary producers (Regulation (EC) no 852/2004). However, prior to designing a HACCP plan in any premises, "prerequisite programs" are essential steps required for the success the HACCP (Bas, *et al*, 2006).

2.3.2 The Concept of Prerequisites Programs

Prerequisite programs (PRPs) are defined as "*Practices and conditions needed prior to and during the implementation of HACCP and which are essential for food safety'* (WHO 1999). In the same context, the US National Advisory Committee on Microbiological Criteria for Foods (NACMCF, 1997) defines pre-requisite programs as '*Procedures, including Good Manufacturing Practices that address operational conditions providing the foundation for the HACCP system*'. Pre-requisite programmes refer to a variety of good practices during food processing such as, Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP), which provide the basis of the HACCP system (Wallace and Williams, 2001). Generally speaking, GMP is a standard method of ensuring high standards in personnel, building, equipment, documentation, production and quality control (Zschaler, 1989). As well as this, GHP includes staff training, disinfection and cleaning, ingredient and product specifications in addition to hygienically designed facilities (WHO, 1993). According to National Restaurant Association Educational Foundation, (2002) PRPs can be described as standard operating procedures (SOP), which involve good personal hygiene , sanitation and cleaning programs, correct facility -design practices, equipment-maintenance, and supplier choice and measurement programs (cross-contamination control). In any food premises, confirmation of effective PRPs indicates that the HACCP system can be implemented. On the other hand, non-application of the PRP prior to designing a HACCP system will probably be waste of money, resources and effort, as well as resulting in unsuccessful HACCP

implementation (Bas, *et al,* 2006). Therefore, PRPs and HACCP are integrated processes to ensure effective food safety control, thus producing safe products.

2.3.3 Implementing Food Control Systems in Healthcare Sector

As stated above, one of the main goal of food services departments in hospitals is to provide food that free from any contaminations, especially microbial contamination, because patients are more vulnerable than healthy subjects (Askarian, *et al*, 2004). Due to this, implementation of the HACCP system in hospitals, especially with regard to PRPs, is strongly required. However, implementation of HACCP system and PRPs in healthcare institutions is likely to face some barriers. Those barriers are the same which other food business operators faced. Bas *et al* (2005) reported that lack of financial support, absence of training programmes, and inadequate equipment and environment are the major hurdles. In addition to this, the large mixture of products used in hospitals may be considered a significant barrier. A wide range of food products may limit HACCP implementation where the number of CCPs will be considerable (Wallace and Williams, 2001). According to a survey conducted in Greece that included 99 hospitals, only 4 hospitals had established a HACCP system (Lund and Brien, 2009). Although, hospital food service systems are considered one of the most complicated production processes in the hospitality sector (Bas, *et al*, 2005) HACCP system has been implemented successfully in some other hospitals. A survey conducted in Calabria, Italy in 2001 to assess 27 hospitals regarding HACCP implementation showed that more than half of assessed hospitals are using the HACCP system and, of those implementing HACCP, 79% adopted a food-hygiene–practice manual (Angelillo *et al*, 2001). The study demonstrated that most hospitals already had developed PRPs before implementing HACCP (Angelillo *et al*, 2001).

PRPs are more likely to be implemented in private hospitals than general hospitals and that may be attributed to high financial resources. A 2005 study conducted in Ankara, Turkey, to

evaluate safety practices related to PRPs in private and government hospitals showed that the private hospitals implemented PRPs professionally more than government hospitals (Bas, *et al*, 2005). Lack of adoption of PRPs in hospitals certainly obstructs HACCP. In Ankara, several hospitals are not ready to implement HACCP because only a few have always implemented PRPs (Bas, *et al*, 2005). The same findings were obtained in Iran, where only 35% of the hospitals in Shiraz were aware of general hygiene practices (Askarian, *et al*, 2004).

2.3.4 HACCP, Prerequisite Programs and Food Safety in Saudi's Hospitals

It has been reported that the food safety systems in developing countries is not sufficient to protect human health (FAO/WHO, 2005). Saudi's hospitals are still far away from the implementation of HACCP system, although this system has been implemented in several hospitals around the world, particularly in the developed counties. Non-application of the HACCP system in hospitals is due to several reasons, some of which are not clearly understood. Insufficient pre-requisite programs (PRPs) may restrict the HACCP implementation in Saudi's hospitals. Problems of implementing PRPs in hospitals may include lack of food hygiene management training and inadequate equipment and environment. The design of food services departments in hospitals may be ineffective. Although the MOH has expended great efforts to develop foodservices, food safety and hygiene issues, particularly hygiene training courses, are still given a low priority compared with other health services which receive high funding and support to improve their services. For instance, some hospitals could accept a candidate if he is a certified professionally only without regard to the hygienic aspects and he may start the work with insufficient hygiene training or maybe without it. This deficiency could attribute to the lack of the importance of food handler training and education.

Staff might be considered a barrier in the application of the system due to a number of factors such as lack of education and their multiple nationalities. Although the Ministry of Health is trying to amend the food contract terms and force the suppliers to apply the HACCP, this modification may be without regard to PRPs. To date, no official data exist concerning knowledge, attitudes, and practices about food safety and PRPs in Saudi's hospitals. Therefore, it is important to determine the barriers to implementation that may exist. Specialists in food hygiene are rare in Saudi Arabia. This information can assist in the development of guidance that will help successful implementation and, as a result, improved the food safety in the hospitals.

2.4 Staff Role in Providing Safe Meals and the Importance of Training

2.4.1 Foodborne Diseases Outbreaks in Hospitals

Overall, foodborne diseases represent an important health problem around the world as the number of notified incidence of outbreaks has increased gradually (Todd 1989 and Notermans *et al*, 1994). In developed countries, 30% of the public suffers from foodborne illnesses (Sanlier *et al*, 2010). Contaminated food in America has caused 76 million illnesses and 5000 deaths annually (Medeiros *et al*. 2001; De Waal 2003). In Europe and Asia, about 130 million people are infected yearly (Sanlier *et al*, 2010). In Saudi Arabia, about 249 outbreaks were reported in 2010 with more than 1485 cases, most of them associated to *Salmonella*, and 1 death was caused by *C. Botulinum* (MOH 2010). In Taiwan, a total of 18,067 people suffered from foodborne illnesses between 2004 and 2008 (Shih and Wang, 2011). It has been demonstrated that the majority of foodborne illnesses are caused by preparing food improperly in small food businesses, canteens, homes, hotels, and other places where food is prepared for consumption (Bas¸ *et al*. 2006). According to Wilson *et al*, (1997), 70% of all bacterial food poisoning incidences are caused by caterers. In particular, 30% of these food poisoning outbreaks are caused by cross-contamination and the remaining 70% are the result of inadequate time and temperature cooking. However, Tebbut (1984), concluded that cross- contamination tends to be greater in the kitchens of cafes, restaurants and hotels than those of, hospitals, schools and staff canteens. In hospitals, the delay between food preparation and distribution could support the growth of pathogens if the temperature is abused (Reglier-Poupeta, *et al*, 2005).

Catering companies who supply healthcare institutions with food are required to provide their services under high hygiene standards. Most of consumers in hospitals are hospitalized patients, who have a weakened immune system, so it is a necessary to plan strict measures

minimizing the hazards of food poisoning (Barrie, 1996; Guzewich, 1986 and Smith, 1999). Therefore, the hospital food operator must produce meals free from contamination. Universally, hospitals outbreaks represent relatively a low percentage of total incidences outbreaks compared with other food businesses sectors. In the Netherlands, hospitals were responsible for approximately 9% of 281 of gastroenteritis outbreaks in 2002 (Van Duynhoven *et al*, 2005). In Poland the average outbreaks in hospitals represented 1.5%-6% of the total number of outbreaks between 1985 - 1999 (Przybylska, 2001). Although the number of outbreaks in hospitals is relatively small, the numbers of affected cases from each outbreak likely to be high compared with other eating establishments (Lee, 2000). For instance in Ontario, although only reported 12 reports outbreaks occurred in hospitals between1993-1996, approximately 352 people were affected (Lee, 2000). In Italy between 1991-1994, the average number of cases per incident for hospitals was 58 compared with only 15 for restaurants and 4 cases in homes (Lee, 2000,). In Canada in 1990-1993, the average number of cases per outbreak was only 8 for restaurants comparing with 27 cases for hospitals (Lee, 2000). In Australia, outbreaks in healthcare institutions were responsible for 35% of deaths from foodborne infections (Dalton, *et al*, 2004). Where outbreaks do occur in healthcare settings they can be more extreme than in other food service settings.

Generally, the pathogens that cause foodborne illnesses in healthcare sitting are the same as those causing illnesses in the community (Getachew , 2010). However, the consequences of infection in healthcare sector are greater because of the increased vulnerability of patients and these incidences can also critically disrupt health services in the infected hospital (Evans, *et al*, 1996). A number of foodborne outbreaks have been reported in healthcare settings linked to pathogens such as; *Listeria monocytogenes* (Lingaas *et al*., 2008) and *Escherichia coli O157:H7* (Bolduc *et al*., 2004) in sandwiches, salads, cheeses and deli meats. *Salmonella*, which is one of the common pathogens, affected 5% of a private hospital patients and staff in

London in 1994 (Maguire, 2000). There have been 248 outbreaks of *Salmonella* infection in hospitals affecting more than 3000 patients and causing 110 deaths were reported in England and Wales between 1978 and 1987 (Joseph and Palmer, 1989). In Bavaria, a *Salmonella enteritidis* outbreak caused 6 deaths among nurses and patients in hospitals (Heissenhuber *et al*., 2005). However, physical and chemical contamination must also be considered. Table 2.2 illustrates other outbreaks which occurred in healthcare sittings over the world and the causes. Food implicated are various. Mishandling of food could be a common factor even in hospitals or in other eating places. According to Food and Drug Administration, 2004, the main factors contribute to outbreaks of foodborne illness in hospitals are; improper holding time/temperature; contaminated equipment; poor personal hygiene; chemical contamination; and food coming from unsafe sources. The Food Safety Authority of Ireland (FSAI) have identified similar risk factors which are: infected food handlers; cross contamination; inadequate cooking; inadequate storage; inadequate reheating and delayed serving (Anonymous, 1998). Several studies have estimated the relative importance of these factors. In England and Wales, for instance, infected food handlers in about 10%, inadequate heat treatment is a risk factor in about 29%, inappropriate storage in about 28% and cross contamination in about 25% of general outbreaks (Anonymous, 2000). Comparing with the US, improper holding is a causative factor in 60%, while poor personal hygiene in about 31%, contaminated equipment in 26% and inadequate cooking in 18% of general outbreaks (Olsen *et al*., 2001). It is clear to conclude that, improper practices of staff are a main cause of foodborne diseases in any food premises.

Region	Caused	Affected Cases	Food implicated	Factors leading to outbreak
Canada, 2002	*E. coli O157*	109- 2 deaths	Probably salads and sandwiches	Preparation in hospital kitchen by symptomatic food handler
England, 2002	*Salmonella Enteritidis*	29	Imported eggs	Eggs infected with outbreak strain and undercooked
Japan, 2001	*Clostridium perfringens*	90	Boiled beans	Beans cooked in large quantities, cooled slowly, not reheated adequately before serving
Sweden, 1999	*Norovirus*	400 including secondary spread	Pumpkin salad	Contamination by food handler
Netherland, 2001	*Salmonella Enteritidis*	82 – 5 deaths	Bavaroise	Raw eggs used to prepare bavaroise, under heated, no temperature checks
Denmark, 2005	*Norovirus*	970 patients and staff	Imported, frozen raspberry pieces	Contamination during growth/harvesting on several small-scale farms
Canada, 2008	*Listeria monocytogenes*	57 – 21 deaths	Deli meat	Outbreak strain identified in meat product. Failure to clean meat slicer thoroughly
USA, 1997	*Campylobacter*	16	Sweet potato	Opportunities for cross-contamination in the kitchen
Australia , 2006	*Campylobacter jejuni/coli*	21	Poultry dishes	Food prepared in hospital kitchen with recently established cookechill system and no HACCP system
Scotland, 1997	*E. coli O157*	20	Home-baked, cream-filled cakes	Possible contamination of fresh cream (made with pasteurized milk) in cream cakes

Table 2-2: the outbreaks reported in some countries and it causes (Lund and Brien, 2009) (with permission – appendix 22)

2.4.2 The Relationship between Food Safety and Food Handlers

In August 1984, 355 patients and 106 staff in a large hospital in London were infected in an outbreak of *Salmonella typhimurium* causing in 19 deaths. The investigation identified that, cross-contamination between raw and cooked foods, poor food preparation and storage facilities and insufficient staff awareness to follow the basic rules of food hygiene practice are the main factors contributing in the outbreak (DHSS, 1986). It has been reported that, improper food handling may be implicated in 97% of all foodborne diseases associated with catering food services (Howes, *et al*, 1996). Improper practices responsible for the majority of microbial foodborne diseases and have been well documented (Bryan, 1988). That includes cross-contamination of raw and cooked foodstuffs, insufficient cooking and storage at unsuitable temperatures (Egan, *et al*, 2007). However, cross contamination may consider the most important risk factors, mainly between the food and the preparation surfaces (Bisbini, *et al*, 2000). Foodborne pathogens might be transferred to food by food handlers either directly or by cross-contamination (Todd, 2007). Food handlers could also carriers of pathogens in on their bodies (Cruickshank, 1990). When good practices are not maintained properly, kitchens might become an important contamination resource point. Consequently, food handlers play an important role in food safety and preventing contamination (Acikel, 2008).

In hospitals catering foodservices employees are the main food handlers, (Tokuç, *et al*, 2009) and as a consequence they represent a potential cause of foodborne outbreaks by poor practices (Angelillo, *et al*, 2001; Lo *et al*, 1994). Comprehensive knowledge about hygiene issues such as foodborne diseases and attitudes about good practices among staff and their managers is a significant step towards the successful implementation of HACCP in any food premises. However, implicating food handlers as a main cause of foodborne outbreaks could be partially incorrect. Some other authors consider food handlers as victims of events, rather

than the main cause (Lund and Brien, 2009). This opinion based on the fact that food handlers are culture positive for an outbreak strain (Lund and Brien, 2009). Nevertheless, food handlers, who are symptomatic and continue working, should be excluded from workplace and considered as a possible cause of the outbreak. Some countries require that, all food handlers with infectious diseases must stop working and report to their supervisors. However, that may not apply in a number of catering companies. For instance in Saudi Arabia, sick leave could be unpaid in a number of restaurants and catering companies. Therefore, staff might attempt to hide any symptoms..

2.4.3 The Importance of Training and its Effect on Foodservices Staff

It is identified that, staff knowledge is a significant factor influencing contamination of food, in addition to other factors such as their health status and personal hygiene (Jacob, 1989). The main aim of food hygiene training is to change behaviours that are most likely to cause foodborne disease (Egan, *et al*, 2007) by increasing the recipients knowledge. Inversely, there is links between low levels of staff training and those premises with poor hygiene practices (Audit Commission, 1990).

In healthcare setting, food handlers and other domestic staff, such as nurses, who are not trained about food hygiene and HACCP, may pose a great concern (Grintzali and Babatsikou, 2010). A survey conducted by Buccheri. *et al* (2007) in two hospitals in Italy showed that, there was a lack of knowledge among nurses, who serve the food, about basic food hygiene rules such as correct temperatures of storage of some foods and food vehicle associated to foodborne illness. Moreover, only 20% of the respondent nurses had attended training courses about food hygiene. In general, lack of knowledge about food control programs such as HACCP, and lack of prerequisite programs were identified as the main hurdles for food safety in food premises (Bas, *et al*, 2007). Training staff in basic food safety to support implementation of prerequisite programs and HACCP in food premises were strongly

emphasized (Bas, *et al*, 2007). A number of studies support the need for training of food handlers in public hygiene measures due to their lack of knowledge (Nel *et al*. 2004 and Bas *et al*. 2006). According to Patchell *et al. (*1998), training program which has included perquisites programs needed prior to and during the implementation of HACCP system has decreased the occurrence of contamination of enteral feeds.

When HACCP plans, as an example, have been implemented, workers must be trained to deal with any expected critical control points (CCPs). Training on food hygiene should be delivered to all foodservices staff in the premises including supervisors and even managers (Powell ,*et al*,1997). Some managers and supervisors may believe that training is limited only to food handlers. A review of the influence of catering managers training in the USA, covering the period from 1971 to 1984, reported that, those managers tend to be careless in attending training programs particularly if attendance was voluntary, although they need more training in food safety (Julian, 1984). One study examined more than 1500 catering establishments in the UK about the microbiological status of surfaces used in food preparation and has found that, the premises that are managed by trained managers have shown lower levels of contamination of food contact materials (Sagoo, *et al*, 2003). Managers should support training programs and motivate their staff to attend these programs and perform what they have learnt (Seaman and Eves, 2010). Other managers may have a negative role in encouraging their employees to attend training courses. Prior to training, managers and supervisors are required to support trainees by encouraging them and providing sufficient release time to prepare and attend training (Cohen, 1990). Despite the fact that several large food companies have excellent training programs, some managers do not understand what the importance of staff training or even what the purposes of some hygienic practices (Jevsnik *et a*l, 2008). For instance, a survey conducted among food catering managers in the UK by Food Standard Agency found that 64% had a general understanding

about the importance of washing hands (Food Standard Agency, 2002), implying that over a third of managers do not understand the importance of hand washing. A number of other researchers (e.g., Audit Commission, 1990; Egan *et al*., 2007; Griffith, 2000; Seaman & Eves, 2008) recommend that catering managers have an essential responsibility in promoting food handlers to enact the knowledge learnt on food hygiene courses. However, this responsibility is not only limited to managers, but food supervisors, nutritionists, and even peers should participate. That is supported by Ajzen's theory that has proved that, the behavioural intention of an individual could influence their peers and supervisors behaviours (Ajzen, 1991).

Some authors attribute the lack of effectiveness of training to other reasons such as; high level of seasonal staff (Travis, 1986), rapid staff turnover (Burch & Sawyer,1991), low educational level (Clingman, 1977; Oteri & Ekanem, 1992), and literacy and language problems(Taylor, 1996). Questionnaires completed by 137 food handlers from 52 small to medium-sized food businesses in Wales has shown that the majority of staff were aware of the food safety actions they have to be carrying out but identified a number of barriers which would restrict them from implementing good practices such as, lack of staff, a lack of resources and lack of time. The previous survey has found that 95% of participants receiving food hygiene training but only 27% carried out full food hygiene practices. However, work environment may affect the translation of training to the work place. According to Worsfold and Griffith 2003, supervisor and peer support, situational constraints and resources used in the work place, have a major impact on trainees' motivation to transfer training to behaviours. It has been observed that, working in foodservices sector in general puts the food handler under a severe pressure which may reflects his ability to receive training and new skills (Seaman and Eves, 2006). However, in hospitals, the situation might tend to be more critical.

2.4.4 Training Models and Evaluation

In general, food safety education can be defined as "*the delivery of facts and skills to any person who handles food at any step in the food system to ensure compliance with food safety issues"* (Hazelwood and McLean 1994). It can be observed that, "food safety training" term is used more commonly to refer to the food safety education. However, food safety training and food safety education may differ. Yiannas (2009) considers food safety training as a part of food safety education. He identified food safety education as a course which is conducted by a teacher in a class room and involves only theoretical information about food safety issues such as foodborne diseases and food contamination, while food training is more specific to certain duties and tends to be practical. For instance, teaching a new food handler his duties or training another how to deal with food to keep it safe, all constitute food safety training. Although there is equal importance to the education part and as well the training, it seems to clear that some food operators could apply one of them and ignore the other. Food handlers should receive first a proper food safety education and then training in workplace. However, Yiannas (2009) stated that, person's behaviour could be influenced by his attitudes and beliefs. Nevertheless, it is also important to highlight the benefits of hygiene practices. Some staff may be trained only and follows their supervisors' instructions but they perhaps don't understand why they have to follow these instructions and what the consequence is if they ignore it. Hence they need the education part first. For instance, a food handler should be educated at least in the principles of foodborne diseases, such as how do they transfer and what the optimum temperature for growth, after that he should be trained how to apply the prevention methods. Thus, food handler can understand the benefits of washing his hands and keeping food at specific temperatures. Worsfold (1996) emphasized that training must involves at least essential kitchen hygiene and personal hygiene.

On the other hand, training can be delivered by several methods such as home study, workshops and, as well, by the official courses (Egan, *et al*, 2007). However, training in the work place might be more affected as the trainee can transfer what he has gained easily. Seaman and Eves (2006) have recommended that, the training should be related to the business activity. Axtell *et al*. (1997) study has also concluded that, in order to transfer new skills to behaviour, a trainee needs to feel that the training program is associated with his job. Rennie (1994) recommends that training programs that are linked with the work environment and supported by a practical training are more useful than other conventional means of training. Materials used in training may include posters, PowerPoint presentations, training videos, booklets and discussion techniques such as case studies and exercises (Nieto-Montenegro *et al*, 2006). Before starting the training learners' needs should be identified (Worsfold 1992). Communication means or language as an example, is one of the most important needs for the learners. Yiannas, (2009) has emphasized that; training should be in the native language of the trainees. However, if the learners are non-native speaking, other methods can be used or included to deliver the session such as pictures, icons, and drawings (Yiannas, 2009). In order to design a successful training it is has recommended that, factors underlying current food hygiene practices in the place of work should be identified (Clayton, *et al*, 2002). Furthermore, barriers that could prevent food handlers from implementing these practices must be fully understood (Clayton,, *et al*, 2010). Other factors should be taken into account such as, the quality of the programme delivered, the background of the trainee and the cost (Harris (1995).

Criteria that could be used for assessing the effectiveness of training are various. Evaluating knowledge tends to be more common. Egan, *et al* (2007) have published a review paper investigated 22 studies concerning hygiene training. They found that, 17 of the 22 studies used a knowledge measure to assess the impact of training, particularly a pre- and post-test.

These studies used multiple-choice questionnaires to measure staff knowledge. Attitudes and behaviours may also be involved in assessing the effectiveness of some training programs. According to Axtell and others (1997), learners' reactions to a course and their attitude about the amount they have gained are the most common way used to measure the effectiveness of the courses. Egan, *et al* (2007) classified the means of evaluating attitudes and behaviour into two kinds; structured questionnaires and premises inspections by surveys. The questionnaires are quite often used to assess learners believes and attitudes, whilst the premises inspection is used to assess behaviours as it involves observation of staff practices during inspection (Egan, *et al* 2007). However, attitudes and behaviours measures may not reflect the truth as some responses try to express positively (Egan, *et al*, 2007). Clayton, *et al*, (2002) have also suggested that the actual food safety practices of some food handlers might be less often than the self-reported. Ultimately, food handlers tend definitely to be more hygienic during any official inspection or even in front of their supervisors.

2.4.5 The Relationship between Staff's Knowledge, Practices and Attitudes

Despite the belief that knowledge, attitude and practice (KAP) are the main factors controlling food poisoning (Angelillo, *et al*, 2001), there is an argument about the links between them. A number of studies have proved that there is no a strong association between knowledge and personnel attitude or practice (Acikel *et al*, 2008, Askarian, *et* al, 2004). Personnel knowledge about food hygiene issues could not affect food handling practices. Angelillo, *et al*, (2000) interviewed 411 food handlers regarding food hygiene practices and demonstrated that positive attitude does not necessarily support good practices among food services staff. In the USA, another survey was conducted to assess the links between hygiene practices and knowledge among employees. This found that although the staff may have a high level of knowledge, they did not practise the correct hygiene behaviours during food preparation (Hertzman and Barrash 2007). Using bare hands, not washing hands and

inadequate cooking, were the most common food safety contravention among employees in the previous study. This confirms that high level of knowledge or a positive attitude does not always lead to changes in food handling practices. A number of studies also have proved that, there is no association between attitudes and practices towards food hygiene. The findings of three other studies conducted in Iran, Italy and Turkey showed that the protective measures, such as use of protective clothes, have never been completely implemented in practice, although all respondents understand that safe food handling is a significant part of their job responsibilities and using protective clothing has minimised the risk of food contamination (Askarian *et al*., 2004; Buccheri *et al*., 2007 Tokuç *et al*, 2009). Furthermore, using the same towel to clean several places and wiping the face, wiping the hands on clothes and touching mouth with hands are other common bad habits reported by Dag (1996). The UK's Food Standards Agency conducted a study in 2002 to assess hand washing practices among food catering companies staff, and they reported that 39% of the participants did not wash their hands after using the toilet and only 5% understood that washing hands links with personal hygiene.

However, other authors have assumed that there is a strong link between behaviour and knowledge as the level of knowledge could be translated into behaviours in the work place (Glanz & Lewis, 2002). Knowledge is enhanced through education and training processes, which might be official or unofficial, work experience, supervisors instructions and experiential sharing via peers and work environment (Glanz & Lewis, 2002). Furthermore, it is demonstrated that, a person's attitudes and beliefs will influence his behaviour and practices (Yiannas, 2009). Nevertheless, it has been found that knowledge alone might not lead to changes in attitudes and consequently behaviours but other factors besides knowledge may influence behaviours such as environmental, economic and socio cultural factors (Seaman and Eves, 2006). Clayton, *et al*, (2002) has pointed that, training programs could

affect the knowledge positively but it does not always lead to changes in behaviours. Rennie 1995, attributes the disparity between knowledge and practice to the training design which usually based on KAP model. This approach presumes that a person's practice (P) is influenced by his level of knowledge (K), hence, educating staff will change attitude (A) and then will lead to change in practices (P). However, (Ehiri *et al.,* 1997) has argued that the knowledge is the main factor affecting staff behaviours. Rennie (1995) as well has mentioned that this model ignores cultural, social and environmental factors which may influence beliefs and consequently behaviours.

The level of knowledge and attitude differs between staff and may depend on demographic characteristics such as educational level, gender, work experience, culture and training. A study conducted in Calabria (Italy) to assess knowledge, attitudes, and practices of hospitals food-services employees with regard to food hygiene demonstrated that younger workers have a high level of knowledge regarding food safety such as safe temperature for food storage, while older usually have a better attitudes and practice (Angelillo *et al*, 2001). The number of prepared meals might also affects standards; the previous Italian study showed that positive attitudes toward foodborne diseases prevention was high among the staff in hospitals with a low number of beds (Angelillo *et al*, 2001). In hospital with low numbers of beds, food processing can be controlled easier and staff may have a time to attend courses related to good practices and hygiene. Some authors have confirmed that personal hygiene practices may be affected negatively by the length of employment with the same facility (Cushman, *et al*, 2001). Other surveys conducted in Iran in 2002 to evaluate hygiene practices in hospitals showed that males practice of safety measures tend to be higher than females (Askarian, 2002). However, Tokuc *et a*l, 2009, demonstrated that, knowledge, attitudes and practices of food service staff are not significantly associated with gender, age and length of service in the employment.

It is noted that the studies conducted in hospitals concerning knowledge, attitudes, and practices of food services staff are limited and few attempts have been made to assess kitchens facilities (Angelillo and *et al* 2001; Tokuç, *et al*, 2009). Despite the limitation of studies in this field, there are no formal studies which have included the knowledge or duties of food services managers and supervisors regarding food inspection and staff controlling.

Chapter 3: Methodology

3.1 Introduction (Background and Overview of the Project)

The study was designed in two parts. The first was as a survey of existing conditions which would act as a baseline for the MOH. All participating hospitals were involved in the survey. The second part was an interventional study. The intervention study focused on specific groups of food handlers in the participating hospitals and assessed the delivery of hygiene training and its effect on the food handlers. In addition to that, the extent of Pre-Requisite Programmes (PRPs) was evaluated by using audit forms assessing the building, the facilities and the food preparation and storage procedure for each hospital's kitchen. The survey evaluated the following:

- Staff procedures, practices, knowledge and attitude, using self-completed questionnaires
- The extent to which PRP's have been implemented using an audit

The intervention study was carried out in 3 key stages; pre-training stage, training stage and post-training stage. Participants were divided into two groups; an intervention group and a control group. The intervention group was subjected to food safety training while the control one was not. The intervention study was carried out between July 2010 and August 2013. The initial data obtained from the pre-training stage was analysed to identify the specific deficiencies in food safety knowledge and practices of foodservices staff. A training program was then developed according to the weak points identified from the questionnaires answers. The training program included lectures and workshops to improve knowledge and good practices. The training programme was then delivered to the selected staff and their food safety knowledge, practices and attitudes were retested using the same food safety knowledge questionnaire previously administered in the pre-training phase. The results were then

analysed to determine the impact of the training programme. A control group was also tested and re-tested but did not receive any training. This chapter explains the methods used to gather the data from the participated hospitals.

3.2 Preparation and Permission

3.2.1 The Official Approvals

As the study was to be a carried out in Saudi Arabia it was necessary to liaise with the relevant authorities and to acquire permission to conduct the study. Two authorities in the Ministry of Health had to award their approval; the Directorate General of Nutrition and the General Directorate of Medical Research.

In September 2009, the Directorate General of Nutrition in the Ministry of Health in the Kingdom of Saudi Arabia was contacted and provided with the study's idea and vision. As mentioned in chapter 2, all foodservices in the Saudi hospitals are under the supervision of the Directorate General of Nutrition in the Ministry of Health. Hence, it was necessary to ask the assistance and the guidance from that authority. The researcher has conducted several meetings with the director of Nutrition Administration in the MOH as well as with the manager of Nutrition Administration office in the Health Affairs in Riyadh region. This authority was willing to support the project. Six hospitals in Riyadh area were initially nominated by the Nutrition Administration office to participate in this project (Appendix 3). However, the final decision and the official letter of approval had to be obtained from the General Directorate of Medical Research in the Ministry of Health. They required a full proposal of the study in addition to other documents.

The General Directorate of Medical Research team is responsible for medical and health research in Saudi's hospitals. They also schedule, review and direct researchers to concerned sectors besides facilitating studies in health fields in Saudi Arabia (MOH 2011). In June

2010, the study design was completed; subsequently the researcher met the director of the Medical Research Centre in the Ministry of Health in Riyadh city to award the final approval. To issue the approval letter, the following documents were required from the researcher:

1- The full proposal of the study and the questionnaires.
2- A copy of the researcher's national ID.
3- A cover letter from the researcher.
4- A copy of the scholarship letter of the researcher from the Cultural Bureau in Saudi Embassy in London
5- A copy of the researcher's registration letter from the University of Birmingham.
6- A cover letter from the researcher's supervisors (appendix 1).
7- A copy of the ethical approval from the school (appendix 1).
8- An "Informed Consent" Form in Arabic and English (appendix 2).

After a month of receiving the required documents and studying the research proposal, the General Directorate of Medical Research accepted the study and provided the researcher with an authorisation letter entitling him to access the six nominated hospitals and collect the required data (appendix 4).

3.2.2 Ethical Consideration

As human volunteers were involved in this project, an ethical letter from Birmingham University- Chemical Engineering School- was required and considered during the data collection. A formal letter of the ethical approval was given to the Medical Research Director in the Ministry of Health informing the purpose of the study and mutters that must be considered. Confidentiality of the respondents and the hospitals has been maintained. A copy of the ethical review is attached in the appendix 1. The results of this project will be used for academic assessment only. However, the General Directorate of Medical Research in the Ministry of Health asked the researcher to provide them with a full copy of this study.

3.3 Study Population & Sample Selection

3.3.1 Participating Hospitals

Hospitals those were appropriate for inclusion in this study had to meet the following criteria:

1. The hospitals needed to have new catering contracts in place. There were two reasons for this requirement. The first was that HACCP was only being introduced as a requirement with contracts issued after 2010. The second reason was to ensure continuity in the intervention study. This required testing and re-testing of the participants over a period of time. A change of company during this period would also change the staff and render the retest results useless.
2. The hospitals needed to be in Riyadh as this was where the HACCP implementation was being initiated.
3. The hospitals needed to be large capacity so that sufficient staff could be assessed. It also meant that the project focused on hospitals with the potential to affect many patients which could therefore be considered higher risk
4. The hospitals needed to have good facilities so that the hygiene requirements for infrastructure were met. Poor facilities would be a confounding factor when trying to assess staff attitude and particularly any change which might be caused by the intervention.

Six hospitals were originally nominated by the Directorate of Medical Research in the Ministry of Health (appendix 3). Four of these hospitals met the selection criteria and were invited to participate in the project. During July 2010 and while waiting for processing the authorisation letter from the Medical Research Centre in the Ministry of Health, the researcher visited the six nominated hospitals and met their nutrition services managers with a view to matching the hospitals against the study's required criteria. The two excluded

hospitals were small, outside of Riyadh city, and had nearly reached the middle of the contract period. Three hospitals were allocated to the intervention while the fourth acted as a control. All the three selected hospitals have different catering operators. The selected hospitals were:

1- King Saud Medical City (or RCH), which is the oldest hospital in Riyadh with a total of 1500 beds.
2- King Saud Hospital for Chest diseases, with a total of 200 beds.
3- Riyadh Rehabilitation Hospital, with a total of 500 beds.
4- Prince Salman General Hospital (the control) with a total of 500 beds.

3.3.2 Employees Participated in the Survey

Data on knowledge, attitude and self-reported behaviours was gathered using questionnaires and surveys. It was planned to involve about 300 of the hospitals foodservices staff. The research targeted employees working for the Ministry of Health and also employees working for catering companies in the selected hospitals. Because these staff have a variety of responsibilities there are different knowledge and behaviour requirements. The participants were therefore classified into four groups according to their careers and positions (Figure 3.1). Each group had a specific questionnaire and the questions levels were varied according to each group. Those groups are:

1-***Group (1)***: Ministry staff; included departments' managers, supervisors and nutritionists who work for the Ministry of Health.

2- ***Group (2)***: Caterers staff; included departments officers and nutritionists who work for the catering companies.

3-***Group (3)***: Food handlers; included chefs and waiters who work for the catering companies. This group was exposed to training program.

4-***Group (4):*** Stores keepers and cleaners who work also for the catering companies.

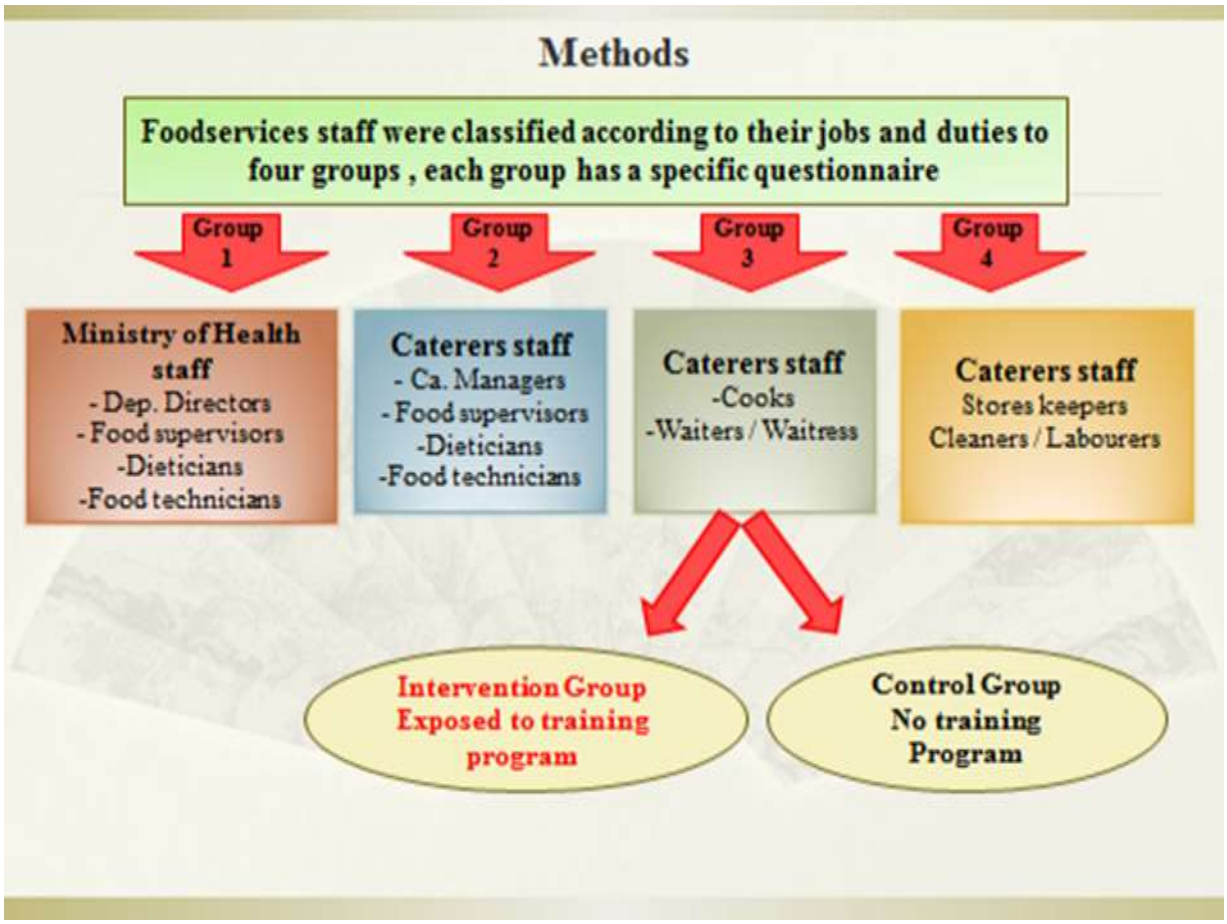


Figure 3-1 Questionnaires Classification

The participants in this research were not randomly selected. Instead, all qualified employees were asked to participate. Participants were all volunteers.

3.4 Study Design

3.4.1 Instrument

Although the Ministry of Health in Saudi Arabia intends to implement HACCP system in all hospitals, the readiness of hospitals for that system has not really been considered. In view of that, a sample of hospitals was surveyed with regard to hygiene status which included PRPs and foodservices staff knowledge and practices (Figure 3.2). Furthermore, this study investigated the acceptance of implementing HACCP system in nutrition departments particularly among managers and food supervisors. To date, no clear database about demographic characteristics of foodservices staff exists, so information was gathered on this as well. The hygiene status of the hospitals prior implementing HACCP system was assessed using an audit. In summary, for the baseline survey the following aspects were evaluated:

1- **The PRPs** were evaluated in the kitchens by using an audit checklist. This is an important step prior to implement HACCP system. This was explained in detail in section 3.4.5.

2- **Demographic characteristics of foodservices staff**: the demographic characteristics of all foodservices staff, such as education level, ages and positions held were identified. This was explained in detail in section 3.4.2.

3- **Knowledge**: the staff knowledge toward food hygiene practices were assessed to measure their information about food safety and the acceptance of implementing HACCP in their departments in future. This formed part of the baseline survey but was also used to develop a training program for the intervention study. The development of the training program and the knowledge part was explained in detail in sections 3.4.2.

4- **Practices**: a survey of self-reported practices was used to assess the staff behaviours during food handling. It is important to discover bad practices and correct them in the training program. This part was explained in detail in section 3.4.2.

5- **Attitude**: foodservices staff opinions were evaluated for their level of acceptance of good hygiene practices and investigated how they intend to change their bad behaviours. This was explained in detail in section 3.4.2.

For the intervention, a bespoke training program was used to train a sample of food handlers (group 3). Those groups were assessed before the training based on the results that gathered from the baseline survey. After the training, they reassessed to measure the impact of that training on their knowledge, practices and attitudes.

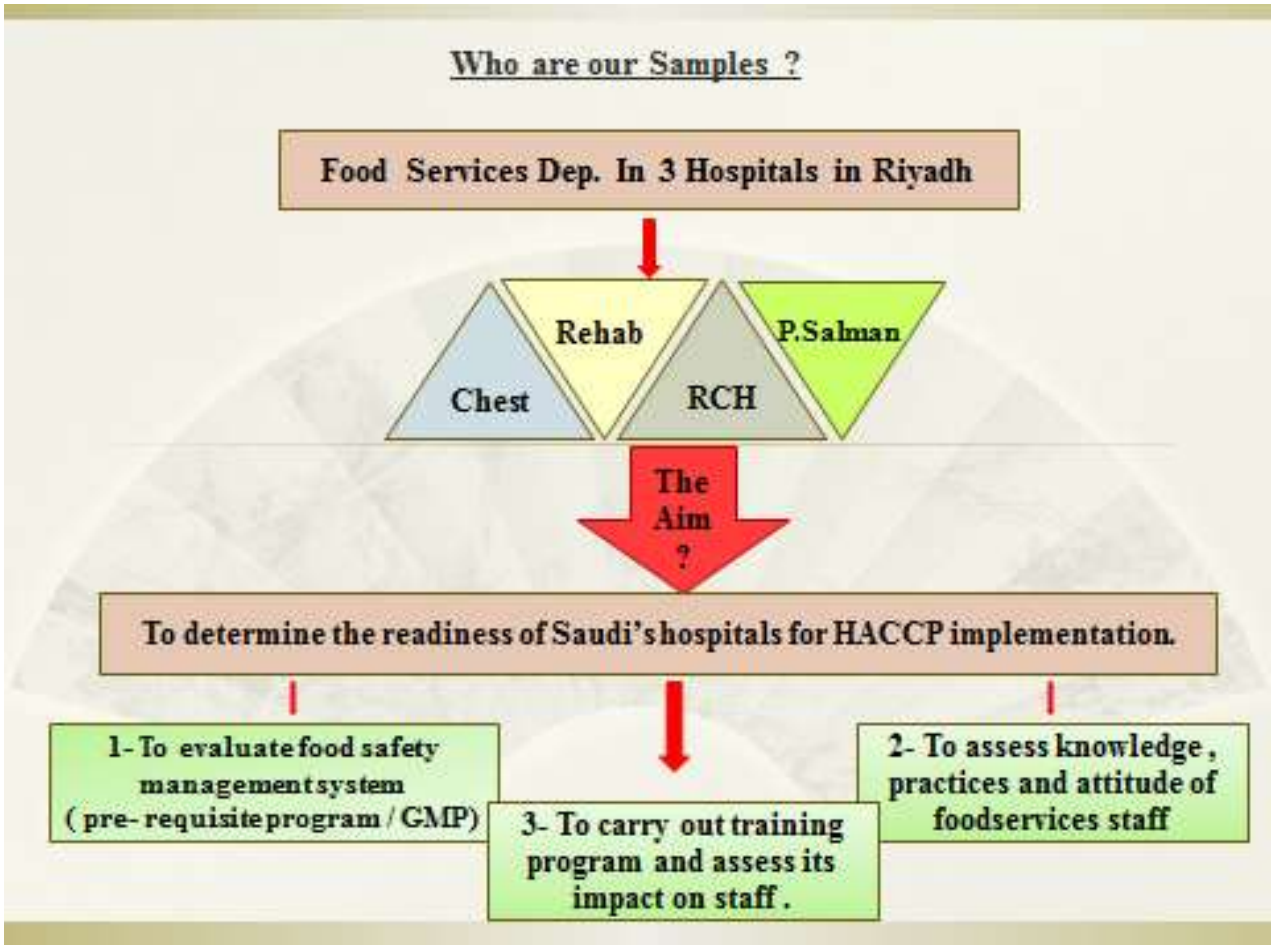


Figure 3-2 A summary of the study aims

3.4.2 Self-completed Questionnaires

A self-completed questionnaire was the chosen method to collect the data required for points 2-5 above. There were a number of reasons for using this method. As mentioned in section 2.4.4 (Training Models and Evaluation**)**, knowledge, practices and attitudes could be assessed by different methods such as observation, inspection and questionnaires. Using inspection or observation will be quite complicated in hospitals rather than other public restaurants as foodservices departments are a sensitive area. Conducting the survey by the previous methods could restrict the service in the kitchen whereas it timed and scheduled. While using questionnaires could conducting any time out of services time as what happened in this study. However, completing the questionnaires was conducted under the supervision of the researcher. The questionnaires consisted mainly of multiple-choice questions developed by the researcher. However, some questions from existing questionnaires previously used in other studies also included where these were relevant and suitable. To obtain understanding about the real level of the staff working in the hospitals before implementing HACCP in the kitchens, all the foodservices staff were asked to participate. Differences between staff in educational levels, positions and duties were considered. Therefore, four different questionnaires were developed and used as previously explained. Each was sub-divided into four parts; demographic part, knowledge, practices and attitude.

One questionnaire (number 1) was used to survey nutrition departments' managers, food supervisors and nutritionists who work for the MOH. The second questionnaire (number 2) was used to survey caterers' officers and nutritionists who work under the operators at the same selected hospitals. The third one (number 3) was used to evaluate food handlers who work for the operators such as, chefs and waiters. This third group also formed the intervention group. They were selected to be the only group subjected to the training program as they are in direct contact with food. The last questionnaire (number 4) examined store

keepers and cleaners who work also for the operators. The questions levels were varied according to each group. Nevertheless, the questionnaires for group one (MOH supervisors and nutritionists) and two (catering supervisors and nutritionists) were very similar as the respondents from each group have equal qualifications and some similar duties. The main difference is that they are employed by different organisations.

Questionnaire for Group One and Two

This questionnaire addressed Ministry and caterers staff (appendices 5, 6, 7, and 8). The participants have degrees in food and nutrition and work supervising and managing patients' meals. The Catering Supervisors work for the contracted catering companies while the Ministry supervisors work for the MOH and are responsible for ensuring the Catering supervisors implement the relevant practices and controls. The questionnaire for these groups consisted of 35 questions distributed in four parts, demographics, knowledge, practices and attitudes. Formally, the jobs for both groups must be occupied by educated people who have at least a degree in food sciences and nutrition, thus the questionnaires included questions which reflected this advanced situation. The questions which measured their knowledge focused on the scientific aspects of microbiology, food poisoning and also food safety management and hygiene practices. The questions were the same for both groups apart from the attitude section which contained one different question, reflecting the differences in their employment. The questionnaires were delivered in Arabic and English languages only because most of the respondents are Arabic native speaking while the others can speak both languages (English and Arabic). The Ministry staff are all Saudi Arabian while catering supervisors and nutritionists include Saudis and Egyptians (Arabic speakers) and Filipinos who are expected to be fluent in English.

A- *Demographic Characteristics Part*

Part A contained ten items; six of them are multiple-choice for obtaining demographic characteristics of the respondents (gender, age, nationality, position, education level, and number of years employed in foodservices). The classification of the jobs was according to their job titles in the employment contracts. However, all these staff had approximately similar duties and tasks. The other four questions were open-ended questions for obtaining supervisors and nutritionists' opinion about implementing HACCP in their departments and how they manage food handlers. These questions are:

1.7 Do you think that HACCP can be successfully implemented in your department? Please justify

1.8 Do you think you need more information about HACCP implementation? please justify

1.9 What do you think are the main contraventions regarding hygiene practices committed by staff?

1.10 How do you think staff can be motivated to change hygiene behaviour?

Determining the opinions of these groups on HACCP implementation was important as studies have identified poor attitude in management a barrier to HACCP implementation (Jevsnik *et al*, 2008, Seaman and Eves, 2010, Wilcock *et al*, 2011).

B- *Knowledge Part*

Part B was designed to measure supervisors and nutritionists' knowledge related to food safety. It consisted of 11 multiple-choice questions. However, this part comprised 12 multiple-choice questions. It was reduced after considering the results of the pilot study. One

question was deleted as the participants in the pilot study recommended (please see section 3.4.4). The remained 11 questions included the following:

- Four questions were about food bacteria and factors effecting its growth (questions 1.11, 1.12, 1.13 and 1.15).
- Two questions about temperatures control (question 1.14 and 1.16).
- One question about food spoilage and contamination (question 1.17).
- One question about food poisoning (question 1.18)
- And the last three questions were about HACCP principles (1.19, 1.20 and 1.21).

It was important to include more than question about HACCP system as those supervisors will follow up the implementation of HACCP in their departments in the future. All the questions were designed by the researcher except question number 1.17, which was developed based upon questionnaires previously used and validated in a study done in Turkey (Bas, *et al*, 2005). The content reflects the basic hygiene knowledge required to be able to deliver food which is safe and hygienic. Respondents here were asked to choose from among five options. The options included three wrong answers in addition to "Don't Know" choice to reduce the probability of selecting the answer by chance. It was set up with one (1) point for correct answers and zero (0) points for wrong answers and "Don't Know", with a total possible score of 11 points. A total score of less than 50% on the questionnaire were considered poor knowledge. When more than one option was chosen by participants, not complying with the rules set, it was evaluated as the answer "Don't Know", and scored with zero (0) points.

C- Food Safety Practices

Food safety management performance was measured by using (8) multiple-choice questions. The questions used in this part were based on the duties and tasks of the food supervisors and

nutritionists in the departments. Specific questions related to steps in the flow of food, hygienic practices, food inspection and foodservices staff supervision. The questions included the following:

- Three questions about receiving food, delivery inspection and using thermometers, (questions 1.22, 1.26 and 1.27).
- Three questions about hygiene practices and personal hygiene such as washing hands and using gloves during inspection (questions 1.23, 1.24 and 1.25)
- The last two questions were about supervision on food handlers (questions 1.28 and 1.29).

For each practice, respondents indicated the frequency that the practice was followed in their departments using the options: always, sometimes and never. For analysis these, were scored, 2, 1 and 0, respectively, making the score range between 0 and 16. However, the scores were reversed before analysis in the question number (1.26) which asked respondents about receiving supplies from unapproved sources as the response 'always' for this question reflected poor practice while 'never' reflected the best practice.

D- Attitude

Part four included (6) questions each related to food supervisors and nutritionists attitudes toward food safety, training and hygiene management. All the questions were developed by the researcher. In this part, the same questions addressed both groups except question number (1.31/2.31). As the groups have some differences in their duties, the question number (1.31) for Ministry Staff (group 1) was: *I believe that, my responsibility is to control my department's hygiene*, while the same question in number order (2.31) for catering staff (group 2) was; *I believe that my responsibility is to reduce cost on the company*. Participants were asked to indicate their level of agreement to the statements using a 5-point Likert-type

rating scale, rating from one (1) “strongly disagree/ extremely unimportant to five “strongly agree/ extremely important”. However, the question’s (1.31/2.31) scale for (group 2) was obverse as an answer of 1 for this question reflects poor attitude rather than good. The score ranges were between 0 to 30.

Questionnaire for Group Three

This questionnaire addressed food handlers, such as chefs, assistant cooks, butchers, waiters and waitress, who work for the hospitals caterers. The main duty of this group is limited to food services and preparation thus the intervention training program was delivered to this group. As mention above, this group was divided into two groups, intervention group and control group. The questionnaire here consisted of 32 questions distributed in four parts, demographics, knowledge, practices and attitudes. As this group is in direct contact with food, the questions for the knowledge part focused on the principles of microbiology, cross contamination and temperature control. The questionnaire was administered in English, Arabic, Indian (Malayalam) and Bengali languages (appendices 9, 10, 11, and 12). The effect of the training program was also measured using the questionnaire as this group was subjected to the training program. The same questionnaire was admitted to the control group also.

A- Demographic Characteristics Part

Part A contained 9 items, 7 were multiple-choice questions for obtaining demographic characteristics of the respondents (gender, age, nationality, position, education level, number of years employed in foodservice, and salary range). Jobs classification was based on the nutrition contract. The other two questions were closed-ended questions for investigating food handlers training and how their managers encourage them to attend training courses. These questions are:

3.8 Have you received any hygiene training?

3.9 Has your manager required of you to attend any food hygiene training course?

B- Knowledge Part (question number 1.19

Part B was designed to measure food handlers knowledge related to food hygiene. It included 13 multiple-choice questions. These included the following:

- Four questions about cross-contamination (question 3.10, 3.11, 3.12 and 3.13)
- Three questions about temperature control (questions 3.17, 3.18 and 3.19)
- One question about food microbiology (question 3.14)
- One question about food spoilage and contamination (question 3.15) and this one is similar to question 1.17 in the groups 1&2.
- Three questions about safety and hygiene procedures (questions 3.16, 3.20 and 3.22).
- One about HACCP principles (question 3.21).

A number of the questions were designed by the researcher while others were developed based upon questionnaires previously used in studies conducted in several countries. These questions are :

- Questions 3.15 and 3.17 from a study done in Turkey (Bas, *et al*, 2005).
- Questions 3.18 and 3.19 from a study done in Italy (Angelillo, *et al*, 2001).
- Question 3.21 from a study conducted in Ireland (Bolton *et al*, 2007).

Respondents were asked to select from among five options. The options included three wrong answers in addition to "Don't Know" choice to reduce the probability of selecting the answer by chance. It was set up with one (1) point for correct answers and zero (0) points for wrong

answers and “Don’t Know”, with a total possible score of 13 points. When more than one option was chosen by participants, not complying with the rules set, it was considered the answer “Don’t Know”, and scored with zero (0) points.

C- Food Safety Practices

Self-reported food safety practices were measured by using (5) multiple-choice questions. The questions used in this part focused on hygienic practices during food preparation. Specific questions related to hands washing and using thermometers were included. For each practice, respondents indicated the frequency that the practice was followed in their departments using the options always, sometimes and never, which were scored, 2, 1 and 0, respectively, therefore, the score range was between 0 and 10.

D- Attitude

Part four included (5) questions each related to food handlers attitudes toward food hygiene practices. All the questions were developed by the researcher. Participants were asked to indicate their level of agreement to the statements using a 5-point Likert-type rating scale, rating from one (1) “strongly disagree/ extremely unimportant/ highly impossible/ extremely unlikely” to five “strongly agree/ extremely important/ highly possible/ extremely likely”. However, the scale of question 3.31 which stated that *I believe that my behaviour during food preparation is more hygienic when my supervisor is present*, was adverse for analysis. The score ranges were between 0 to 25.

Questionnaire for Group Four

This questionnaire addressed foodservices cleaners and stores keepers, who work under caterers. The main duties of this group are limited to transferring deliveries, arranging suppliers in stores, cleaning kitchens and utensils. The questionnaire for this group comprised 30 questions distributed in four parts, demographics, knowledge, practices and attitudes. Because of this group is partly indirect contact with food, the questions for knowledge part focused on the principles of food hygiene, cleaning methods and refrigerators temperatures. The questionnaire was admitted in English, Indian (Malayalam) and Bengali languages (appendixes 13, 14 and 15).

A- Demographic Characteristics Part

Part A contained 9 items, 7 of them are multiple-choice for obtaining demographic characteristics of the respondents (gender, age, nationality, position, education level, number of years employed in foodservice, and salary range). The other two were closed-ended questions for investigating food handlers training and how their managers encourage them to attend training courses. These questions are:

4.8 Have you received any hygiene training?

4.9 Has your manager required of you to attend any food hygiene training course?

B- Knowledge Part

Part B was designed to measure stores keepers and janitors' knowledge related to food storage and cleaning methods. It included 12 multiple-choice questions. The questions included the following:

- Two questions about refrigerators temperature (questions 4.12 and 4.13) and question 4.12 was included in group 3 questionnaire (question 3.18)
- Four questions about cross-contamination and personal hygiene (questions 4.10, 4.11, 4.14 and 4.21).
- One question about hygiene procedure during ill (question 4.15) and this question is included in the group 3 questionnaire (question 3.20).
- Four questions about cleaning techniques (questions 4.17, 4.18, 4.19 and 4.20).
- One question about HACCP principles (question 4.16).

The majority of the questions were designed by the researcher but those which concerned temperature control were developed based upon a questionnaire study done in Turkey (Bas, *et al*, 2005). Respondents here were asked to select from among five options. However, two questions included four options (questions 4.17 and 4.18). The options included one correct choice. It was analysed by allocating one (1) point for correct answers and zero (0) points for wrong answers and "Don't Know", with a total possible score of 12 points. Furthermore, Yes/No/ Don't Know responses were options for the questions 4.19, 4.20, and 4.21. Scores were assigned as a 1 (yes) or 0 (no) and (Don't Know) . The scale for question (4.21), which stated that; "Keeping on my gloves when going to the toilet may prevent diseases", was adverse. Scores lower than 50% on the questionnaire were considered poor knowledge. When more than one option was chosen by participants, not complying with the rules set, it was considered the answer "Don't Know", and scored with zero (0) points.

C- Food Safety Practices

A self-reported food safety practices and cleaning methods were measured by using 4 multiple-choice questions. The questions used in this part focused on hygienic practices during kitchens cleaning. For each practice, respondents indicated the frequency that the

practice was followed in their departments using the options always, sometimes and never, which were scored, 2, 1 and 0, respectively, therefore, the score range was between 8 and 0. The scale of question 2, which stated "Do you use the same towel to clean many places in the kitchen", was adverse reversed for analysis.

D- Attitude

Part four included 5 questions which were used previously with group number three. All the questions were developed by the researcher. Participants were asked to indicate their level of agreement with the statements using a 5-point Likert-type rating scale, rating from one (1) "strongly disagree/ extremely unimportant/ highly impossible/ extremely unlikely" to five "strongly agree/ extremely important/ highly possible/ extremely likely". However, the question 4.29 scale which stated that; *I believe that my behaviour during food preparation is more hygienic when my supervisor is present* was reversed for analysis. The score ranges were between 0 to 25.

3.4.3 Translation

To account for the multinational staff, all questionnaires were written in English and translated to different languages. Questionnaires for groups one and two were translated to Arabic. Questionnaire for group three was translated to Arabic, Indi (Malayalam) and Bengali. Questionnaire for group two was translated to Malayalam and Bengali. Malayalam is the official language in Kerala region in India. This language was chosen because most of the Indian food handlers speak Malayalam. The translation has done by an interpretation centre in Riyadh – Saudi Arabia. To verify the translation, copies of questionnaires (English, Indian and Bengali versions) were sent to two staff members working in a fifth Saudi hospital which did not form part of the study group (The Armed Forces Hospital in Dhahran city, Saudi Arabia). These staff members have a long work experience in hospitals foodservices.

One of them is an Indian cook and the other is a Bengali store keeper. They revised the questionnaires for group three and four and then the questionnaires were translated back to English. The questionnaires were then checked with regards to some terms and resent them to these two staff to amend the comments. The same order of questions and its choices was followed in all translated questionnaires. Also, English numbers and letter were used in the questions punctuation and to simplify data analysis.

3.4.4 Pilot Survey

The questionnaires were pre-tested before starting the survey to confirm question clarity, identify participants' opinions and time requirements. The questionnaire for the first group was pilot-tested in June 2010 by 3 Saudi students qualified with food and nutrition sciences, who were enrolled in the MSc in Food Hygiene, Safety and Management course at the University of Birmingham in the same year. The three respondents had a previous work experience in food inspection and they tested the Arabic version. It took about 10 minutes to complete the questions. The main comments and suggestions were in the knowledge part for all groups. In general, the respondents agreed about the level of the questionnaire and the time needed to complete the survey. However, they suggested deleting two questions in the knowledge part. The first one was about pathogens terms and the second one was about HACCP principles. Their justification for the first suggestion was that the supervisors and nutritionists do not work mainly in microbiology field. The justification for the second one was that the questionnaire included three questions about HACCP and this was too many about the same subject. One question about microbiology was deleted. However and given the importance to the investigation of HACCP knowledge, all three questions related to HACCP principles were administered (questions 1.19, 1.20 and 1.21). Through the pilot test carried out using this questionnaire, 58 percent answered the question correctly.

The Armed Forces Hospital in Dhahran city, Saudi Arabia, was selected to pre-test the questionnaires for the other groups. The researcher used to work as a foodservices manager. Participants were tested after translating the questionnaires to Bengali, Malayalam in addition to Arabic and English. These questionnaires were pilot-tested in June 2010 by 8 participants. All had work experience in the hospitals catering sector. These respondents were not included in the final survey. The questionnaire was revised on the basis of the pilot study results and other suggestions. For group 2 (catering supervisors and nutritionists) two Egyptians working as supervisors and two Filipinos working as dieticians tested this questionnaire. Although groups one and two had a similar questionnaire, it was a necessary to consider the catering companies supervisors and nutritionists feedback. However, they had the same comment about pathogens term which had been made before by the first group. Group three questionnaires was tested by one Bengali working as a waiter, one Filipino working also as a waiter, one Egyptian working as a chief cook and one Indian working as a cook. A few linguistic mistakes were identified by the responses, specifically in the Indian and Bengali version, thus the questionnaires were amended as a result by the two staff member who assisted in the translation before. The questionnaires took longer to complete it than expected (about 15 minutes). Therefore, two questions were removed. The first one was about the ways that bacteria can be brought into the kitchen, and it was deleted because there is a similar question about *E. coli* bacteria transmission (question 3.14). The second deleted question was about the correct place to store meat in the fridge. It was selected to remove because of foodstuff storage and organisation is mainly the responsibility of the store keepers. Thus it moved to the questionnaire for group 4 (store keepers and cleaners). The last group (4) was tested by one Bengali working as a store keeper and one Indian working as a cleaner. The main comments here were the linguistic mistakes in the Bengali version which were

identified by the store keeper thus it was necessary to amend this mistakes. This questionnaire took less than 10 minutes.

3.4.5 Checklist development

An audit form was used to assess structures, facilities and good manufacturing practices for each hospital kitchen. To complete the audit form, face-to-face interviews were conducted with the departments' managers. The audit form was prepared and developed based upon check list previously used in studies conducted by Birmingham University in catering premises (Acosta 2008; Smith *et al* 2002). It consisted of two parts:

1- General questions about the number of food service staff, hospital beds, and meals served and the implementation of HACCP systems.

2- (Yes/No) checklist questions and divided into three parts; the first one concerned of the general condition and the cleanness of the structures, equipment and facilities in the kitchens such as, walls, floors, sinks and toilets. The second concerned staff status and the compliance with hygiene conditions such as; wearing a protective uniforms, working with valid health certificates and as well receiving training hygiene. The last part was to evaluate hygiene procedures during food preparation such as food sampling and temperature control.

The total number of (Yes/No) checklist questions was 103. Each response was coded on a 1-point for full compliance and 0 for incompliance. However, some items could be considered more fundamental and major than others such as temperature control, staff training and pest control. Kitchens, stores and refrigerators were inspected by the researcher, who was accompanied by the departments' supervisors. Workers were observed while performing catering duties. The full content of the audit is included in appendix 16.

3.5 Baseline Study (gathering data)

3.5.1 Completing the Questionnaires

In the middle of August 2010, the food safety knowledge, practices and attitude of nutrition services staff were assessed in the baseline study and this information was used to develop the training program. Although this assessment included all four groups, only group three received the intervention and was re-tested. The participants were interviewed using the designed questionnaires for their group. All staff signed a consent form that they would be willing to participate in the survey. The participants answered the questionnaires under the supervision of the researcher. A short brief illustrating the survey objectives was attached with each questionnaire.

a- Group one and two: The food supervisors and nutritionists (group 1 &2) were surveyed in their offices, which were sometimes shared with each other, during break times. During the survey, the researcher was helping the participants in understanding some questions. All participants were so happy to answer the questionnaires. However, one of the managers evaded completing the questionnaire and one of the food supervisors tried to use the internet to find some answers. Accordingly, his sheet was eliminated. Each questionnaire took approximately 10 min to complete. The total number of food supervisors and nutritionists who work for the MOH in the three hospitals is 48. The total number of nutritionists/dieticians who work for the caterers in the three hospitals is 30. In this research, the total responses from group one was only 24 (50%), while 25 (83.3%) participants were from group two answered the questionnaire. However, the shortage was because some of employees were in their annual holidays.

b- Group 3 and group 4: the food handlers and cleaners survey (group 3&4) took a place at dining rooms in each hospital. Both groups were tested together. Assistance was asked if necessary from a number of staff to help a few illiterate participants. To reach more respondents, the survey was conducted during break times and at the changeover of the work shift. Each questionnaire took about 12 to 15 min to complete. The total number of food handlers (group 3) working in the three hospitals is 150 (110 from RCH, 20 from Rehab hospital and 20 from Chest hospital). One hundred and eleven (73.3%) participants from group three in the pre-training stage replied to the questionnaire (79 from RCH, 16 from each Chest and Rehab hospitals). The total number of cleaners and store keepers working in the three hospitals is 40. Almost 29 (72%) from group 4 answered their questionnaires.

Chest hospital was the first surveyed followed by "Rehabilitation Hospital" and the latest was the largest one, King Saud Medical City (RCH). Collecting the respondents' answers took 7 weeks, four weeks for the first and second hospitals and three weeks for the largest one. The collected data from this stage was statistically analysed and used in initial assessment and to develop the training program for group (3), which was delivered later.

3.5.2 Completing the Audit Form

In August 2010, intensive meetings were conducted between the researcher and the nutrition departments' managers in the selected hospitals. Each manager was met separately. Initially, data collection methods were arranged and scheduled for each hospital. Then and at the next visits, the part one of the audit forms were completed by conducting face to face interviews with the foodservices supervisors who work for the MOH. After that, a food processing and kitchens units were investigated by the researcher together with the supervisors to complete the second part of the checklists which was (Yes/No) questions. A thermometer was used to

check some food. Chest hospital was visited first then “Rehabilitation Hospital” and after that RCH. Completing the audit forms took approximately 2 weeks. Prince Salman hospital was checked later with their group assessment and took about couple days.

3.6 Intervention Development

The intervention was a bespoke 5 hour food hygiene training course developed by the research team.

3.6.1 Attending Courses in Teaching Skills

Prior to developing the intervention, the researcher attended and passed two courses in "Train the Trainer" certificated by "Chartered Institute of Environmental Health". The first course was "Level 3 Award in Training Skills and Practice (TSP)" conducted on 29th and 30th of March 2011. The second one was "Level 3 Award in Preparing to Teach in the Lifelong Learning Sector (PTLLS)" conducted between the 5th and 7th of April 2011. The main objective of these courses is to develop the skills of the trainer in planning and executing successful training activities as well as to deliver programs. Assignments for the courses included:

1- Producing a plan for a 25–30-minute micro-teach session for the course's learners.
2- Writing an essay to demonstrate the understanding of teacher's role and responsibilities.
3- Reviewing a teaching session that was recently delivered.

By successfully completing these courses, the researcher was in possession of the skills required to deliver the intervention.

3.6.2 Identifying Needs Assessments of the Participants (Training Needs Assessment)

In general, one of the aims of the training session is to provide the learner with an understanding of the principles of food safety. The second purpose was to advise food handlers (group 3) how they could convert their acquired knowledge to behaviours that control hazards and prevent food poisoning. It was expected that the research, and particularly the intervention study would demonstrate the significance of food safety

education and training programs especially in healthcare sector in Saudi Arabia. A successful outcome might encourage the Ministry of Health to train all foodservices staff prior to implementation of HACCP systems. As discussed in chapter 2, most foodservices staff in Saudi Arabia do not receive any (education) related to food safety and hygiene and they only receive a basic training or instructions regarding their jobs tasks and duties. Accordingly, this group had not receive any training when the baseline measurements were taken.

In March 2011 and before planning the training course, the foodservices managers in the participating hospitals were phoned. The essential points that had to be considered before delivering the sessions such as, the lecture's location and times, staff working schedules, resources and facilities, were discussed. The researcher also identified needs assessments of the participants which is an important step before developing and delivering any course. Identifying needs is achieved by classifying the differences between the learners/participants to deliver the training program in the correct way and in a suitable environment. The participants in this study were varied. The following were the major needs identified and considered:

1- Literacy and language levels

The majority of the food handlers had limited literacy. Many did not speak Arabic or English as their first language but could understand simple Arabic and English. Therefore, it was important to use basic terms and vocabularies from both languages when writing and delivering the lessons. Also, it was necessary to use more photographs, demonstrations and images in addition to or in place of spoken and written information. This helped to facilitate the course and improve the trainees' outcomes and experience.

2- Religious and social consideration

The trainees here come from different countries and cultures hence it was essential to respect their backgrounds beliefs. For example, images containing alcohol or other taboo substances were deleted. Prayer times also had to be considered and calculated out of the lessons times.

3.6.3 Development of the Syllabus

In order to target the training, weak points in the knowledge of group 3 were identified from analysis of the completed baseline questionnaires and then were used in designing some aspects of the sessions. Most of the weak points and misunderstanding of the food handlers were in temperature control, food poisoning and cross contamination. Staff may have been doing the right practices during food preparation but they did not appear to understand why they have to follow those practices. This may be because they might have received only very basic training. Therefore it was important to illustrate different aspects of food hygiene practices when designing the session. To develop and deliver the syllabus, both a scheme of work and a session plan for the course were designed.

1- Scheme of Work

This is the first part in designing the course. The scheme of work (Table 3. 1) generally sets out the course topics, general aim, assessment methods, dates, locations and resources used for the whole period. Four topics needed to be included in the course as the following:

a) Principles of Food Contamination and Microbiology.
b) The Safe Ways to Prepare and Store Food.
c) Foodborne Disease.
d) Personal Hygiene.

2- Session Plans

After designing the scheme of work, a session plan was developed. In general, a session plan includes all the necessary information about the lectures such as, curriculum, outcomes and objectives of the particular lesson, groups, class activities and times for each lesson or part. The course was designed to be delivered in 5 hours, over two days. The estimated duration for each lesson was two and half hours. The session plan was divided into two parts; session plan (1) and session plan (2). Each one contained two lessons. The four topics which were identified in the scheme of work were distributed in these plans; two for each plan. It was proposed that, "Principles of Food Contamination and Microbiology" and "The Safe Ways to Prepare and Store Food" were delivered together in the first day and the remaining two in the following day. A full description of the session plans is illustrated in the Tables 3.2 and 3.3.

Before writing the text for the lessons of the training program, learning outcomes and objectives were defined carefully such that the trainees could achieve the tasks by the end of the training sessions. A full copy of the PowerPoint slides is attached in the appendix 17. Each lesson has its own objectives according to the following:

1- Lesson one " Principle of Food Contamination and Microbiology":

a) To list the types of contamination.
b) To know the features and characteristics of bacteria and their effect on food.
c) To recognize the factors affecting growth of bacteria
d) To list the sources of microbial contamination in food and the causes of cross-contamination
e) To apply the appropriate methods to prevent contamination and stop bacterial growth.

2- Lesson two “The Safe Ways to Prepare and Store Food” :

a) To define low & high risk food.
b) To recognize the signs & causes of food spoilage.
c) To describe the correct way to store food.
d) To know the appropriate temperature for cooking and storing food.
e) To know the right way to use thermometers.

3- Lesson three “Foodborne Diseases” :

a) Recognize the characteristics of foodborne diseases & the symptoms of food poisoning.
b) To know the main causes of food poisoning and how pathogens can transfer
c) To define the risk groups who are more vulnerable to food infection.
d) To describe the suitable prevention methods controlling the infection.

4- Lesson four “ Personal Hygiene”

a) To understand the relationship between personal hygiene & food infection.
b) To know the main rules of personal hygiene.
c) To demonstrate the correct way to wash hands.

The delivery methods used a student centred approach from the teacher to the learners. A PowerPoint program was used to design and present the lessons but the delivery was interactive and multimedia. The lectures were designed in English language and then translated to Arabic by the researcher. They included two parts; a theoretical part and a practical activities part. The first part contained theoretical lectures and ended with video clips about good practices. The video clips were from the Food Standard Agency in the UK and presented by several languages (Arabic, English, Indi and Bengali).

Each subject of the lectures consisted: aims, outcomes, an introduction and definitions, main subjects and conclusion. The "Safer Food, Better Business Online Video Guide" was run in several languages by the end of each session (Food Standard Agency, n. d.). The lectures also contained several activities to engage learners such as discussion about their experience of food poisoning and as well as groups work to answer some exercises. The practical part was designed to apply some hygiene practices. It included practices about using thermometers and demonstrating the proper way to wash hands by using hand washing kits (inspector lotion UV lamp). The portable hand hygiene training kit used in this survey included; Glowbar UV lamp and Bottles of Glitterbug gel and powder which was used to inspect and train staff to wash their hands properly. The kit was purchased from "Food Safety Direct Limited" company. Given the low literacy levels of the food handlers, content was supplemented with images in each PowerPoint slide. A number of photographs and short exercises used in the lessons were developed from "Level 2 Award in Food Safety Interactive Training Package (PowerPoint)"- Highfield Company (Highfield Ltd). Photographs were presented to show proper examples of correct and incorrect practices and to use it as well in exercises and groups activities in the class.

Course title : Food safety and Hygienic Practices in Hospitals			**Teacher :** Mohammed Al-Mohaithef		**Aim**: To provide an understanding of the principles of food safety, and how to apply this knowledge to control hazards and prevent food poisoning .
Group : Foodservices staff		**Date:** 1- 3 July	**Time** : 2 hours / session	**Location** : Lecture room - Riyadh Central Hospital	
No.	**Learning outcomes/topic**	**Link to assessment**	**Link to functional skill**	**Resources**	**Teaching and learning Activity**
1	**Introduction to course** **Using initial assessment**		Literacy (Arabic – simple English)	Lap top Projector PowerPoint Course handout	Discussion and questions .
2	**Microbial Contamination in food**	Questionnaire to test and assess		Lap top Projector PowerPoint Course handout	Discussion , small groups work
3	**The Safe Ways to Prepare and Store Food**	Questionnaire to test and assess		Lap top Projector PowerPoint Course handout Hand washing kit Video clip	Discussion, practical activity by using the thermometer in food
4	**Foodborne Diseases**	Questionnaire to test and assess	Numeracy ,calculator ,to calculate the correct temperature	Lap top Projector PowerPoint Course handout Thermometer	Discussion and practical activity
5	**Personal Hygiene**	Questionnaire to test and assess	Numeracy , calculator to calculate the percentage of the chemicals	Lap top Projector PowerPoint Course handout Chemicals	Discussion , Washing and inspection hands (practical activity by using hand washing kit)

Table 3-1 Scheme of Work for Training Program which was conducted in July 2011

Teacher : M. AL-Mohaithef	**Date :** 2 July	**Time :** 10 – 12 am	**Location :** Lecture room - RCH	**Group :** Foodservices staff	**Course :** Food Safety & Hygiene

Topic / Aim : 1- Microbial contamination in Food

2- Food spoilage and storage

Differentiation: Learners are coming from different countries, so, they have different languages and culture. Moreover, their education level may be different.

Learning Outcomes : By the end of this session , learners will be able to :
1- List the types of contamination. 2- Know the feature and characteristic of bacteria and its effect on food. 3- recognize the factors effecting growth of bacteria 4- List of the sources of microbial contamination in food and the causes of cross-contamination 5-Apply the appropriate methods to prevent contamination and stop bacterial growth . 6- Define low & high risk food 7 - Recognize the sings & causes of food spoilage 8- Apply the correct way to store food . 9- Know the appropriate temperature for cooking and storing food. 10- Know the right way to use thermometers.

Time	Learning outcomes	Teacher activity	Leaner activity	Functional skills	Assessment	Resources
10:00	Welcome – general idea about food safety issues in the hospitals.	Discussion	Listen , question	Literacy (Arabic – simple English)	Q & A	
10:05	Aware of intended outcomes	Display and talk through intended outcomes	Listen and discussion			Lap top Projector PowerPoint Course handout
10:10	The types of contamination in food	Using PowerPoint to illustrate the types of contamination in food, and then ask each learner to give an example.	Answer and give an example of one type of contamination according to his experience.		Listening to answers and discussion	Lap top Projector PowerPoint Course handout
10:20	The feature and characteristic of bacteria and its effect on food	Using P.P to illustrate the features of bacteria as, its importance relating to food , its hazards and multiplication.	Listen , question		Q&A	Lap top Projector PowerPoint . Course handout
10:30	The sources of microbial contamination in food and the causes of cross-contamination	Using P.P. to explain the sources of bacteria and how it is brought to kitchen, ask learners to give an examples of cross-contamination	Listen, answer and discussion		Listening to answers and discussion	Lap top Projector PowerPoint . Course handout
10:40	the appropriate methods to prevent contamination and stop bacterial growth	Using P.P. to explain the suitable methods to control bacterial growth	Listen and discussion		Q&A	Lap top Projector PowerPoint . Course handout
10:50	Break and coffee					

11:00	High & low risk food	Using P.P to illustrate the preferred food for bacteria . Split group into two groups and distribute papers contain types of food and ask each group to class food into H & L	Listen, discussion and then class food into H & L		Observation and listen to group activity , questions & responses	Lap top Projector PowerPoint . Papers & pens Course handout
11:10	The signs & causes of food spoilage	Using P.P to explain the effect of bacteria on food and how to recognize spoilage food , then ask named learner to give an example of spoilage signs .	Listen , give one sign of spoilage		Listen to answers	Lap top Projector PowerPoint . Course handout
11:20	The correct way to store food	Using P.P to explain the appropriate methods to store food in refrigerators, freezers and dry store. Spilt group in pairs and distribute some posters showing poor storing ways in refrigerator and ask learners to define it. Playing a short video showing food order in a refrigerator .	Listen , discussion with pair	Posters	Observation and listen to pairs activity , questions & responses	Lap top Projector PowerPoint . Video CD Course handout
11:30	The appropriate temperature for cooking and storing food	Using P.P to explain the correct temperature for freezers, refrigerators, store rooms, also, internal T when cooking and holding food. Exhibit different types of food and ask learner to expect the appropriate internal T for cooking.	Listen , discussion and answer the question	Calculator , thermometer	Observation and listen to answer	Lap top Projector PowerPoint . Course handout
11:40	The correct way to use the thermometer	Using P.P. to explain how to check and record thermometers, and the common mistakes. Ask learners to move to the kitchen and show them the practically the correct way to use the thermometer in food . Ask each one to try that individually.	Listen , discussion and using the thermometer	An electronic thermometer	Observation	Lap top Projector PowerPoint . Thermometer Course handout
11:55	Discussion & end	Answer questions	Ask questions			

Table 3-2 Session Plan (1) for Training Program

Teacher : M. AL-Mohaithef	**Date :** 3 July	**Time :** 10 – 12 am	**Location :** Lecture room - RCH	**Group :** Foodservices staff	**Course :** Food Safety & Hygiene

Topic / Aim :1- Food poisoning & Foodborne diseases

2- Personal hygiene

Differentiation: Learners are coming from different countries, so, they have different languages and culture. Moreover, their education level may be different.

Learning Outcomes : By the end of this session , learners will be able to :
1- Recognize the characteristics of foodborne diseases & the symptoms of food poisoning. 2- Know the main causes of food poisoning and how pathogens can transfer 3- Define the risk groups . 4- Apply the suitable prevention methods. 5- Understand the relation between general hygiene & food infection. 6- Know the main rules of personal hygiene. 7- Apply the correct way to wash hands.

Time	Learning outcomes	Teacher activity	Leaner activity	Functional skills	Assessment	Resources
10:00	Welcome – recap last session.	Discussion	Listen , question	Literacy (Arabic – simple English)	Q & A	
10:05	Aware of intended outcomes	Display and talk through intended outcomes	Listen and discussion			Lap top Projector PowerPoint Course handout
10:10	The characteristics of foodborne diseases & the symptoms of food poisoning	Split learners into pairs and ask them to discuss their own experience about food poisoning. Using PowerPoint to illustrate the characteristics of foodborne diseases & the symptoms of food poisoning.	Discuss their own experience about food poisoning, listen, ask questions	Posters	Observation and listening to groups activity , Q & response	Lap top Projector PowerPoint Course handout
10:20	The main causes of food poisoning and how pathogens can transfer	Using P.P. and images to illustrate the causes of food poisoning and how pathogens can transfer and the differences between food poisoning & food infection.	Listen , question		Q & A	Lap top Projector PowerPoint. Course handout
10:30	The risk groups	Using P.P to list the risk group and how they would be affected	Listen , question		Q & A	Lap top Projector PowerPoint. Course handout
10:35	Prevention methods	Using P.P to illustrate the appropriate ways to prevent food poisoning . Ask named learner to give an example .	Listen and discussion		Q & A	Lap top Projector PowerPoint. Course handout

10:45	Break and coffee					
10:55	The relation between general hygiene & food infection	Using P.P to illustrate how personal hygiene , equipment and contact surfaces cleaning can prevent food infection. Exhibit image of dirty kitchen & person with poor hygiene looking and ask each learner to spot the hazard.	Listen and discussion		Q & A	Lap top Projector PowerPoint. Course handout
11:15	The main rules of personal hygiene	Exhibit images contain a delicious food then image of dirty cook & kitchen and ask them if they can eat that food if it is prepared by that person. Using P.P. to illustrate the main rules of personal hygiene and the importance of hygiene.		Posters		Lap top Projector PowerPoint. Course handout
11:30	The correct way to wash hands	Ask learners to move to the kitchen and request one or two voluntaries to wash their hands then use hand washing kits(inspector lotion UV lamp) . Show them the correct way to wash hands and then play video about the correct way to wash hands.	Observation , participation		Observation	Lap top Projector CD Hand washing kits
11:45	Hazard from cleaning	Using P.P. to illustrate the hazard may associated with cleaning (physical, chemical and microbial hazard) .	Listen , question		Q & A	Lap top Projector PowerPoint. Course handout
11:55	Discussion & end	Answer questions	Ask questions			

Table 3-3 Session Plan 2 for Training Program

3.6.4 Validation of the Training Program

A draft of the training program for this study was used in "Preparing to Teach in the Lifelong Learning Sector" (PTLLS) course assignment in the scheme. The first lecture "Principle of Food Contamination and Microbiology" was used only. This because that the time was limited for each learner. It was delivered by the researcher for all attendances (learners) during the course assessment and evaluated by the course instructor in addition to peers who sent their feedback. There were six attendances three of them specialists in food safety and public health issues and the other three were from different disciplines. All of them were English. The feedback and comments were used to improve the sessions. The main comments were about using body language. One comment was about the colour of the PowerPoint presentation where it was darker. One of attendances recommended repeating some scientific words, such bacteria names, twice with a brief clarification. He was a food safety trainer and this recommendation to give a chance for the attendance to understand the terms correctly.

3.7 Introducing the Intervention and Collecting Data

The intervention group was trained and retested a year after the baseline test and immediately following the intervention (between July and September 2011) and then again after six months (March 2012). The control group were only assessed twice, with the second assessment being carried out 9 months after the first one

3.7.1 Delivery of the Training Program

It was proposed to deliver the sessions in two days, each day covering two subjects. The duration for each subject was two hours in addition to one hour for the practical parts, thus, the total was five hours. However, in the largest hospital (RCH), the sessions were delivered in one week as it had a high number of staff. Before starting the session, staff in all hospitals were asked in which language they like the sessions to be delivered.

In the first and second hospitals (Chest hospital and Rehabilitation Hospital) lectures were given during break and changing shifts between 12:00 and 14:00. The sessions were delivered between 24th and 28th of June 2011. The number of attendances was 16 from each hospital and all had participated in the previous questionnaire (for group 3) which was conducted in August 2010. The lectures were given by mixed Arabic and English languages. Hand-outs were available in English and Arabic.

In RCH, almost 103 food handlers attended the training course. The staff were divided into two groups according to their languages. First were those who were speaking English and simple Arabic and all of them were non Saudis. The total number of them was 80 food handlers from different countries. They then were divided into five small groups contained about 16 workers according to their shift schedules and the sessions. Each day the same session was delivered twice to each small group. They then required five days to cover all sessions. The second were those who were speaking Arabic only. They were 23 and all of

them were Saudis (females). They divided into two small groups. They needed two days to deliver the session to them. The lectures and hand-out were for those 23 were totally in Arabic.

The staff in general were very responsive in the lectures and asked several questions. All of them were engaged in the courses activities. Hand-outs and course materials were distributed before starting the sessions. To engage all attendees, a number of questions were asked and some attendees were asked to speak about their past experiences on issues concerned in the lecture. For instance, in each lecture, participants were split into pairs and asked to exchange their experiences about some issues in food hygiene such as food poisoning and food spoilage. Also and to engage all learners, each attendance group were split into two groups and papers were distributed containing types of food. The groups were asked to class food into high risk and low risk. A number of images about good and bad practices during food preparation were exhibited and then staff were asked to give their comments. Furthermore, at the end of each lecture a short video about bad practices was played and staff were asked to spot the hazards. All the lectures were delivered in the same expected time without any delay.

After finishing the theoretical part, staff were requested to move to the kitchen. A number of volunteers were asked to wash their hands in front of others and then to use hand washing kits (inspector lotion UV lamp). Following, the appropriate way to wash hands was shown and other volunteers were requested to do it again. Then, the researcher explained the correct way to wash hands and inspected his hands by UV lamp. After that, the participants were asked to move to the cooking area. The correct way to use the thermometer in food was explained and each one of the participants had this opportunity to try that individually. The previous steps were applied in the three hospitals with slight differences in times and organising.

3.7.2 Attendances Feedback

After ending all sessions, participants were requested to give their feedback about the lectures. Papers contained two questions were distributed to the participants. The questions were:

1- Please give me two new things you have learnt?

2- Please write your comments and feedback

A copy of staff feedbacks attendance form is presented in the appendix 18. The participating hospitals provided the researcher with certificates confirmed that he gathered data and trained staff in those hospitals (appendix 19).

3.7.3 Completing the Questionnaire for Post-Training Stage

The intervention group was tested one year pre training and approximately a month after delivering the training. However, a sample of the participants in Rehab and Chest hospitals was retested – for a third time- approximately six months after delivering the training to determine any longer term change. RCH was excluded from the third test because it has a new caterer supply with a new staff. The same questionnaire was used at all three test stages. Figure 3.3 summarises the data collection procedure for the intervention group. It was originally proposed to include the same staff by code in the three tests, giving matched groups but preserving anonymity. However, this proved unfeasible because of the difficulty in ensuring staff retained their coding accurately. This meant access to the named individuals could be problematic. The participants in the second test (after the intervention) had participated in the baseline test and for the third test only the food handlers who have participated in the previous tests were asked to answer the questionnaire. The groups therefore comprised the same participants but the results were analysed as unmatched pairs because the test scores could not be allocated to any individual over the test period in the second and third tests, data collection took less time than the first test (baseline study). This

period was more organised than the first test and the staff were familiar with the questionnaire answers methods as they had an experience from the first test.



Figure 3-3 A summary of the hospitals visits to collect data (intervention group only)

3.7.4 Completing the Questionnaires for the Control Group

Data collection for this group (group 3) was conducted in Prince Salman hospital first in December 2012. It was proposed to collect the control group data at the same time with the intervention group but the process has been postponed to the next year. The delay was because of some difficulty in access to the hospital. The researcher tried to collect the data from this hospital at the same time with the others (2010 – 2011) but at that time the new contractor was just started in Prince Salman Hospital. Therefore, the nutrition manager asked the researcher to postpone the visit. The staff then were reassessed in August 2013. The total number of food handlers here was 30. The total number of the respondents was 25 (83.3%). In the next test, the same number of respondents was reached. Only the people who answered the questionnaire before were selected. However, it was not possible to match the participants' papers from the first test and the second one as explained in the intervention study.

3.8 Analysis

The SPSS 18.0 statistical package was used for analysing the questionnaires. Microsoft Excel was used only for audit forms. In this project, a number of comparisons were performed to identify the differences between the participants and the hospitals thus, it was necessary to use several statistical tests. Statistical tests used in the current study include descriptive statistics, Kolmogorov –Smirnov test, Mann Whitney and Kruskal-Wallis. The demographic data were tabulated as nominal data and the descriptive statistics are used to analyse it by percentage. Mann Whitney and Kolmogorov –Smirnov tests were used to define the distribution. Kruskal-Wallis was used to test knowledge, practices and attitude and define the differences between the groups. Results were considered to be significant at $p \leq 0.05$. First, Kolmogorov –Smirnov was used to test the distribution from each hospital separately. As the data was not normally distributed, Mann Whitney was used to test the normality. Kruskal-

Wallis test was used to compare between the groups in the hospitals and to measure the effect of training on the treatment group

Chapter 4: Results and Discussion
Baseline Study

4.1 Baseline Study Results

4.1.1 An Overview

Four governmental hospitals with a number of beds between 400 and 1500 were selected in this project. All these hospitals were willing to participate in the study. An audit form was used to check the hospitals' kitchens. Also, different questionnaires were used to survey staff's demographics characteristics, knowledge, practices and attitude. The foodservices staff were classified into four groups. Each group had its own specific questionnaire. Two hospitals had recently implemented a HACCP plan. At these two hospitals, consultants have been used to provide HACCP documentation and to assess its plan. This, in general, could be due to the misunderstanding of HACCP implementation among catering staff and as well MOH supervisors. Although the participating hospitals are supplied by different catering companies, the same catering contract was applied in all these hospitals. This chapter shows the results of the audits forms and as well the questionnaires before the intervention.

The checklists used in inspecting the hospitals have shown that, in the beginning all the hospitals had the same hygienic status level. The standards of the staff's replies on the questionnaires were varied. The lowest level of the correct responses was found in the knowledge part. All the participants in the four groups had poor food safety knowledge.

4.1.2 Characteristics and Hygienic Status of the Participated Hospitals

Riyadh Centre Hospital (RCH) was the largest hospital with a total number of beds of more than 500 and more than 2000 meals a day. Also, the RCH had a highest number of foodservices staff with a 25 food supervisors/nutritionists working for the MOH and 150 employees working for the hospital catering company (including group 2). Consequently, this hospital had the largest kitchen. The other three hospitals were medium size and this was reflected in the capacity and employee number. The number of the beds for the other three hospitals ranged between 100 to 500 beds. Table 4.1 summarizes the characteristics of the participated hospitals and the checklist results.

As mentioned in the methodology (section 3.4.6), the audit form contained 103 (Yes/No) checklist questions (appendix 16). According to the foodservices managers in these hospitals, the HACCP system was implemented initially in RCH and Rehab hospital. In contrast, no HACCP system or even food hygiene manual was adopted in the Chest hospital or Prince Salman hospital. They just followed the terms and conditions in the foodservices contract. According to the audit results, all the four hospitals obtained a total score of more than 75/103 (72.8%), which can be considered a reasonable hygienic level. RCH had the highest level with a total score of 87 (84.5%) while P. Salman and Chest hospitals obtained 76 (73.7%) for both. It was observed that, RCH had a CCTV in all operations areas. The food supervisors were watching food processing from their offices. A number of major violations were observed which included low food safety management standard. Also, poor design and structure in some hospitals was observed. Examples of the violations include:

- Temperature abuse: Thermometers were not used to check cooking food in the four hospitals and that was considered a major violation. The food placed in the main employees restaurant in RCH was found to be under 50 ^{0}C, although that food was placed on the heaters for several hours. Refrigerator and freezer temperatures were

also not taken properly. Food supervisors based only on the refrigerators/freezers thermometers rather than using their own checked the temperature of the foods.

- Absence of records and documentation: there were no documents keeping the process records such as temperature control and traceability system.
- Lack of staff training: This was also one of the common violations between the four hospitals. No formal training had been delivered to the staff.
- Structural deficiencies: RCH and P.Salman hospital provided private toilets for foodservices staff, while the staff in the other hospitals were using the public toilets or hospitals visitors' toilets. In addition, no receiving areas were available in the Chest, Rehab and P. Salman hospitals and the food was received at the main entrance.

Table 4.1 illustrates the main violations in the hospitals. It was observed that, all the food operations in the kitchens, which included receiving, preparation and distribution, were under the supervision of the MOH food supervisors and nutritionists. Foodstuffs were received, checked and then stored properly. However, good hygiene practices were noted in the participating kitchens. For instance, raw food, meat, dry food, cooked food and chemicals materials were stored separately (Picture 4.1). Red meats were delivered fresh from slaughterhouses in cold cars with health certificates. After receiving meats it was stored separately and stamped with dates. With regard to foodservices staff, all of them had clean uniforms. The uniforms colours were varied according to the employee's position. It was clear to see that, food handlers followed the supervisors' instructions regarding good practices. For instance, knives and cutting boards were labelled to avoid cross contamination. Some sensitive food were prepared in an isolated rooms such as, salad and baby foods (Picture 4.2). Patients' meals were organized on the trays line and then transferred to the wards by using a divided hot/cold food carts (Picture 4.3 and 4.4). The general condition of the kitchens structures, facilities and equipment was good in the RCH and Rehab hospital as

they were lately renewed whilst the building and structure of Chest and P. Salman kitchens were poor as they were so old.

Characteristics	RCH	Chest	Rehab	P. Salman
N. of meals	More than 2000	145	170	200
N. of beds	500 <	100 - 200	200 – 500	200-500
N. of Food supervisors who work for MOH	25	12	11	13
N. of caterer staff including group 2	More than 100 (150) 20 group 2 110 group 3 20 group 4	10 – 50 (35) 5 group 2 20 group 3 10 group 4	10 – 50 (35) 5 group 2 20 group 3 10 group 4	10-50 (49) 9 group 2 30 group 3 10 group 4
HACCP	Yes	No	Yes	No
Food hygiene manual	Yes	No	Yes	No
Total score / 103	87 (84.5%)	76 (73.7%)	77 (74.75%)	76 (73.7%)
Main violations	1- The main entrances doors were always open –no automatic doors. 2- No adequate staff training. 3- Thermometer was not used to check food temperature. 4- No formal pest control contract 5- Staff toilets were near from the operation area. 6- Hot food in cafeteria was kept in inappropriate temperature.	1-The main entrances doors were always open –no automatic doors. 2- No adequate staff training. 3- Thermometer was not used to check food temperature. 4- No adequate lights in the preparation area. 5- No receiving area. 6- No toilets for staff and they were using hospital toilets. 7- No wash hands basins. 8- Heater and cooling in food carts wasn't work.	1-The main entrances doors were always open –no automatic doors. 2- No adequate staff training. 3- Thermometer was not used to check food temperature. 4- No toilets for staff and they were using hospital toilets. 5- No receiving area. 6- No wash hands basins. 7- Electrical fly killings were placed over the food preparation area. 8- No formal pest control contract	1-The main entrances doors were always open –no automatic doors. 2- No adequate staff training. 3- Thermometer was not used to check food temperature. 4- No receiving area. 6- No wash hands basins. 7- The celling was in poor condition.

Table 4-1 Hospitals characteristics and the main violations which were observed during the visits



Figure 4-1 Fresh meat refrigerators (RCH)



Figure 4-2 Isolated room for special diet (RCH)



Figure 4-3 Trays line (RCH)



Figure 4-4 Hot/Cold Food Carts (RCH)

4.1.3 Questionnaires Results

4.1.3.1 First Part: Demographic Characteristics

This was the first part of the questionnaires. It consisted of two sections. The first section consisted of multiple choice questions concerned the demographics characteristics of the participants such as gender, age, and education level. The second section included general questions about participants' information to gather their opinions about HACCP, poor practices and food safety training. The questions were partly different according to each group.

Group one Demographics (Ministry of Health Staff – supervisors and nutritionists)

This demographic part for the first and the second groups involved ten questions classified in two sections. The first section consisted of multiple choice questions concerned the demographics characteristics. The second section included four general questions. The first two questions were Yes/No answers –with justification- about HACCP and training. The other two questions were open ended to obtain the feedback and comments of the food supervisors about food handlers' contraventions during food preparation. The respondents for this group were identified as foodservices managers, food supervisors, nutritionists/dieticians and food technicians who worked for the Ministry of Health. This group was surveyed in three hospitals only which are, RHC, Rehab hospital and Chest hospital. The Prince Salman hospital participated with the group three which was considered as a controlled group. A total of 24 participants completed this questionnaire from group 1. Twenty two were employees of the Ministry of Health. In addition two internship students from Food and Nutrition Sciences College replied to the questionnaire in RCH. All were Saudis.

1- First Section (demographics): The majority of the respondents (63%) were from the RCH as this was the biggest hospital. Only three participants (13%) were females while twenty one (87%) were males. One participant (4%) was over 55 years old while all the other (96%) were under 44 years old. Two (8%) of the subjects were foodservices managers, 4 (16%) were food supervisors, one (4%) was a clinical dietician and 15 (62%) were food technicians. The majority of the subjects (58%) held a 3 years diploma certificate in food and nutrition and 8 had a degree in food sciences and human nutrition while only two (8%) had a degree in dietetics. Only one of the participants (4%) had worked for more than 25 years. The principle characteristics of the Ministry of Health staff are presented at Table 4.2

Characteristics	No./Total	Valid Percentage
Hospitals		
RCH	15/24	62.5 %
Rehab Hospital	5/24	20.8%
Chest Hospital	4/24	16.7%
1.1 Gender		
a- Male	21/24	87.5%
b- Female	3/24	12.5%
1.2 Age group		
a- 24>	4/23	16.7%
b- 25-34 years	8/23	33.3%
c- 35-44 years	10/23	41.7%
d- 55<	1/23	4.2%
1.3 Nationality		
Saudis	24/24	100%
1.4 Position		
a- Department head	2/24	8.3%
b- Food supervisor	4/24	16.7%
c- Dietician	1/24	4.2%
d- Food technician	15/24	62.5%
e- Other, students	2/24	8.3%
1.5 Education Level		
a_ Diploma in food and nutrition	14/24	58.3%
c_ BSc food sciences and nutrition	8/24	33.3%
d_ BSc Dietetics	2/24	8.3%
1.6 Years of Work Experience		
5>	8/24	33.3%
5-15 years	7/24	29.2%
15-25years	8/24	33.3%
d- 25<	1/24	4.2%

Table 4-2 The demographics characteristics of the Ministry of Health employees (group 1)

2- **<u>Second section (general questions)</u>:** The food supervisors and nutritionists were asked four questions (1.7, 1.8, 1.9 and 1.10) about HACCP, training and food handlers' supervision. These questions were :

1.7 *Do you think that HACCP can be implemented in your location? Please justify*

1.8 *Do you think you need more information about HACCP implementation and PRP in hospitals? Please justify*

1.9 *What do you think are the main contraventions regarding hygiene practices committed by staff?*

1.10 *How do you think staff can be motivated to change hygiene behaviour?*

Respondents could give any answers they chose.

<u>Question 1.7</u>: According to the results, the majority of the Ministry of Health employees (87%) believed that HACCP can be implemented in their departments. There was some variation in the respondents' justifications according to the location but this reflected whether the hospital already had a HACCP plan in place or not

<u>Question 1.8</u>: overall, (70%) of the participants said that, they need more information about HACCP system as well as PRPs. This was similar across the hospitals irrespective of whether there was a HACCP plan in the hospital. Table 4.3 summarizes the justifications for the questions related to HACCP system.

Q. 1.7 – Do you think that HACCP can be implemented in your location? Please justify	
Yes 87.5 %	**RCH staff's justifications (100% said Yes)** - There is an effective management system. - The hospital has contracted with a HACCP consulting company. - The kitchen is new and has farcicalities support the system. - The staff have enough experience about HACCP system. **Rehab hospital staff's justifications (100% said Yes)** - The kitchen is new and has facilities which support the system. - The staff have enough experience about HACCP system. **Chest hospital staff's justifications (40% said Yes)** - The staff can be trained on this system. - Kitchen is small so it is easy to control the –hazards.
No 12.5%	**Chest hospital staff's justifications (60% said No)** - The location's structure is old and not supports the HACCP - The staff haven't any knowledge about HACCP.
Q 1.8 – Do you think you need more information about HACCP implementation and PRP in hospitals? Please justify	
Yes 73.91 %	**RCH staff's justifications (71.43% said Yes)** - It is a new system. - The majority of the staff understanding these systems inaccurately. - To implement the systems correctly. - Because the HACCP was inserted in the new catering contract. **Rehab hospital staff's justifications (75% said Yes)** - I need to acquire a new skills **Chest hospital staff's justifications (80% said Yes)** - For patients health and safety. - No professional people in the MOH.
No 26.09 %	**RCH staff's justifications (28.57% said No)** - I have attended several lectures about HACCP **Rehab hospital staff's justifications (25% said No)** - I have enough knowledge. **Chest hospital staff's justifications (20% said No)** - No justifications

Table 4-3 Group 1 comments and justifications about implementing HACCP in their departments

Questions 1.9 and 1.10: With regard to the last to these two questions, the Ministry of Health employees observed several contraventions while doing their main task which is the supervision of the caterers staff. The respondents' replies for the last two questions were similar in the three hospitals. According to the food supervisors, the most common violations observed were:

- Poor personal hygiene and;
- Ignoring wearing protective clothing, such as masks and gloves.

Some supervisors suggested planning motivational rewards to encourage food handlers to follow the good practices. Other supervisors stressed that training is an essential step to improve staff behaviours. Table 4.4 includes a summary of the main food handlers' violations and some suggestions to prevent poor practices.

Q1. 9 – What do you think are the main contraventions regarding hygiene practices committed by staff?		
RCH	**Rehab Hospitals**	**Chest Hospital**
- All staff are unqualified. - Some staff don't care about their personal hygiene. - Food handlers are not wearing masks and gloves	**- Some staff don't care about their personal hygiene. - Food handlers are not wearing masks and gloves.**	**- Some times, the staff use the same utensils with different types of foods. - Food handlers are not wearing masks and gloves. - Some staff hide their sickness. - Storing food under bad conditions.**
Q1. 10 – How do you think staff can be motivated to change hygiene behaviour?		
- Lectures, signs and training. - Motivational rewards - CCTV to control the staff. - Warning letters.	**- Lectures, signs and training. - Motivational rewards**	**- Lectures, signs and training. - Warning letters. - Motivational rewards**

Table 4-4 A Summary of food handlers' violations observed by the Ministry of Health employees'

Group 2 Demographics (Catering companies' staff – supervisors and nutritionists)

This group was surveyed using the same questionnaire in the previous group (appendices 7and 8). The respondents for this group were identified as location manager (catering officer), foodservices supervisor nutritionists/dieticians and food technicians who worked for the catering companies. As the previous group, this group was surveyed also in three hospitals only which are, RHC, Rehab hospital and Chest hospital. The total number of participated was 25 employees worked for the caterer in the three hospitals.

1- First Section (demographics): The majority of the participants (64%) in this group were from the RCH and in contrast to the previous group, most of them (72%) were females. The age range of 19 subjects (72%) was between 25 and 34 years. Comparing with the group 1, only 19 (56%) of the participants here were Saudis, while the other nationalities were distributed between, Philippine (24%), Egypt (16%) and India (4%). Three of the participants (12%) worked as locations managers, 11 (44%) worked as foodservices supervisor, 9 (36%) as dieticians, one (4%) as a food technician and one (4%) also as a HACCP coordinator. Only two (8%) hold a diploma in food sciences and nutrition and two (8%) had a MSc in food sciences and nutrition. However, the majority of the subjects (84%) hold a bachelor degree food sciences, nutrition, and dietetics. About 44% worked in the catering companies between 6 to 15 years. The principle characteristics of the catering companies staff (group 2) are presented at Table 4.5.

Characteristics		No./Total	Valid (%)
Hospitals	RCH	16/25	64 %
	Rehab Hospital	5/25	20 %
	Chest Hospital	4/25	16%
2.1 Gender	a- Male	7/25	28%
	b- Female	18/25	72%
2.2 Age group	a- 24>	1/25	4 %
	b - 25-34 years	19/25	76%
	c - 35-44 years	4/25	16
	d - 45-54 years	1/25	4 %
2.3 Nationality	a- Saudi	14/25	56 %
	b - Philippine	6/25	24 %
	c - Egypt	4/25	16 %
	d - India	1/25	4 %
2.4 Position			
	a- Location Manager	3/25	12 %
	b- Foodservices Supervisor	11/25	44 %
	c- Dietician	9/25	36 %
	d- Food Technician	1/25	4 %
	e- Other (HACCP Coordinator)	1/25	4 %
2.5 - Education Level			
	a- Diploma	2/25	8 %
	b- BAc home economic	6/25	24 %
	c- BSc food and nutrition sciences	6/25	24 %
	d- BSc Dietetics	9/25	36 %
	e- Other(MSc in food sciences)	2/25	8 %
2.6 Years of Work Experience			
	a- 1>	6/25	24 %
	b- 2- 5 years	6/25	25 %
	c- 6- 15 years	11/25	44 %
	d- 16-25 years	2/25	8 %

Table 4-5 The demographics characteristics of the catering companies employees (group 2)

2- **Second section (general question):** The food supervisors and nutritionists were asked four questions about HACCP, training and food handlers' supervision. These questions were the same one used with the first group. The results show that, (95.8%) of the caterers' supervisors and nutritionists believed that HACCP can be implemented successfully in their departments. At the same time, (92%) also need more information about HACCP system and PRPs. The respondents' justifications were mainly common with the group one. Although, the majority of group two respondents hold a BSs degree in food and nutrition sciences, a number of them did not recognise the HACCP system. Table 4.6 includes group 2 justifications for the questions related to HACCP system.

Q.2.7 – Do you think that HACCP can be implemented in your location? Please justify	
Yes 95.8 %	**RCH staff's justifications (93.3.% said Yes)** - There is an effective management system. - The kitchen is new and has good farcicalities support the system. - The staff have enough experience about HACCP system. **Rehab hospital staff's justifications (100 % said Yes)** - The kitchen is new and has good facilities to support the system. - All the company's staff are trained on this system. - The staff have enough experience about HACCP system. **Chest hospital staff's justifications (100% said Yes)** - No justifications
No 4.2 %	**RCH staff's justifications (6.6.% said No)** - I don't know what does HACCP mean ? - Kitchen's location is not suitable as it is in the basement - The staff use the same supplies entrance and that can cause contamination.
Q. 2.8- Do you think you need more information about HACCP implementation and PRP in hospitals? Please justify	
Yes 92 %	**RCH staff's justifications (93.7.43% said Yes)** - It is a new system and so important in the food industries. - There is no official courses about HACCP. - To implement the systems correctly. **Rehab hospital staff's justifications (80% said Yes)** - I need to acquire a new skills - For patients health and safety. **Chest hospital staff's justifications (100% said Yes)** - For patients health and safety.
No 8 %	**RCH staff's justifications (6.2% said No)** - I have attended several lectures about HACCP **Rehab hospital staff's justifications (20% said No)** - I have enough knowledge.

Table 4-6 Group 2 comments and justifications about implementing HACCP system in their departments

The last two questions results included the same common violations as reported by Group one (MOH staff). However, there were some differences in this group opinion than the first group. The caterers' supervisors and nutritionists tended to be stricter than the previous group in their opinions and suggestions regarding food handlers' behaviours. The main task of caterers' supervisors and nutritionists is focused on food services operation and cost control but the supervision on their food handlers is also one of their duties according to catering contract. In general they included poor personal hygiene and ignoring wearing protective clothing, such as masks and gloves as the main violations. Touching hair and nose with bare hands and poor control on food temperature were also observed by the caterers supervisors on their staff. In common with the first group, some caterers staff suggested also motivational rewards and training program to improve staff behaviours. However, this group also suggested punishments, such as salary deductions, to change the bad behaviours. Table 4.7 includes a summary of the main food handlers' violations and some suggestions to prevent poor behaviours.

Q. 2.9 – What do you think are the main contraventions regarding hygiene practices committed by staff?		
RCH	**Rehab Hospitals**	**Chest Hospital**
- **Some staff don't care about their personal hygiene.** - **Food handlers are not wearing masks and gloves** - **Touching hair and nose with bare hands**	- Some staff don't care about their personal hygiene. - No control on food temperature. - Food handlers are not wearing masks and gloves.	- Some staff don't care about their personal hygiene. - Food handlers are not wearing masks and gloves.
Q. 2.10- How do you think staff can be motivated to change hygiene behaviour?		
- Lectures, educational signs and training. - **Motivational rewards** - **Strict control** - **Warning letters.** - **Punishments such as deducting from the salary**	- Lectures, signs and training. - Motivational rewards - Strict control	- Lectures, signs and training. - Strict control - Motivational rewards

Table 4-7 A Summary of food handlers' violations observed by the caterers supervisors (group 2)

Group 3 Demographics (Catering companies' staff – chefs and food handlers):

The demographic part of this group's questionnaire differed from the same section in the questionnaires for groups 1 and 2. It was still divided into two parts but consisted of nine questions. The first part contained seven questions concerning the demographic characteristics of the staff. The second section included two Yes/No questions. The first question was to determine if the food handlers have received food safety training or not. The second one asked participants if their managers encouraged them to attend these courses. The respondents for this group were identified as chief cooks, cooks, assistant cooks and waiters/waitress. The total number of staff participated here was 111 (73%). Descriptive statistics related to the food handlers' demographics (group 3) are presented at Table 4.8.

1- <u>First section (demographics)</u>

Overall, this group included food handlers from RCH, Rehab hospital and Chest hospital. `The majority of the participants were from RCH as it was the largest hospital. The males represented high percentage in both tests. Almost 69 (62.2%) of participants were between 25 to 34 years old. It was clear to find that, most of the food handlers were from the Filipinos and Bangladesh. Most of the Filipinos worked in RCH. The Saudis were only about 16 (14.4%) and all were females working as waitresses (Table 4.8). Almost 24 (21.6%) of respondents had a degree. Only one (0.9%) of the food handlers from Bangladesh had an experience more than 25 years. Approximately 45% of the food handlers had between 2 to 5 years' experience. The majority of respondents worked as a waiters/waitress. Cooks represented only 9%. All of the cooks and their assistants were males, as the females' jobs are limited in foodservices as waitress only –or dieticians in supervision jobs. This rule is based on the Ministry of Health's foodservices contract. The salaries of food services staff were very low. Most of the participants received less than 600 Riyals/month (about £100). Only 19

(17.1%) participants received between 1000 SR (about £180) and 2000 SR (about £ 350) and most of them were the Saudis females and cooks (Table 4.8).

Category	Group 3 Total N (111)
Hospital	
Chest	16 (14.4%)
Rehab	16(14.4%)
RCH	79 (71.2%)
P. Salman	-
3.1 Gender	
Male	70 (63.1%)
Female	41 (36.9%)
i. Age	
a. 24>	22 (19.8%)
b. 25-34	69 (62.2%)
c. 35-44	12 (10.8%)
d. 45-54	5 (4.5%)
3.3 Nationality	
a. Saudi	16 (14.4%)
b. Philippine	41 (36.9%)
c. Egypt	6 (5.4 %)
d. India	14 (12.6%)
e. Bangladesh	32 (28.8%)
f. Sri lanka	1 (0.9%)
g. Nepal	0
3.4 Education	
a- Elementary	48 43.2%)
b- Diploma	27(24.3 %)
c- Bachelors	24 (21.6%)
d- other	6 (5.4%)
3.5 Years of experience	
a- 1>	14 (12.6%)
b- 2_5	50 (45%)
c- 6_15	33 (29.7%)
d- 16_25	12 (10.8%)
e- >25	1 (0.9%)
3.6 Work Activity	
a- Chief cook	5 (4.5%)
b- Cook	10 (9%)
c- Assistant cook	4 (3.6%)
d- waiter/Waitress	80 (72.1%)
e- Other	11 (9.9%)
3.7 Salary(SR)	
a- <600	71 (64%)
b- 600_1000	18 (16.2%)
c- 1000_2000	19 (17.1%)
d- >2000	3 (2.7%)

Table 4-8 : Group 3 demographics characteristics (baseline study)

2- Second section (general question)

This group was asked two questions regarding food safety training and also about the role of food handlers managers in supporting these courses. These questions were to prove if the staff were qualified enough to deal with HACCP system and also to measure the awareness level of their manager toward these courses. The first question (3.8) was to explore if the food handlers have received any food safety training. The second one (3.9) was to investigate if the staff received enough support from their managers to attend these courses. According to the results, about 76% of the total participants have received food safety training (Q 3.8). Question 3.9 showed that, about quarter of the total respondents here did not receive any support from their managers to attend courses in food safety and hygiene (Table 4.9)

Questions	Group 3
3.8 Have you received any training course about food safety?	
Yes	85 (76.6%)
No	24 (21.6%)
3.9 Have your manager required you to attend any food safety training?	
Yes	82 (73.9%)
No	27 (24.3%)

Table 4-9 Second sections replies of food handlers (group 3)

Group Four Demographics (Catering companies' staff – stores keepers and cleaners)

This group was the last one surveyed. The demographic characteristics part was exactly the same one used in the third group. It contained nine questions. The first seven questions concerned the staff demographics characteristics while the last two were general questions that used with the previous group. The respondents for this group were identified as stores keepers and cleaners/janitors. It was surveyed in three participated hospitals RCH, Rehab hospital and Chest hospital. This group was surveyed one time and did not involve in training program as the task of this group is limited in cleaning and storing and cost control. Therefore the fourth hospital – P. Salman- was not included in the survey. The total number of participants was 29 from the three hospitals.

1- **First section (demographics) :** As the previous groups, the majority of the participants were from RCH. All the cleaners and stores keepers who replied in this questionnaire were male. About half of them were between 25 and 34 years old and only one was between 45 and 54 years old. The nationalities were limited to India, Bangladesh and Sri Lanka. However, the Bengalis represented around 89% of the sample. Only four (13.8%) of the participants worked as store keepers while twenty three worked as cleaners. The other two classified their jobs under the choice of (other). They could work in stores as helpers or clerks. The results found that 6 (20.7%) of the participants here had degrees. This nearly the same percentage in the third group. The percentage of the participants with elementary schools was less than those in the third group particularly those in the second test. About half of them had experience between 2 to 5 years. As the results in the third group, the majority of this group members received monthly salaries under 600 SR/month (about £100). Only two store keepers received salaries between 600 SR and

1000 SR (about £180). Table 4.10 shows the findings obtained by the questionnaire with reference to the section of group 4 demographic characteristics.

	Characteristics	No./Total	Valid (%)
1 – Hospitals	RCH	14/29	48.3%
	Rehab Hospital	10/29	34.5%
	Chest Hospital	5/29	17.2%
4.1 Gender	a- Male	29/29	100%
	b- Female		
4.2 Age group	a- 24>	7/29	24.1%
	b – 25-34 years	15/29	51.7%
	c – 35-44 years	6/29	20.7%
	d – 45-54 years	1/29	3.4%
4.3 Nationality	a – India	2/29	6.9%
	b – Bangladesh	26/29	89.7%
	c – Sri lanka	1/29	3.4%
4.5 Position			
	a – store keeper	4/29	13.8%
	c – cleaner	23/29	79.3%
	c – other	2/29	6.9%
	Education Level		
	a – Elementary	9/27	31%
	b – Diploma	3/27	10.3%
	c – Bachelors	6/27	20.7%
	d – Other	9/27	31%
4.6 Years of Work Experience			
	a -1>	3/27	10.3%
	b -2- 5 years	15/27	51.7%
	c -6_15 years	8/27	27.6%
	d – 16_25 years	1/27	3.4%
	ii. - Salary a		
	a - <600 SR	27/29	93.1%
	b -600 -1000 SR	2/29	6.9%

Table 4-10 Group 4 demographics characteristics

2- **Second section (general questions)**: the same two questions used in the third group were also included for group 4. About 71 % of the participants confirmed that they received training in food safety. Also, about 31% of the participants have not received any support from their supervisors to attend any training course. Table 4.11 exhibits the results of this section.

Questions	Replies
4.8 Have you received any training course about food safety?	
Yes	20 (71.4%)
No	8 (28.6%)
4.9 Have your manager required you to attend any food safety training?	
Yes	20 (69%)
No	9 (31%)

Table 4-11 Second section replies for cleaners and stores keepers (group 4)

4.1.3.2 Second part: Food safety Knowledge

The knowledge part was the second section in the questionnaires. A number of multiple choice questions were used to evaluate foodservices staff with regards to food safety and hygiene knowledge. The correct answer was given 1 mark and 0 for incorrect reply. This part was an important part, particularly for the group 3 who was subjected later to the training program. As the data from each hospital was not normally distributed, a non-parametric test (Kruskal Wallis) was used to identify whether the difference between the groups was significant. As the first and second groups had the same questionnaire, their findings are shown and compared under the same section. In general, there were no differences between the staff standards in all the hospitals as *p*-value > 0.05.

Knowledge of Groups one and two

Foodservices managers, food supervisors, and nutritionists who work for the Ministry of Health (MOH) and for the catering companies replied to the same questions in this part. It consisted of 11 multiple choice questions. The total possible score was 11. The initial results showed that, there was no significant difference between the levels of knowledge among all the staff in the three hospitals ($p > 0.05$). Furthermore, comparing the first group (MOH staff) with the second one (companies staff) gave the same result (P > 0.05). These findings indicated that, the knowledge level of the MOH staff was the same as those who work for the catering companies. However, both groups had poor food safety knowledge. The mean scores for the MOH group was 3.8/11 (34.5%) and 4.1/11(37.3%) for the catering operators staff. The maximum score was 7 /11 for both groups. Table 4.12 shows the initial results of the knowledge part for group 1 and group 2.

	Group 1 (MOH staff)	Group 2 (Companies staff)
Minimum score	0 / 11	1 / 11
Maximum score	7 / 11	7 / 11
Mode	3	4
Mean scores	3.8 (34.4%)	4.1 (37.3%)
St. deviation	1.8	1.6
Kruskal wallis	No differences between staff in the three hospitals ($p > 0.05$)	

Table 4-12 The mean scores of the knowledge for groups 1 and 2

A full description of the group 1 and 2 answers is presented at Tables 4.13 and Table 4.14. Almost all of the respondents showed a low level of awareness about food microbiology particularly about foodborne pathogens. For example, in questions 1.15/2.15 as 100% of the participants – in both groups- were unable to recognise the most common pathogen associated with chicken. Only 1 (4.5%) of MOH staff and 3 (13%) of the catering companies staff identified the optimum Water Activity (aw) that suitable for bacterial growth. Fourteen percent (14%) of the participants from both groups said that they can recognise food contaminated with pathogens by looking at it. Twenty percent (20%) of the catering companies' staff said they could recognise contaminated food by smelling it. Less than one third from either group chose the correct answer. Slightly more than half of the respondents (52.2% in group one and 58% in group 2) knew the correct temperature for storage of hot, ready to eat food in the Bain Marie, which means that 47.7 % and 42% did not know this. Questions 1.16/2.16 asked why hot food should be cold before refrigerating. Nearly 42% of the MOH staff and 33% of the caterers participants though that hot food must be cold before refrigeration to improve the quality rather than for reasons of safety. Only 22.7% of the MOH

staff and about 8.3 % of the caterers' staff selected the correct answer. Questions 1.19,1.20 and 1.21 specifically related to HACCP and the replies were much better in both groups. Almost 82% and 92% of the first and second group respectively were able to define the main goal of the HACCP. Question 1.20 was designed to test the participants' working knowledge of HACCP and the associated terminology and 50% of the caterers' staff answered correctly while only 43% of the MOH staff did. The MOH staff had fewer correct answers for all the three questions (1.19, 1.20 and 1.21) than who work for the catering companies.

Questions	Answers	Replies n. (valid %)	
		Group 1	Group 2
1.11 - The most important factors to control the growth of bacteria are	a- Light and oxygen	4 (17.4%)	5 (20.8%)
	b- **Time and temperature**	**11 (47.8%)**	**11 (45.8%)**
	c- Oxygen temperature	6 (26.1%)	6 (25%)
	d- None of these	1 (4.3%)	2 (83%)
	e- I don't know	1 (4.3%)	0
1.12 - The optimum Water Activity (aw) that support the growth of most pathogens is	a - 1	0	5 (21.7%)
	b -**0.95**	**1 (4.5%)**	**3 (13%)**
	c - 0.75	4 (18.2%)	7 (30.4%)
	d - 0	1 (4.5%)	0
	e - I don't know	16 (72.7%)	8 (34.8%)
1.13 - Most pathogens are likely to grow at pH range of	a - 1	1 (4.3%)	2 (8.3%)
	b - **4 - 7**	**10 (43.5%)**	**9 (37.5%)**
	c -2-4	3 (13%)	4 (16.7%)
	d - above 7	4 (17.4%)	6 (25%)
	e - I don't know	5 (21.7%)	3 (12.5%)
1.14 - Hot ready to eat foods should be maintained in the Bain Marie at	a - 25C	3 (13%)	0
	b - 50C	3 (13%)	6 (25%)
	c - **65C**	**12 (52.2%)**	**14 (58%)**
	d - 100C	3 (13%)	0
	e - I don't know	2 (8.7%)	4 (16.7%)
1.15 - The most common pathogen associated with chicken is	a - *Bacillus cereus*	4 (18.2%)	5 (22.7%)
	b - *Vibrio Cholera spp*	0	2 (9.1%)
	c - ***Campylobacter jejuni***	**0**	**0**
	d - *Shigella spp*	9 (40.9%)	8 (36.4%)
	e - I don't know	9 (40.9%)	7 (31.8%)
1.16- Why must hot food be cooled before refrigeration?	a-To avoid smell developing	0	3 (12.5%)
	b-To improve the quality of the food	9 (40.9%)	8 (33.3%)
	c-**The refrigerator temperature doesn't increase**	**5 (22.7%)**	**2 (8.3%)**
	d-To avoid cross contamination	5 (22.7%)	11 (45.8%)
	e - I don't know	3 (13.9%)	0
1.17- It is easy to recognise food contaminated with food poisoning bacteria by:	a -Tasting it	1 (4.5%)	2 (8%)
	b -Smelling it	0	5 (20%)
	c –Looking at it	14 (63.6%)	13 (52%)
	d -**None of these**	**6 (27.3%)**	**5 (20%)**
	e - I don't know	1 (4.5%)	0
1.18 -Food poisoning can be divided into two categories: intoxication or infection and the difference between them is:	a - Intoxication is caused only by the ingestion of a high dose of pathogenic cells.	3 (13.6%)	4 (16.7%)
	b - Intoxication is caused only by the consumption of chemical toxins	4 (18.2%)	5 (20.8%)
	c**. - Intoxication is caused by the consumption of microbial or/and chemical toxins**	**8 (36.4%)**	**8 (33.3%)**
	d - There is no difference between them	3 (13.6%)	6 (25%)
	e-I don't know	4 (18.2%)	1 (4.2%)
1.19 - What is the purpose of HACCP plan?	a - To control specifically microbial hazards in food	4 (17.4%)	0
	b - To organise food preparation process	0	0
	c - To reduce cost and effort in food production	0	0
	d **- To provide safe food by identifying a specific hazard and implementing measures to control it**	**19 (82.6%)**	**23 (92%)**
	e - I don't know	0	2 (8%)
1.20 - Principle 4 of HACCP, which is concerned with monitoring procedures, requires:	a - Monitoring hygiene practices for all employees	6 (26.1%)	4 (16.7%)
	b - Recording refrigerators and freezers temperatures	1 (4.3%)	3 (12.5%)
	c - **Monitoring activities to ensure that the process is under control at critical points**	**10 (43.5%)**	**12 (50%)**
	d - None of the above	2 (8.7%)	1 (4.2%)
	e - I don't know	4 (17.4%)	4 (16.7%)
1.21 -Verification ensures the HACCP plan is :	a - Adequate and working properly	1 (4.3%)	4 (16%)
	b - Recording all CCPs	6 (26.1%)	0
	c - Using appropriate corrective actions	1 (4.3%)	5 (20%)
	d - **All of the above**	**8 (34.8%)**	**11 (44%)**
	e – I don't know	7 (30.4%)	5 (20%)

Table 4-13 A full description of groups 1 and 2 choices for knowledge part

Statement	Respondents n. (%)			
	Correct		Not correct	
	Group 1	Group 2	Group 1	Group 2
1.11The most important factors to control the growth of bacteria are	12 (52.2%)	12 (50%)	11 (47.8%)	12 (50%)
1.12 The optimum Water Activity (aw) that support the growth of most pathogens is	2 (9.5%)	3 (13.6%)	19 (90%)	19 (86.4%)
1.13 Most pathogens are likely to grow at pH range of	10 (47.6%)	9 (39.1%)	11 (52.4%)	14 (60.9%)
1.14 Hot ready to eat foods should be maintained in the Bain Marie at	11 (50%)	14 (58.3%)	11 (50%)	10 (41.7%)
1.15 The most common pathogen associated with chicken is	0	0	20 (100%)	20 (100%)
1.16 Why must food be cooled before refrigeration?	6 (28.8%)	2 (8%)	15 (71.4%)	23 (92%)
1.17 It is easy to recognise food contaminated with food poisoning bacteria by:	6 (27.3%)	5 (20%)	16 (72.7%)	20 (80%)
1.18 Food poisoning can be divided into two categories: intoxication or infection and the difference between them is:	7 (29%)	9 (36%)	14 (66.7%)	16 (64%)
1.19 What is the purpose of HACCP plan?	20 (83.3%)	23 (92%)	4 (16.7%)	2 (8%)
1.20 Principle 4 of HACCP, which is concerned with monitoring procedures, requires:	10 (43.5%)	13 (54.2%)	13 (56.5%)	11 (45.8%)
1.21 Verification ensures the HACCP plan is :	8 (24.8%)	11 (45.8%)	15 (65.2%)	13 (54.2%)

Table 4-14 Correct and incorrect replies of the MOH staff and catering companies staff (knowledge part)

Knowledge of Group three

In general, the staff at all hospitals had very low baseline knowledge about most aspects of food safety, according to the results obtained from the first survey. The level of the total employees' knowledge was very low with a mean score of 4.8/13 (36 %,). Statistically, there was no significant difference in the knowledge level between the staff in the three hospitals since the *p-value > 0.05* (Tables 4.15).

Less than 50% of the respondents answered this part correctly (Table 4.16). About half of the food handlers thought that the benefit of using gloves was just to protect food from contamination and only 39% answered the question correctly (Q3.12). In Q3.15, about 40 % of the food handlers said that they would recognise contaminated food by smelling. Only about 10% of respondents answered this question correctly. The majority of the participants were unable to define the required refrigeration, cooking and holding food. Almost 3.7% of the participants said that they will reuse a cooked food to reduce the cost on the caterer even if they doubted its safety (Q3.16). Question 3.20 demonstrated that, although the majority gave the correct answer, 1.9% of the respondents tried to hide their illness because they were afraid to be suspended from work without salary. Many of the food handlers answered the HACCP question (Q3.21) properly.

Knowledge	Group 3
Minimum score	0 / 13
Maximum score	11 /13
Mode	4
Mean scores	4.8 (36.9%)
St. deviation	2.5
Differences between the three hospitals	Kruskal-Wallis *: p-value < 0.01*

Table 4-15 The mean scores of food handlers (group3) knowledge

Questions	Choices	Answers
3.10 Cross contamination is the transfer of harmful microorganism from:	a- Food to food only	21 (20.2%)
	b -Person to food only	16 (15.4%)
	c - Contact surfaces to food only	13 (12.5%)
	d- All above	**46 (44.2%)**
	e -Do not know	8 (7.7%)
3.11 Why is it important to wash your hands after handling raw meat?	a. To prevent spread of bacteria/germs	28 (25.7%)
	b. To avoid cross contamination	33 (30.3%)
	c. To avoid food poisoning	7 (6.4%)
	d. All the above	**38 (34.9%)**
	e. Do not Know	3 (2.8%)
3.12 Using gloves during preparing food is to	a. protect food from any contamination	51 (46.4%)
	b. Protect me from any contamination	11 (10%)
	c. Both of a and b	**43 (39.1%)**
	d. No benefit of using gloves and it is restrict my work	4 (3.9%)
	e. Don't know	1 (.9%)
3.13 During food preparation and refrigeration, raw and cooked food must be separated because	a. Kitchen will be more organised	19 (17.3%)
	b. The flavour may be affected	26 (23.6%)
	c. To avoid cross-contamination	**55(50%)**
	d. Ministry's employees require that	5 (4.5%)
	e. Do not Know	5 (4.5%)
3.14 *E. coli* bacteria can be transmitted by	a. Fly only	36 (33.3%)
	b. Human only	11 (10.2%)
	c. Raw meats and vegetables only	24 (22.2%)
	d. All the above	**26 (24.1%)**
	e. Do not Know	11(10.2%)
3.15 You can recognise food contaminated with poisoning bacteria by	a. Smelling it	41 (40.6%)
	b. Tasting it	31 (30.7%)
	c. My experience	10 (9.9%)
	d. None of those	**9 (9.9%)**
	e. Do not know	10 (9.9%)
3.16 When you are in doubt about the safety of a previously cooked food, do you	**a. Report it to the Ministry's supervisor**	**50 (46.3%)**
	b. Reuse it directly to reduce the cost	4 (3.7%)
	c. Reheat it to kill microorganism then reuse it	13 (12%)
	d. Throw it out	39 (36.1%)
	e. Do not know	2 (1.9%)
3.17. When you cooking chicken, the internal temperature should be at least:	a. 55 C	19 (17.4%)
	b. 65 C	14 (12.8%)
	c. 75 C	**51 (46.8%)**
	d. 100 C	13 (11.9%)
	e. Do not know	12 (11 %)
3.18 The correct temperature for a refrigerator is	a. 10 C - 15 C	28 (26.2%)
	b. 5 C – 10 C	27 (25.2%)
	c. 1 C – 5 C	**36 (33.6%)**
	d. Below 0 C	7 (6.5%)
	e. Do not know	9 (8.4%)

	a. 25 C	24 (22.6%)
3.19 Hot ready to eat foods should be maintained in the Bain Marie at	b. 50 C	32 (30.2%)
	c. 65 C	**35 (33%)**
	d. 100 C	2 (1.9%)
	e. Do not know	13 (12.3%)
	a. Continue working normally	7 (6.5%)
	b. Report Ministry's employees	**25 (23.4%)**
3.20 When you suffer fever, diarrhoea, or vomiting, will you:	c. Go to doctor then continue working normally	72 (67.3%)
	d. Afraid to report because they stop your work without salary	2 (1.9%)
	e. Do not know	1 (1.9%)
	a. Food safety system by using computer	4 (3.8%)
3.21 What do you understand by "Hazard Analysis critical control Points" (HACCP) ?	b. Process control	17 (16%)
	c. Temperature control	7 (6.6%)
	d. System to ensure safe food by identifying and controlling specific hazards	**69 (65.1%)**
	e. Don't know	9 (8.5%)
	a. Cigarettes smell may transfer to food	4 (15.8%)
3.22 Smoking is unacceptable practice in kitchen because	b. Bacteria in mouth may transfer to figures thus to food	17 (12.9%)
	c. It may cause fire in kitchen	7 (20.8%)
	d. Al of the above	**69 (43.6%)**
	e. Do not know	9 (6.3%)

Table 4-16 Group 3 Answers for Knowledge Questions (baseline study)

Knowledge of Group Four

The knowledge of food services cleaners and stores keepers was also evaluated. Twenty nine participants' answers were considered in this group. The questionnaire consisted of twelve questions. However, questions 4.12, 4.13 and 4.16 were used previously in the group 3 questionnaire. This group had also a very poor knowledge. The mean food safety knowledge scores here was 3.4/12 (28.3%). Therefore, this group had the lowest knowledge level comparing with the other three groups. The Kruskal Wallis test did not indicate any differences between the participants practices in the three hospitals. An analytical description of the participants replies are presented at Tables 4.17 and 4.18. Less than half of this group members answered knowledge questions correctly. Only questions 4.13, 4.18, 4.19 and 4.20 were answered correctly by 70% of the participants. The findings showed that, 80% of the participants knew the correct temperature for freezers and at the same time only 17.9% knew the right temperature for the refrigerators. Likewise, more than 82% of the respondents thought that meat should be stored at the top of the fridge and only 10% selected the correct answer. In question 4.15, which was used also in group 3 (Q3.20), more than 78% said when they suffer from infectious diseases they just will go to a doctor and then continue then work normally. However, the percentage of the same reply was lower in group three. On the other hand, about 85% of the cleaners thought that, keeping their gloves on all the time even during using a toilet can prevent them from diseases (Table 4.18).

	Group 4 (cleaners and stores keepers)
Minimum score	**0 /12**
Maximum score	**8 / 12**
Mode	**3**
Mean scores	**3.4 (28.3%)**
St. deviation	**1.9**
Kruskal wallis	***Comparing group 4 based on their hospitals : p-value* : >0.05**

Table 4-17 The mean scores of the knowledge for group 4

Questions	Answers	Replies n. (valid %) Group 4
4.10 Why is it important to wash your hands after handling raw meat?	a-To prevent spread of bacteria/germs	10 (35.7%)
	b-To avoid cross contamination	16 (57.1%)
	c-To avoid food poisoning	1 (3.6%
	d-All the above	**1 (3.6%)**
	e – Don't know	0
4.11 Food poisoning bacteria can be brought into the kitchen by	a - People only	17 (58.6%)
	b - Insects only	10 (34.4%)
	c - Raw meat and vegetables only	0
	d- All the above	**2 (6.9%)**
	e - Do not know	0
4.12 The correct temperature for a refrigerator is	a. -10 C - 15 C	16 (57.1%)
	b -5 C – 10 C	5 (21.4%)
	c -1 C – 5 C	**5 (17.9%)**
	d - Below 0 C	0
	e -Do not know	1 (3.6%)
4.13 The correct temperature for a freezer is	a- 0 C	2 (8%)
	b - _4 C	2 (8%)
	c - -18 C	**20 (80%)**
	d - 1 C	0
	e- Don't know	1 4%)
4.14 Raw meat should be stored at:	a - The top of the fridge	23 (82.1%)
	b -The bottom of fridge	**3 (10.7%)**
	c - The centre of fridge	1 (3.6%)
	d - None of those	0
	e - Do not know	1 (3.6%)
4.15 When you suffer fever, diarrhoea, or vomiting, will you:	a. Continue working normally	3 (10.7%)
	b. Report Ministry's employees	**1 (3.6%)**
	c. Go to a doctor then continue working normally	22 (78.6%)
	d. Afraid to report because they stop your work without salary	2 (7.1%)
	e. Do not know	0
4.16 What do you understand by "Hazard Analysis critical control Points" (HACCP) ?	a. Food safety system by using computer	3 (12%)
	b. Process control	4 (16%)
	c. Temperature control	4 (16%)
	d. System to ensure safe food by identifying and controlling specific hazards	**13 (52%)**
	e. Don't know	1 (4%)
4.17 When a disinfectant is used to clean refrigerators the equipment should be turn off and brought to room temperature because	a - It is safe	15 (53%)
	b - To reduce electric cost	3 (10.7%)
	c - **Disinfectant works best at room temperature**	**10 (35.7%)**
	d - Do not know	0
4.18 Why floors must be kept clean especially at the end of the day?	a - To keep the tiles in a good condition	6 (21.4%)
	b -Insects may transfer contamination between floor and work surface	**20 (71.4%)**
	c -To remove bad smell	2 (7.1%)
	d -Do not know	
4.19 Washing utensils with water and soap only kill all bacteria	a – Yes	**27 (100%)**
	b – No	0
	c – Don't know	0
4.20 - Chemicals items should be stored separately than other foodstuffs	**a – Yes**	**23 (95.8%)**
	b – No	0
	c – Don't know	1 (4.2%)
4.21 Keeping on my gloves when going to the toilet may prevent diseases	a – Yes	23 (85.2%)
	b – No	**3 (11.1%)**
	c – Don't know	1 (3.7%)

Table 4-18 A full description of group 4 answers for knowledge questions

4.1.3.3 Third part: Food safety practices

Self-reported food safety and hygiene behaviours were measured by using multiple-choice questions. For each practice, participants indicated the frequency that the practice was followed in their departments using the options always, sometimes and never, which were scored, 2, 1 and 0, respectively. The scores range was varied according to each group. As in the knowledge part, there were no differences between the staff replies in all the hospitals as *p-value > 0.05*. In general, the participants had a good self –reported behaviour.

Food Safety Practices for Groups one and two

The third section of the group 1 and 2 questionnaire consisted of 8 questions with highest possible score of 16. Responses for this area are displayed in Tables 4.19 and 4.20. Overall, mean scores for the selected questions of this section was 13.1/16 (81.8%) and 11.1 /16 (69.4%) of the maximum possible score for group 1 and 2 respectively. There was no significant difference between the groups (*p-value > 0.05*) and the levels of staff in the three hospitals were mainly same (Tables 4.19).

	Group 1 (MOH staff)	Group 2 (Companies staff)
Minimum score	9 / 16	4/16
Maximum score	16 / 16	16/16
Mode	12	14
Mean scores	13.1 (81.8%)	11.1 (69.4%)
St. deviation	2.1	3.8
Kruskal–Wallis	*p-value >0.05*	

Table 4-19 The mean scores of the food safety practises for groups 1 and 2

The self-reported hygienic practices showed that about 37 % of the MOH staff used thermometers regularly to check food, while only 12 % of the caterers' staff did that (Table 4.20). These percentages were considered very low in both cases. Only half of the MOH staff stated that they always washed their hands before inspecting the new supplies while caterers' staff were likely to be more aware as 63.3% reported always washing their hands before inspecting. In group 1, 87% of them washed their hands after inspecting the supplies. In contrast, 95% of the companies' staff stated that they wore gloves when they inspect food and only 37.5% of the MOH staff did that. With regards to receiving food with unapproved sources, 20% of the MOH staff said that sometimes they accepted food from unknown sources and that only happened in the emergency cases. All catering staff (100%) denied this behaviour. With regards to sickness, 18.2% of the caterings staff said that they would not stop any food handlers working when he/she suffers from infectious diseases symptoms.

Questions	Answers	Replies n. (valid %)	
		Group 1	Group 2
1.22 Do you inspect all deliveries and supplies which enter your department?	Always	19 (79.2%)	10 (45.5%)
	Sometimes	4 (16.7%)	7 (31.8%)
	Never	1 (4.2%)	5 (22.7%)
1.23 Do you wash your hand before inspecting the new supplies?	Always	12 (50%)	14 (63.6%)
	Sometimes	10 (41.7)	4 (18.2%)
	Never	2 (8.3%)	4 (18.2%)
1.24 Do you wash your hands after inspecting the new supplies?	Always	21 (87.5%)	15 (68.2%)
	Sometimes	3 (12.5%)	4 (18.2%)
	Never	0	3 (13.6%)
1.25 Do you wear gloves when you inspect food during preparation?	Always	9 (37.5%)	23 (95.8%)
	Sometimes	15 (62.5%)	1 (4.2%)
	Never	0	0
1.26 In emergency cases; such as food shortage, do you accept food with unapproved sources?	Never	19 (72.9%)	21 (100%)
	Sometimes	5 (20.8%)	0
	Always	0	0
1.27 Do you use thermometer to check cooked food temperature?	Always	19 (37.5%)	3 (12%)
	Sometimes	13 (54.2%)	9 (36%)
	Never	2 (8.3%)	10 (40%)
1.28 Do you stop any employee working when suffering any of the following symptoms: diarrhea, fever, vomiting, jaundice and sore throat with fever?	Always	21 (87.5%)	17 (77.3%)
	Sometimes	2 (8.3%)	1 (4.5%)
	Never	1 (4.2%)	4 (18.2%)
1.29 Do you request all foodservices staff to wash their hand all hours of operations?	Always	17 (70.8%)	15 (56.2%)
	Sometimes	7 (29.2%	5 (21.7%)
	Never	0	3 (13%)

Table 4-20 Group one and two answers for the practices questions

Food Safety Practices for Groups three

The self-reported hygienic practices questions for this group (food handlers) consisted of five questions about food hygiene practices with highest score of 10. The participants' answers and statistical analyses are presented and analysed at Tables 4.21 and 4.22. In general, the majority of the respondents showed high awareness with regard to hygiene practices as the mean scores for the questions was 8.7/10 (87%). The self-reported hygienic practices indicated that more 90% of participants in washed their hands before touching unwrapped food. Also 83.8% of the food handlers always wore caps when they prepare unwrapped foods. Only 60% the respondents said they were always using thermometers to check food.

	Group 3
Minimum score	**4/10**
Maximum score	**10/10**
Mode	**10**
Mean scores	**8.7(87%)**
St. deviation	**1.6**
Comparing between participants in the three hospitals	**(Kruskal Wallis) $p > 0.05$**

Table 4-21 The mean scores of the food safety practises for group 3 (baseline study)

Questions	Choices	Answers
3.23 Do you wash your hands before touching unwrapped foods?	Always	100 (90.0%)
	Sometimes	10 (9.1%)
	Never	0
3.24 Do you use mask when you prepare or distribute unwrapped foods?	Always	102 (94.4%)
	Sometimes	4 (3.7%)
	Never	2 (1.9%)
3.25 Do you wash your hands after touching unwrapped foods?	Always	99 (92.5%)
	Sometimes	6 (5.6%)
	Never	2 (1.9%)
3.26 Do you wear a cap or head covering when you prepare or distribute unwrapped foods?	Always	93 (83.8%)
	Sometimes	5 (5%)
	Never	2 (2%)
3.27 Do you use a thermometer to monitor the temperature of food?	Always	63 (60.6%)
	Sometimes	24 (23.1%)
	Never	17 (16.3%)

Table 4-22 Group three answers for the practices questions

Food Safety Practices for Groups four

The self-reported hygienic practices questions for this group consisted of four questions about food hygiene practices and cleaning methods with highest possible score of 8. The Kruskal Wallis test did not indicate any differences between the participants practices in the three hospitals. The participants' answers are presented and analysed at Tables 4.23 and 4.24. Initially, this group had an acceptable level of self-reported good practices. The total mean score was 5.6 /8 (70%) (Table 4.23).

	Group 4 (cleaners and stores keepers)
Minimum score	2/8
Maximum score	8/8
Mode	6
Mean scores	5.6 (70%)
St. deviation	1.4
Comparing between participants in the three hospitals	(Kruskal Wallis) *: p-value* : 0.65

Table 4-23 The mean scores of the food safety practises for group 4

The respondents had a poor hygiene practices in some parts. Almost 92% said they always washing their hands before touching any food (Q 4.22). In question (4.23), about 69% of the participants here said that they were always using the same towel to clean several places in the kitchen. Only 61% of respondents said they always checked the concentration of sanitizing solutions (Table 4.24).

Questions	Answers	Replies n. (valid %)
		Group 4
4.22Do you wash your hands before touching unwrapped raw foods?	Always	26 (92.9%)
	Sometimes	1 (7.1%)
	Never	0
4.23 Do you use the same towel to clean many places in the kitchen ?	*Never*	6 (23.1%)
	Sometimes	2 (7.7%)
	Always	18 (69.2%)
4.24Do you wash your hands after touching unwrapped raw foods?	Always	24 (92.3%)
	Sometimes	1 (3.8%)
	Never	1 (3.8%)
4.25Do you check the concentration of sanitizing solutions according to manufacturer's instruction?	Always	16 (61.5%)
	Sometimes	9 (34.6%)
	Never	1 (3.8%)

Table 4-24 Group four answers for the practices questions

4.1.3.4 Fourth part: Staff Attitudes

This part included multiple choice questions to try and assess the attitudes of foodservices staff toward good practice. The questions used one type of response, which was a five point Likert scale. The rating was from one "strongly disagree/ extremely unimportant to five "strongly agree/ extremely important". However, some question's scales were adverse. The scores range was varied according to each group. In general, a positive attitude was reported by a great majority of foodservices staff. In this part only question 1.31/2.31 was different for group one and two; therefore their results are presented under one section.

Attitudes for Groups one and two

The food supervisors and nutritionists who work for Ministry of Health (MOH) and catering companies answered the same questions except question number 1.31/2.31. As the groups have some differences in their duties, the Q1.31 for Ministry Staff (group 1) was : *I believe that, my responsibility is to control my department's hygiene* , while the Q2.31 for group 2 was: *I believe that my responsibility is to reduce cost on the company.* There were six questions with a total possible score of 30. The responses for this area may be seen at Tables 4.25 and 4.26. The results showed a positive attitude for both groups. The mean score of the first group was 28.1/30 (93.6%) and 23.7/30 (79%) for the second one. It was clear to see that the MOH staff had more positive attitude than the second group. The Kruskal Wallis test indicated that there was a significant difference between the groups means ($p < 0.05$).

	Group 1 (MOH staff)	Group 2 (Companies staff)
Minimum score	**25/30**	**18/30**
Maximum score	**30/30**	**30/30**
Mode	**28**	**25**
Mean scores	**28.1 (93.6%)**	**23.7 (79%)**
St. deviation	**1.7**	**2.9**
Comparing between the groups	(Kruskal Wallis) ***p-value <. 0.01***	

Table 4-25 the mean scores of attitudes part and differences between group 1 & 2

According to the replies, 79.2% of the MOH staff agreed strongly that good employee hygiene can help to prevent food borne illness comparing with 96 % of the companies staff had the same attitude. In question 1.31, only 50% of the MOH staff believed strongly that their main responsibility was to control the kitchen hygiene. However, 72% of the catering companies' staff failed to answer question 2.31 and of those who did 42% of the respondents agreed that their main job was to reduce the cost to their companies. Catering staff are usually encouraged by the MOH supervisors to act hygienically, regardless of the company costs. At the same time, catering managers ask those staff to reduce costs and expenses. Therefore, group 2 here could be exhibiting a conflict of interest or simply be less confident in replying to this question. With regard to the hygiene training, the majority of the respondents from both groups thought that the training was extremely important for all foodservices staff. On the other hand, only 45% of the catering companies' staff strongly agreed to be subjected to punishment if they violated the good practices rules (Table 4.26).

Questions	Answers	Replies n. (valid %)	
		Group 1	Group 2
1.30 I believe that good employee hygiene can help to prevent food borne illness	1. Strongly agree	19 (79.2%)	24 (96%)
	2. Agree	4 (16.7%)	1 (4%)
	3. Neither agree nor disagree	0	0
	4. Disagree	1 (4.2%)	0
	5. Strongly disagree	0	0
1.31 believe that, my responsibility is to control my department's hygiene (*for MOH staff only*)	1. Strongly agree	12 (50%)	2 (28.6%)
	2. Agree	10 (41.7%)	3 (42.9 %)
	3. Neither agree nor disagree	0	0
2.31 I believe that my responsibility is to reduce cost on the company *(for catering staff only*)	4. Disagree	2 (8.3%)	2 (28.6%)
	5. Strongly disagree	0	0
1.32 I believe that the new catering companies staff need food hygiene training before starting the work	1. Extremely important	23 (95.8%)	18 (72%)
	2. Important	1 (4.2%)	7 (28%)
	3. Neither important nor not	0	0
	4. Unimportant	0	0
	5. Extremely unimportant	0	0
1.33 I believe that courses in food hygiene are important for Ministry's staff	1. Extremely important	18 (75%)	18 (72%)
	2. Important	6 (25%)	6 (24%)
	3. Neither important nor not	0	0
	4. Unimportant	0	0
	5. Extremely unimportant	0	1 (4%)
1.34 I believe that refresh courses in food hygiene are important for all foodservices staff	1. Extremely important	16 (66.7%)	14 (58.3%)
	2. Important	7 (29.2%)	9 (37.5%)
	3. Neither important nor not	1 (4.2%)	1 (4.2%)
	4. Unimportant	0	0
	5. Extremely unimportant	0	0
1.35 I believe that unhygienic behaviour should be punished with sentencing	1. Strongly agree	16 (66.7%)	11 (45.8%)
	2. Agree	8 (33.3%)	9 (37.5%)
	3. Neither agree nor disagree	0	3 (12.5%)
	4. Disagree	0	1 (4.2%)
	5. Strongly disagree	0	0

Table 4-26 Groups 1 and 2 beliefs and attitudes

Attitudes for Group three

This group answered five questions in the attitude part. The total possible score was 25. The responses for this area are presented in Tables 4.27 and 28. The results showed a positive attitude of the food handlers. The mean scores was 19.8/25 (79.2%) (Table 4.27). About 40% of the food handlers said it is highly possible that *hospital patients may die as a result of eating food that was not hygienically prepared.* 42% of the respondents strongly agreed that their behaviour during food preparation is more hygienic when their supervisor is present and this percentage was almost steady.

	Group 3
Minimum score	**3/25**
Maximum score	**25/25**
Mode	**21**
Mean scores	**19.8 (79.2%)**
St. deviation	**2.9**
Kruskal wallis	**Comparing between the staff based on the hospitals *p-value* : >0.05**

Table 4-27 The mean scores of group 3 attitudes

Questions	Choices	Group 3 Replies n. (valid %)
3.28 I believe that carrying out good hygienic practice at all times during food preparation is :	1. Very important	97 (92.4%)
	2. Important	6 (5.7%)
	3. Neither important or not	2 (1.9%)
	4. Unimportant	0
	5. Very unimportant	0
3.29 I believe that carrying out good hygienic behaviour at all times during food preparation can help to prevent food borne illness	1. Strongly agree	75 (74.3%)
	2. Agree	19 (18.8%)
	3. Neither agree nor disagree	0
	4. Disagree	1 (1%)
	5. Strongly disagree	6 (5.9%)
3.30 It is possible that hospital patients may die as a result of eating food that was not hygienically prepared	1. Highly possible	42 (41%)
	2. Possible	41 (39.8%)
	3.Neither possible or not	6 (5.8%)
	4.Impossible	7 (6.8%)
	5. Highly impossible	7 (6.8%)
3.31 I believe that my behaviour during food preparation is more hygienic when my supervisor is present	1. Strongly agree	43 (42.2%)
	2. Agree	38 (37.3%)
	3. Neither agree nor disagree	2 (2%)
	4. Disagree	7 (6.9%)
	5. Strongly disagree	12 (11.8%)
3.32 I intend to carry out good hygienic practice at all times during food preparation	1. Extremely likely	68 (66%)
	2. Likely	34(33%)
	3.Neither likely nor unlikely	1 (1%)
	4. Unlikely	0
	5. Extremely unlikely	0

Table 4-28 Group 3 beliefs and attitudes (baseline study)

Attitudes for Group four

The cleaners and stores keepers, who represented this group, answered the same questions used with group three in this part. The results showed as well positive attitudes among the participants. Descriptive statistics of the respondents' answers are shown in Tables 4.29 and 4.30. The mean score was 19.8/25 (79.2%), which was exactly equivalent to the mean score of food handlers' (group 3) attitudes before the training (*p> 0.05)*. Kruskal wallis test did not indicate any differences between the participants practices in the three hospitals (Table 4.29). In general, most of the respondents' attitudes were consistent with the previous group particular with the pre training survey. For example the majority of the participants were strongly agreed with statements in questions 4.26, 4.27 and 4.30. Also, in questions 4.28 and 4.29 only 48% and 30% respectively were strongly agreed with the statements (Table 4.30).

	Group 4 (cleaners and stores keepers)
Minimum score	**13/25**
Maximum score	**23/25**
Mode	**20**
Mean scores	**19.8 (79.2%)**
St. deviation	**2.3**
Kruskal wallis	**Comparing between the staff based on the hospitals *p-value* : >0.05**

Table 4-29 The mean score of group 4 attitudes

Questions	Choices	Replies n. (valid %)
		Group 4
4.26 I believe that carrying out good hygienic practice at all times during food preparation is	1. Very important	26 (92.9%)
	2. Important	2 (7.1%)
	3. Neither important or not	0
	4. Unimportant	0
	5. Very unimportant	0
4.27 I believe that carrying out good hygienic behaviour at all times during food preparation can help to prevent food borne illness	1. Strongly agree	19 (67.9%)
	2. Agree	6 (21.4%)
	3. Neither agree nor disagree	1 (3.6%)
	4. Disagree	1 (3.6%)
	5. Strongly disagree	1 (3.6%)
4.28 It is possible that hospital patients may die as a result of eating food that was not hygienically prepared	1. Highly possible	13 (48.1%)
	2 . Possible	13 (48.1%)
	3.Neither possible or not	0
	4.Impossible	1 (3.7%)
	5. Highly impossible	0
4.29 I believe that my behaviour during food preparation is more hygienic when my supervisor is present	1. Strongly agree	8 (30.8%)
	2. Agree	15 (57.7%)
	3. Neither agree nor disagree	2 (7.7%)
	4. Disagree	0
	5. Strongly disagree	1 (3.8%)
4.30 I intend to carry out good hygienic practice at all times during food preparation	1. Extremely likely	21 (75%)
	2. Likely	3 (10.7%)
	3.Neither likely nor unlikely	1 (3.6%)
	4. Unlikely	2 (7.1%)
	5. Extremely unlikely	1 (3.6%)

Table 4-30 Group 4 replies on beliefs and attitudes questions

4.1.4 Correlation and Association

4.1.4.1 Correlation between knowledge, behaviours and attitude

Spearman's rank correlation coefficient was used to investigate the correlation type between the total mean scores of knowledge practices and attitudes (KPA). In general, Spearman's correlation is a statistical measure of the strength of a relationship between paired data. If the value closer to $\pm$ 1 the relation will be stronger. The results in this study indicated that there was a positive correlation between KPA in a number of groups. Tables 4.31 4.32 and 4.33 demonstrate the results of Spearman's rho test used to identify the correlation. In the first group, the correlation coefficient showed that there was a positive correlation (moderate) between Ministry of Health staff's practices and their attitudes as *r= 0.546 (*Table 4.31*).* In the third group, there was a positive correlation (weak) between food handlers' knowledge and their behaviours.

Correlations between K,P and A (group 1)

			Scores (knowledge)	Scores (Practices)	Scores (Attitudes)
Spearman's rho	Scores (knowledge)	Correlation Coefficient	1.000	.024	-.213
		Sig. (2-tailed)	.	.912	.317
		N	24	24	24
	Score (Practices)	Correlation Coefficient	.024	1.000	**.546****
		Sig. (2-tailed)	.912	.	.006
		N	24	24	24
	Score (Attitudes)	Correlation Coefficient	-.213	**.546****	1.000
		Sig. (2-tailed)	.317	.006	.
		N	24	24	24

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations between K, P and A (group 2)

			Scores (knowledge)	Scores (Practices)	Scores (Attitudes)
Spearman's rho	Scores (knowledge)	Correlation Coefficient	1.000	.267	-.031
		Sig. (2-tailed)	.	.206	.884
		N	25	24	25
	Score (Practices)	Correlation Coefficient	.267	1.000	.333
		Sig. (2-tailed)	.206	.	.112
		N	24	24	24
	Score (Attitudes)	Correlation Coefficient	-.031	.333	1.000
		Sig. (2-tailed)	.884	.112	.
		N	25	24	25

Table 4-31 The correlation between KPA (groups 1 & 2)

Correlations between K, P and A (group 3 before the training)

			Scores (knowledge)	Scores (Practices)	Scores (Attitudes)
Spearman's rho	Scores (knowledge)	Correlation Coefficient	1.000	.231*	.146
		Sig. (2-tailed)	.	.015	.137
		N	111	110	105
	Score (Practices)	Correlation Coefficient	.231*	1.000	.053
		Sig. (2-tailed)	.015	.	.589
		N	110	110	105
	Score (Attitudes)	Correlation Coefficient	.146	.053	1.000
		Sig. (2-tailed)	.137	.589	.
		N	105	105	105

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4-32 The correlation between KPA (group 3)

Correlations between K, P and A (group 4)

			Scores (knowledge)	Scores (Practices)	Scores (Attitudes)
Spearman's rho	Scores (knowledge)	Correlation Coefficient	1.000	.191	-.001
		Sig. (2-tailed)	.	.330	.997
		N	29	28	28
	Score (Practices)	Correlation Coefficient	.191	1.000	.266
		Sig. (2-tailed)	.330	.	.171
		N	28	28	28
	Score (Attitudes)	Correlation Coefficient	-.001	.266	1.000
		Sig. (2-tailed)	.997	.171	.
		N	28	28	28

Table 4-33 The correlation between KPA (group 4)

4.1.4.2 Association and differences between selected questionnaires answers based on training

Cross tabulation and the Kruskal Wllis tests were used to investigate the influence of training on selected respondents answers. For the first and second groups, question 1.8 in demographic part was used to identify its influence on the last three questions replies in knowledge part 1.9, 1.10 and 1.11 (Table 4.34). In question 1.8, which was Yes/No answer, the respondents were asked if they think they need more information about HACCP. The last three multiple choices questions (1.19, 1.20 and 1.21) in knowledge section were about HACCP. The answers of question 1.8 were compared with the answers of questions 1.19, 1.20 and 1.21. The results showed that, there was no significant difference in both groups between the respondents who said they need more information about HACCP and those who said no (*p-value* > 0.05). Nevertheless, in the first group about 16% of the participants who said no answered question 1.20 incorrectly.

1.8- Do you think you need more information about HACCP implementation?

Groups	Answers	Number of Correct answers for HACCP questions (%)			Number of Incorrect answers for HACCP questions (%)			*p-value*
		Q 1.19	Q 1.10	Q 1.11	Q 1.19	Q 1.10	Q 1.11	
Group 1 replies (n of respondents is 24)	Yes	14 (58.3%)	8 (33.3%)	10 (41.6%)	3 (12.5%)	8 (33.3%)	6 (25%)	*0.7*
	No	5 (20.8%)	2 (8.3%)	4 (16.6%)	1 (4.2%)	4 (16.6%)	2 (8.3%)	
Group 2 replies (n of respondents is 25)	Yes	21 (84%)	11 (44%)	13 (52%)	2 (8%)	11 (44%)	10 (40%)	0.3
	No	2 (8%)	0	0	0	2 (8%)	1 (4%)	

Table 4-34 Association between a selected questions in groups 1 & 2

4.1.4.3 Association and comparing means according to staff demographics

The Kruskal Wallis test was used to measure differences in respondent's knowledge, practices and attitudes about food safety on the basis of staff demographic characteristics. Tables 4.35, 4.36 and 4.37 present full description of association between respondents' answers and their demographics. The demographic characteristics of the staff in group 3 did not appear to influence answers and there were no significant differences (*p-value > 0.05*). The findings indicate that knowledge and practices of catering company's nutritionists (group 2) were related to two factors: staff age and their work experiences. Staff nationalities and salary range were important factors for respondents answers in group 3 and 4.

Group	Questionnaire part	Demographics Characteristic	Mean scores (%)	*p*-value
Group 1 (Ministry of Health staff)	Knowledge Practices Attitudes	The was no significant differences	-	$p > 0.05$
Group 2 (catering companies staff)	Knowledge and age group	Age group	mean/11	*p<0.05*
		a - 24>	6 (54.5%)	
		b - 25-34	3.5 (31.8%)	
		c - 35-44	5.7 (51.8%)	
		d - 45-54	5 (45.5%)	
	Practices and years of work experience	Years of work experience	mean/16	*p < 0.05*
		a - 1>	8 (50%)	
		b - 2_5	7 (43.75%)	
		c - 6_15	13.6 (85%)	
		d - 16_25	15 (93.75%)	
	Attitudes	The was no significant differences		$p > 0.05$

Table 4-35 Association between staff demographics and their replies (groups 1 &2)

Group	Questionnaire part	Demographics Characteristic	Mean scores (%)	*p*-value
Group 3	Knowledge and nationality	Nationality a – Saudi (n=16) b – Philippine (n=41) c –Egypt (n=6) d – India(n=14) e-Bangladesh (n=32) f – Sri lanka (n=1)	Mean/13 4.8 (36.9%) 5.4 (41.5%) 7.8 (60%) 5.2 (40%) 3.3 (25.4%) 5 ((38.5%)	***p*< 0.01**
	Practices	The was no significant differences	-	p> 0.05
	Attitudes	The was no significant differences	-	p> 0.05

Table 4-36 Association between staff demographics and their replies (group 3

Group	Questionnaire part	Demographics Characteristic	Mean scores (%)	*p*-value
Group 4	Knowledge and nationality	Nationality a – India b – Bangladesh c – Sri lanka	Mean/12 7.5 (62.5%) 3.1 (25.8%) 6 (50%)	***p* < 0.05**
	Knowledge and salary	Salary a - > 600 SR b -600- 1000 SR	Mean/12 3.1 (25.8%) 7.5 (62.5%)	***p* <0.05**
	Practice and Salary	Salary a - > 600 SR b – 600- 1000 SR	Mean/12 5.5 (68.7%) 7.5 (93.75%)	***p* <0.05**
	Attitudes	The was no significant differences	-	*p > 0.05*

Table 4-37 Association between staff demographics and their replies (group 4)

4.2 Baseline Study Discussion

This project provides information and determines various features concerning hygiene status in a sample of Saudi's hospitals. When reviewing related literature, it was easy to find studies about the knowledge and practices of food safety which was done on different groups. However, studies which investigated the food safety procedures and staff knowledge in hospitals were limited. Furthermore, there are no published studies which examined the knowledge, practice and attitude of food safety among hospitals staff in Saudi Arabia. This study investigated hygiene status of selected Saudi hospitals. This section discusses the results of the baseline survey and compares the obtained findings with the other studies in the same field.

4.2.1 Hospitals Audit and General Hygiene Status

In the last few decades, HACCP has been increasingly implemented for the benefit of food industry (Panisello & Quantick, 2001). Lack of applying prerequisite programs is considered the main barriers restricting HACCP implementation in foodservices sector and food manufacturers (Bas, *et al*, 2007). This is also identified as a significant barrier in hospitals (Kokkinakis *et.al* 2011). In Saudi Arabia, foodservices departments, in hospitals, are now required to implemented HACCP system. This regulation is according to the new nutrition contract that approved by the Ministry of Health (MOH). A part of this project was assessed the general hygiene statues of the selection hospitals. This included prerequisite programs.

The audit form, which was used to inspect the hygienic status of the hospitals kitchens, showed important results about food safety procedure in those hospitals. The results are summarised in Table 4.1. All the four hospitals in this study were governmental hospitals operated by the Ministry of Health (MOH). Also, the same catering contract, which was created and approved by the MOH, was applied in all these hospitals. Therefore, foodservices departments in the four hospitals are managed under identical terms and conditions.

However, the main difference between the hospitals was the capacity. This resulted in a variation between them in the number of beds, the number of employees (for catering companies and MOH), the number of meals produced daily and the size of kitchens. Some kitchens structures and facilities were slightly different. Based on actual findings from the four hospitals, prerequisite programs seemed to be not implemented properly in all participating hospitals. However, two managers stated that HACCP system was implemented initially in their hospitals which were; RCH and Rehab hospital. In contrast, no HACCP system or food hygiene manual was adopted in the Chest and Prince Salman hospitals. There are basic and fundamental rules in prerequisites programs which had not been met including training programs, temperatures control and using thermometers. According to Bas, *et al*, (2007), developing written hygiene procedures and implementing standard operating techniques for food processing in food businesses are the principal step to implement effective HACCP system and other food safety systems. In Italy, 36 hospitals were surveyed with regards to HACCP implementation and hygiene procedure. The results revealed that, more than one half of the hospitals had adopted HACCP, and of those using HACCP, 79% implemented a food-hygiene–practice manual (Angelillo, *et al*, 2001). In 2003, the Hellenic Food Authority team (EFET) assessed 99 hospitals in Greece with regard to HACCP implementation. They found that 95 hospitals had not established a HACCP system (Grintzali and Babatsikou 2010). In the present study the results show that, HACCP was not implemented properly in the two hospitals which claim that they implemented it. The kitchens in these hospitals had very well designed and structured. The premises are provided with excellent facilities and reliable equipment but food safety management systems, such as documentation and records, and knowledge about the HACCP system tend to be insufficient.

The results of the audit were supported by the questionnaire results on knowledge, observations by the supervisors and self-reported behaviour. One of the main violations

observed in these hospitals was the absence of using thermometers (Table 4.1). Obviously, controlling temperature in all food processing is an important step in HACCP system. Walker, *et al* (2003) emphasised that poor temperature control is the major hindrance to effective HACCP implementation. In this survey, managers and supervisors were not rigorous in using the thermometer especially to check the cooked and held food. They believed that, recording refrigerators and freezers temperature is enough. However, refrigerators and freezers temperature also were not taken properly. Food supervisors were using the refrigerators/freezers thermometers rather than using their own one to check the temperature. This could not be enough since the refrigerators/freezers thermometers give sometimes incorrect reading. A study conducted in Turkey to investigate prerequisite program implementation in 20 hospitals foodservices showed same results (Bas, *et al*, 2005). Time and temperature errors were identified as the main violations in the Turkish participating hospitals. The Turkish study indicated that, only 10% of food directors using thermometers and records the temperatures. The study also concluded that, about 90 % of hospitals had no written manuals for food hygiene practice. Another study conducted by the same researchers inspected hygiene procedures of 109 food business in Turkey found that no taking and recording of food temperatures in the majority of food businesses (Bas, *et al* , 2006). Temperature control may be considered a very critical point in a hot country like Saudi Arabia. In a large hospital, such as RCH, patients' meals might arrive to the wards late. RCH consists of several buildings and clinics and there is only one central kitchen in the main building. Any delay can lead to increased temperatures for cold food or decrease temperature for other hot food. For example, the delay between the arrival of the cart in the patients' wards and the first opening of the food cart could be up to 1 hour if the clinic is in the next building. Even the meals are transferred by hot/cold electrical trolley the trolley could not maintain the temperature for that long time especially in hot weather. Furthermore

the trolley will be opened several times during the meals distribution and this practice will also cause temperature fluctuation. Overall, this could provide a suitable environment for bacterial growth as the time and the temperature are both abused. Therefore, it is suggested that food temperature should be taken initially when food is placed in the food trolley and also when it arrives to the wards. Waiter/waitress must aware about the dangerous zone. Temperature should be recorded daily several times and kept in a safe document. All food processing must be recorded.

Generally, HACCP system in food industry is designed to control hazards. In the participating hospitals, hazard sources were not controlled sufficiently. The checklist used during the hospitals investigation revealed that, all the main external entrances of the four hospitals had no automatic doors or air curtains and usually were kept open. This practice can enhance easily the chance of occurring contamination such as microbial contamination via dust or even pest entrance. Flies are a particular risk as they are known to act as vectors (Janisiewicz *et al* 1999, Cooke *et al* 2003). In the same context, there were no food receiving areas in three hospitals, Rehab, Chest and Prince Salman hospitals. The ingredients were being checked at the main entrance or inside the kitchen and then transferred to the stores. This could be considered a main source of contamination. Some ingredients are inherently contaminated such as fresh vegetables and raw meat. Hence, they carry wide types of bacteria and pests to the kitchen. In RCH, there was a proper receiving area. The ingredients were received, checked, cleaning and washing (initially), were carried out and then the food was moved to the stores. However, no thermometers were used to take some food temperatures, such as fish and meat, in all hospitals; supervisors would just check the vehicle thermometer. It was observed that, hospital caterers bring ingredients, including fresh vegetables and fruits, from different suppliers according to the circumstances such as prices and availability. Thus, it was difficult to apply any traceability system. If any food poisoning occurred it would be

difficult to identify the main source. However, other foods, such as canned foods, fresh milk and frozen foods were brought from recognised suppliers.

The hands of food workers can transfer an enormous range of pathogens causing illnesses because of cross-contamination or poor personal hygiene (Bas, *et al*, 2006). In this survey, no adequate hand washing basins were observed in two hospitals kitchens (Rehab and Chest hospitals). This problem has been reported in a number of other studies (Bas, *et al*, 2005 and Bas, *et al*, 2006). It was observed that, a number of food handlers used sinks that were designed for washing salad to wash their hands. This behaviour definitely causes cross-contamination. Besides, no toilets were available in these two hospitals and staff were using hospitals visitors' toilets. In both hospitals the kitchens toilets were locked and used only by supervisors. The researcher asked one of the foodservices supervisors about this issue and he said that the number of staff is high and the toilets insufficient in number. This practice is very critical for two reasons. First, it is difficult to control staff about hand washing and they may not do it properly if they use public toilets. Second, which is more serious, using public toilets can increase the risk of cross contamination specifically given that this practice is done in a hospital. For example, waiters/waitress might use public toilets during the distribution of meals and then infect patients' food via cross-contamination. Patients, as mentioned in chapter two, have less immunity than well people and a low dose of pathogens can cause more severe consequences. This indeed should be considered as a critical point. In contrast, RCH and Prince Salman hospital provided toilets for kitchens staff. These toilets contained facilities such as soap, detergents, hot/cold water, and also had good ventilation. The toilets in RCH were located in the middle of the kitchen near the trays line area where the meals were distributed in the food cart (trolley) and that is a problem. In Prince Salman hospital, the toilets were in front of the kitchen. In Saudi Arabia there are no clear requirements/regulations about hospitals kitchen design. The general regulations for

restaurants and catering design provided by the Ministry of Municipal and Rural Affairs – General Department of Environmental Health (Ministry of Municipal and Rural Affairs in Saudi Arabia, 2009) can be proposed as a relevant regulation. Article 8-4 in these regulations, which concerns the toilets requirements, states that:

> *The toilets must be in a separate area that is far away from the area where food is being processed, prepared or cooked, and not open directly onto that area.*

RCH's kitchen is very large and consists of two floors. Therefore, it is recommended to move these toilets far away from the processing area.

In RCH, there was no official contract with a pest control company. Food supervisors said that, the catering company provides all pest control materials. Article 5-3 in nutrition contract and terms (Ministry of Health) states that;

> *It is under the responsibility of the hospital food operator to protect foods from insects and rodents and also provide pest control programs*.

However, there was no evidence of pest or rodents in neither that hospital nor other hospitals.

Bas *et al* (2007) stated that, food supervisors and managers may find it difficult to make their staff to understand the importance of HACCP steps. Here, the data suggested that foodservices managers and supervisors might need also to improve their own knowledge about HACCP system in addition to other food handlers (Table 4.13). Several studies have stressed that foodservices staff are more likely to implement HACCP correctly if they have already experienced it (Richards, *et al*, 1993 and Angelillo, *et al*, 2001). One of the prerequisite programs is training. Mathias, *et al*, (1995) assessed the effects of inspection frequency and food handler training on restaurant inspection contraventions. They found that

restaurants with trained staff did considerably better on the overall inspection score than those with staff who had no such training. Here, foodservices staff in the participating hospitals had no official training on HACCP and even on general food safety (Tables, 4.9 and 4.11). In fact, there is no official institute in Saudi Arabia that can provide such food safety training for these staff. Even the local or in house training might be difficult because of language barriers as the majority of food handlers do not speak Arabic. Staff knowledge and education about food safety is a significant point. With untrained staff or poor management system, implementing HACCP or any food safety program will definitely fail even with well facilities, equipment and enough funds.

Food Safety Authority of Ireland (2003) conducted a survey to assess food premises with regards to compliance with HACCP. Hospitals were involved in this survey. The results suggested a number of barriers could restrict HACCP in hospitals. These barriers are :

- The lack of HACCP prerequisites.
- The high cost of the system.
- The lack of management/owner commitment.
- The poor ownership of externally designed HACCP plans.
- The staff turn-over regulations within the hospital.

In Turkey, the problems of implementing HACCP food businesses have included physical conditions of the facility and inadequate equipment (Bas *et al.*, 2006). Hospitals in Saudi Arabia may have well the necessary facilities and equipment and should not face any funding problems. However, lack of knowledge about HACCP system, the lack of food safety management strategies, and absence of training programs could be identified as the main barriers for implementing HACCP in Saudi's hospitals. In addition, so far in Saudi Arabia there is no official legislation to enforce foodservices staff to attend food safety training.

This survey shows that hospitals in Saudi Arabia are not really ready to implement HACCP. It should be stressed that HACCP could only be implemented when prerequisite programs were met. The present survey demonstrated that, hospitals do not implement prerequisite programs accurately; hence, implementing HACCP may not be successful.

4.2.2 Questionnaires Results Discussion

4.2.2.1 Group one and two (Food supervisors, managers and nutritionists who working for Ministry of Health and Catering Companies).

The initial results have reported some variations between staff demographics characteristic in both groups. As mentioned in sections (4.3.1.1 and 4.3.1.2), the majority of staff from both groups were working in RCH, because the RCH is the largest hospital. All of the Ministry of Health (MOH) employees were Saudis while about half of those who working for catering companies were from different countries (Tables 4.2 and 4.5). The MOH staff are governmental employees and employed under the regulations of the Ministry of Civil Service while those who working for catering companies are employed by the private sector. Therefore, catering companies, as other private companies, could contract with different nationalities according to their needs. However, this system may have specific issues in the healthcare sector. According to the nutrition contracts, professional jobs in catering services should be occupied by qualified Saudis particularly those jobs in supervision positions such as managers, supervisors and dieticians/nutritionists. Hospital food operators must advertise about vacancies in local media otherwise, fines will be applied. It seems that, there was a shortage in the qualified Saudis, thus the food operators tried to cover this lack by using international employees. Contracting with employees from different countries might have advantages and as well as disadvantages. The more positive point is bringing different sets of experiences. However, language barrier could restrict the communication. Catering companies should employ staff who can understand Arabic and English otherwise developing programs, such as training, could be affected. Foreigner employees come from different cultures, therefore, their concepts of food hygiene and also attitudes may vary. The results show that, RCH for example has more than seven nationalities working together (Table 4.8). Dealing with these different cultures is definitely not easy to manage.

On the other hand, all managers in both groups were university or colleges graduate (Tables 4.2 and 4.5). The American Dietetic Association has stated the position that "effective management of health care food and nutrition services is best accomplished by dietetics professionals with competence in management; foodservice systems, including food science, safety and quality; and nutrition in health and disease, including medical nutrition therapy"(Lafferty and Dowling, 1997). However, the majority of MOH sample (58.3%) held only a 3 years diploma certificate in food and nutrition comparing with only two (8%) from catering companies with the same qualification (Tables 4.2 and 4.5). Obviously, the MOH tends to employ people with a diploma certificate. This perhaps is to reduce the cost as the salaries of university graduates are much higher than those who hold diplomas. Nevertheless, the results of this study showed no significant differences in knowledge, practices and attitude based on the staff education background (Table 4.35). An Italian study, conducted in Sicily to evaluate hospitals foodservices staff obtained the different results (Buccheri , *et al*, 2007). It found inconsistent results with regard to the relation between education level and food safety practices in hospitals. The study has also noted that, some poor practices were more common within higher educated staff. The MOH and food caterers as well in Saudi Arabia should still focus on hiring people who have a degree in food safety and limiting the duties of other staff on food control and HACCP implementation. Dieticians should work in clinics on diet plan and health education only. The survey reported that a number of staff qualified as dieticians are working on food control (about 4% of MOH staff and 36% of caterers staff). This is due to the shortage in people with a degree in food safety (Tables 4.2 and 4.5). There are no universities in Saudi Arabia offering higher degrees programs in food safety. Dietetics courses provided by Saudi universities might focus only on diet plan and clinical nutrition area. Scientific schools at Saudi's universities provide two types of programs in food and nutritional field. One is a BSc in clinical nutrition/dietetics and the

other is a BSc in food sciences and human nutrition. Both programs focus on clinical nutrition and food production rather than food safety and hygiene. For example, the bachelor's program in dietetics offered by King Saud University, which is five years in length, contains only one short module covers food safety and hygiene in the study plan. In food sciences and nutrition program at the same university, there are only two modules focusing on that field (King Saud University, 2009). However, the European Federation of Associations of Dieticians (2005) has recommended that, dieticians should be involved in HACCP and food hygiene management in hospitals. The Dieticians Association of Australia (2001) suggests that, skills and expertise in nutritional and microbial foodservices are the base for establishment of an effective HACCP program in the hospitals (Kokkinakis, *et al* 2011). Dieticians could be in charge of HACCP management if there is not a person, of relevant training, available from the hospital (Kokkinakis, *et al* 2011). Therefore, modules in food safety must be included in all courses related to food and nutrition. Otherwise, it is recommended to establish a new path for food safety from one of those programs.

The demographic characteristics of the staff in the first group did not appear to influence staff answers. This may because all of the participants of this group have the same culture, nationality and education background. Abd Patah, *et al,* (2009) assumed that ethnic origin does not significantly impact the scores of food safety knowledge and attitude. However, in our results some staff demographics characteristic appear linked with their knowledge and behaviours. Knowledge and practices of food caterers' staff (group 2) were related to two factors: staff age and their work experiences (Table 4.35). Employees who are under 24 years old did possess greater knowledge of food safety issues, perhaps because they are fresh graduates. Caterers' employees with long work experience tend to be adhered more to food hygiene practices. Those employees could be more familiar with the MOH nutrition contract rules (including punishments and penalties part) thus their behaviours would tend to be more

hygienic having learned on the job. However, long experience could negatively affect staff behaviours. An Italian study conducted in Calabria (Angelillo, *et al*, 2001) and assessed hospitals staff with regards to food hygiene. It was noted that, younger food-services staff are more likely to be more aware to avoid poor practices than older personnel who might have extreme confidence because of their working experience and did not deign to use gloves. Buccheri, *et al*, (2007) has reported contradictory results with no relationship between food handler age and hygiene practices.

Replies for the open questions (1.7, 1.8, 1.9 and 1.10) differed somewhat (Tables 4.3 and 4.4). With regard to the HACCP questions (Q1.7 or 2.7), the majority of the MOH sample (87%) believed that, HACCP can be implemented in their departments comparing with (95%) of the caterers' staff. There was some difference in the respondents' justifications according to the location but this reflected whether the hospital already implemented HACCP or not. All the MOH employees working in RCH and Rehab hospital, where a HACCP plan was initially in place, believed that HACCP system is/will be implemented successfully in their hospital. In contrast, only 40% of the MOH employees working in the Chest hospital, where there was no HACCP, believed that. The justification of MOH employees (Table 4.3) from RCH and Rehab hospital included:

- There is an effective management system.

- The hospital has contracted with a HACCP consulting company.

- The kitchen is new and has facilities to support the system.

- The staff have enough experience about HACCP system.

These justifications are however inconsistent with the study's findings (Table 4.13). As mentioned above, the management system in all participating hospitals needs to be improved.

HACCP is new in Saudi Arabia particularly in healthcare, and until now there are no official companies providing services to implement HACCP. During the data collection, RCH supervisors asked the researcher to provide them with details of international companies that offer HACCP consultancy, as they could not find one to assess their department. In Rehab hospital, the researcher witnessed a member of an international company who came to evaluate HACCP implementation in that kitchen. Those companies are not licensed as they work from abroad and are expensive and looking for profit only thus their certificates could not be considered. Some staff justifications (Tables 4.3 and 4.6) showed that, staff have enough experience about HACCP which enhances implementing the system. This justification indeed is inaccurate. In question 1.8 /2.8, about 93% of the participants in both groups said they need more information about HACCP because it is new and not understood well (Tables 4.3 and 4.6). Furthermore, less than half of the respondents from both groups answered questions 1.20/ 2.20 (43.5% and 50% respectively) and 1.21/2.21 (34.8% and 44% respectively), both were about HACCP, correctly (Table 4.13). These responses could not support their beliefs about implementing HACCP. The only thing to support HACCP implementation in those two hospitals (RCH and Rehab) is the new facilities and good kitchen structure. However, about 60% of total staff, in the RCH, Rehab and chest hospitals, believed that HACCP cannot be implemented successfully because of poor facilities, old location structure and as well poor employees' knowledge about this system. This is consistent with other published findings. In a study in Taiwan (Shih and Wang, 2011), 132 managers working in 23 hospitals were surveyed about barriers to HACCP. The managers working in the hospitals that with no HACCP in place thought that, HACCP cannot be implemented because of poor support and funds, or human resources from their hospitals administration.

Food supervisors and nutritionists from both groups reported a number of violations among food handlers (Tables 4.4 and 4.7). Poor personal hygiene and ignoring wearing protective clothing, such as masks and gloves were common poor practices in the three hospitals (Q 1.9/2.9 and 1.10/2.10). However, touching hair and nose with bare hands and poor control on food temperature were also observed. Dag (1996) has observed that, the most common poor habits of foodservices staff were touching mouth with bars hands, using the same towel to clean different places and to wipe their hands on their face or clothes while working (Acikel, *et al*, 2008). Some respondents thought that, using a very strict management system, such as punishment and fines, could prevent these practices (Tables 4.4 and 4.7). This is difficult as it is not possible to observe all employees at all times. However, food supervisors in RCH use CCTV to watch food handlers' behaviours in the. Other respondents have suggested using motivational rewards to encourage food handlers. This way might be better as long as the employee trained well on food safety practices.

A UK study (Clayton, *et al*, 2002) examined 137 food handlers from 52 small to medium-sized food businesses in Wales about their beliefs towards food safety. The participants identified a number of barriers which would prevent them from implementing good practices. These barriers included lack of time, lack of resources and lack of staff. Most of the food supervisors and managers who participated in our study believed that the training and education are essential to control poor practices among food handlers. However, supervisors and manager should be involved in food safety training. Kassa, *et al*, (2010) have studied food inspection reports from the Toledo/Lucas County Health Department (Ohio) between March 2005 and February 2006 to explore the association between certification training of foodservices managers and food safety violations in their premises. They found that restaurants without trained and certified managers had significantly more critical food safety violations, such as cross contamination, than those with certified managers. Egan *et al* (2007)

mentioned several benefits of management training such as the ability of managers to influence premises hygiene, fewer turnovers of managers and their influence on the training of workers. Sprenger (1991) argues that food managers training could be more important than that of other food workers. Taylor, (1996), assumed that food handlers training might have a minimal impact while training managers could be more cost effective as they will train their staff and can inspect their premises.

- **Knowledge**

In general, training programs for food managers and supervisors should cover all food safety aspects, management and leadership skills. Furthermore, food managers, particularly those who deal with patients meals, must be expert in all food safety areas. In this study, the majority of the food supervisors in both groups had a very poor knowledge with regard to principle of food safety. The findings showed that, the knowledge level of the MOH staff was the same as those who worked for the catering companies (Tables 4.13 and 4.14). This might suggest that, the education background did not influence the level of knowledge or that the type of education didn't include sufficient technical content. No significant difference was observed between the respondents in three hospitals. Participants knowledge of food microbiology was very poor. Most answered the questions concerned food microbiology incorrectly. In question 1.11/2.11 about half of the participants from both groups identified the most important factors controlling bacterial growth. In the next questions (1.12/2.12), only 1 (4.5%) of MOH staff and 3 (13%) of the catering companies staff identified the optimum Water Activity (aw) (Table 4.13). Also, no one from any group was able to identify *Campylobacter jejuni* which is the most common pathogen associated with poultry (Qs1.15/2.15). In Ireland, approximately 200 foodservices managers, responsible for food hygiene in catering establishments, were surveyed to assess their knowledge of food safety management and hygiene practices. The questionnaire included questions about pathogens

(Bolton, *et al*, 2008). Results indicated that, less than half of participants were aware of *Bacillus cereus* (47.5%), *Campylobacter* (41.5%) and *Clostridium perfringens* (41.5%) and less than 15% of participants were aware of *Shigella* (13%) and *Yersinia enterocolitica* (7%). More than 70% were aware of *Salmonella, Escherichia coli O157, Listeria monocytogenes, Staphylococcus aureus and Clostridium botulinum*. However, the participants in the previous study reported a poor knowledge of the association between specific foods and particular bacterial pathogens. Poor knowledge about *Campylobacter* also reported among foodservices staff in other studies (Bolton, *et al*, 2008). In our study, most of the food managers and supervisors failed to answer question 1.17/2.17 correctly. In this question, (14%) of participants from both groups said that they can recognise food contaminated with pathogens by looking at it, and less than one third from either group chose the correct answer. This misconception is very dangerous and highlights the lack of understanding the survey group both the causes of food borne illness and the appropriate controls. This lack of understanding is not limited to Saudi Arabian hospitals. A study conducted in Slovenia (Jevsnik, *et al*, 2008) to assess foodservices staff knowledge showed that, 50% of staff surveyed believed that they can recognise contaminated food by bad smell, taste or appearance. Food microbiology is an indispensable science in food safety. Understanding pathogens features will help food managers to manage their premises safely.

As stated above, temperature control is a significant step in food control as well as critical point in a HACCP. Food managers and supervisors must to be able to define the dangerous zone. In this survey, more than half of the respondents knew the correct temperature for storage of hot, ready to eat food in the Bain Marie. However, about 22% of the MOH employees and 8% of the caterers staff knew why food should be cooled before refrigeration. In the prior Italian study, less than half (47.7%) of the respondents knew the correct temperatures for storage of hot ready-to-eat foods (Angelillo *et al*, 2001,) and in the Iranian

study, only 9.4 % of the respondents knew this value (Askarian, *et al*, 2004) indicating this lack of knowledge may be a common problem.

Most of the participants in both groups were familiar with HACCP terms (Table 4.13). However, the MOH staff had fewer correct answers for all three questions which concerned HACCP (Qs 1.19, 1.20 and 1.21 for first group and Qs 2.19, 2.20 and 2.21 for the second group, Table 4.13). MOH's staff are main responsible for food safety practices in their departments, hence they should have a sufficient knowledge about HACCP. There was an inconsistency in comparing MOH replies to question 1.20 and their replies on question 1.8 in the demographics part. In question 1.8, a Yes/No answer, the respondents were asked if they think they need more information about HACCP. About one quarter said no. Based on those quarter answers, they understand HACCP well. However, about 16% of participants who said no have answered question 1.20 incorrectly (what is the requirement of principle 4 in a HACCP plan). Clearly, there is a discrepancy between staff answers in this part and the real situation. Staff may say or believe they have sufficient knowledge but when tested this appears not to be the case. This lack of knowledge is found in other studies. One survey in Turkish hospitals showed that foodservice employees have insufficient knowledge regarding the basics of food hygiene. It recommended educating staff about the HACCP system to help in improving their food safety knowledge (Tokuc, *et al*, 2009). However, education about basic food safety should be performed prior to the delivery of HACCP training as HACCP builds on basic hygiene knowledge.

Although both groups had a poor knowledge about food safety, they reported high scores in practices and attitude parts (Tables 4.20 and 4.26). Results indicated that, most of the participants reported hygienic behaviours during food control as well a positive attitude regarding good practices. The self-reported food safety and hygiene behaviours indicated that there was no significant difference between both groups. About three quarters of the MOH

respondents said they checked all deliveries and supplies which enter the kitchen comparing with about half of the second group. Generally, inspection of the new supplies is the responsibility of MOH staff as they are the authorised people by the nutrition contract. However, caterers' supervisors could also be involved here. Hospital catering company must guarantee that all foodstuffs meet high quality and are delivered from the caterer's warehouses under hygiene conditions. Therefore, caterer's supervisors should receive the supplies together with MOH staff and check the condition of deliveries. Besides, supplies must be not received by the caterer's supervisors alone. Receiving supplies should include visual inspection, temperature measurement, and other techniques of quality testing for potentially hazardous ingredients before the supplies enter the premises (Ramírez , *et al*, 2011).

- **Behaviours**

Only about half of the MOH staff stated that they always wash their hands before inspecting the new supplies while caterers' employees were likely to be more aware as 63% reported always washing their hands before inspecting (Tables 4.20). Most of the MOH's staff said they always wash their hands after inspecting the supplies. In question 1.29 /2.29, about 70% of MOH staff request food handlers to wash their hands frequently. Food supervisors may think that their hands are free from any bacteria before food inspection and they just have to wash their hands after the inspection. Inspecting food with unwashed hands could give a negative effect to the inspected food. Food inspectors may contribute cross- contamination. All foodservice staff in hospitals should be aware that a careful personal hygiene is a main measure to inhibit spread of foodborne diseases (Buccheri1, *et al*, 2007). Furthermore, washing hands is not limited to food handlers only but managers/supervisors should aware also about their personal hygiene. Several studies proved that it is essential to practice self-hygiene particularly hand hygiene because the hand is the main agent that transmits microbes

to foods (Aarnisalo ,*et al,* 2006). Contaminated hands with a low dose of certain pathogens, such *E. coli O157,* could be followed by extensive human-to-human transmission (Buccheri1, *et al*, 2007). If such an outbreak occurred in a hospital consequences will be certainly severe.

According to Article 6 in the nutrition contracts, supplies must be from safe sources. The purchases are often delivered daily in the morning and received formally. Inspection at the time of delivery is required from all MOH's and caterer's supervisors/nutritionists according to the tasks schedule. Our results showed that, approximately 20% of the MOH's staff would accept food from unknown sources but that in emergency cases (Tables 4.20). Using food from an unapproved source is inconsistent with food safety principles. On the other hand, more than half of the MOH's supervisors (54%) and approximately one third of caterers staff (36%) were reported not to use thermometers frequently (Qs 1.27/2.27). As mentioned above, temperature control is an important step in HACCP implementation. Ignoring the use of thermometers is reported in the all participating hospitals. Food supervisors may take the reading from the fridge/freezer thermometer. This might give inaccurate reading as the thermometer could be out of order. Temperature must be measured in all food processing. Food supervisors and all other food handlers should have their own thermometer to check food temperatures regularly until it is delivered safely to the patient.

In question 1.28/2.28, 88% of the MOH's employees (group 1) stated that they will always stop any food handler has an infectious disease signs. Three quarters of the group 2 participants had the same beliefs although almost 20% of this group thought that they would never stop any ill employee. According to Article 8-2, B in the new nutrition contract, about 20% of the daily food handler salary plus 10% fines will deducted from the caterer's monthly invoice in case of that worker absent. Therefore some caterers' supervisors might hide their employees' illness from MOH's staff. Also, some food handlers may keep sickness secret from their supervisors as sick leave may be without pay in a number of Saudis companies.

However, if the caterer's supervisors allowed sick employee to work and hide that from the MOH's staff, 20% fines in addition to the employee's daily salary will be deducted (Article 8-3, nutrition contract, MOH 2011). Food supervisors then, who work for MOH, have to observe health status of food handlers and must stop any worker that show ill symptoms on his hands or skins as an example. Also they have to stress on workers to report any unclear symptoms. If so, food supervisors should ask the caterer manager to stop any ill worker with a full pay until he/she recovers.

- **Attitude**:

Participants' replies on attitudes questions showed some differences between both groups (Table 4.25). It is clear to observe that, MOH staff had more positive attitude than caterers' employees. In question 1.30/2.30, most of the participants agreed strongly that good employee hygiene can help to prevent food borne illness. The second question in the attitude part was slightly different. Each group were asked a different question due to their job duties. In the first group, almost half of the MOH's staff believed strongly that their main responsibility was to control kitchen hygiene. Historically, there is a misconception among MOH's nutritionists and dieticians about this point. Some nutritionists think that, their tasks should include nutritional therapy and clinical care only. Besides, some dieticians are involved in food safety control. Our results indicated that, two-thirds of MOH's respondents had a diploma certificate in food and nutrition, classified as food technicians. Almost one third had a degree in the same field, classified as general nutritionists. Only two participants had degrees in dietetics sciences and registered as dieticians. General nutritionists are qualified enough in food sciences and public health nutrition while dieticians are qualified only in nutritional therapy. Therefore, nutritionists could be more suitable for controlling food safety tasks in the hospitals kitchens. However, neither are qualified enough in food safety. Food technicians usually work under the supervision of the nutritionists or dieticians.

In the same context, caterers' staff were asked if they agree that their main responsibility was to reduce the cost on the company (Q2.31). Almost three quarter failed to answer this question and of those who did, about 42% agreed that their main job was to reduce the cost on their companies. This suggests that, some caterers' staff are more interested about reducing the cost rather than patient safety. However, catering staff are usually encouraged by MOH supervisors to be acted hygienic with regardless of company costs. At the same time, catering managers ask those staff to reduce costs and expenses. Therefore group 2 here could have misunderstanding or less confidence to reply on this question

Given the importance of training courses, participants were asked their opinion about this issue (Table 4.26). Most of the respondents from both groups believe in the importance of training. Approximately 95% and 72% of MOH and caterers staff respectively said the training is extremely important for the caterers new employees. Giampaoli, *et al*, (2002) found foodservice managers positively agreed on the importance of certification and food safety training. Findings throughout a British study reported that many food managers aware about the importance of food safety training programs but they don't provide enough support to improve these programs (Seaman and Eves, 2010). As mentioned in the literature review (chapter 2) foodservices workers in Saudi Arabia are not required to attend food safety training. Legally, the employee could start the work straight away after passing the health examinations. This piece of legislation needs review.

On the other hand, about half of the caterers' staff did not strongly agree with using fines or punishments against unhygienic behaviours while two thirds of the MOH's staff did (Table 4.26). Food safety in hospitals is a critical issue; hence strict rules should be followed to eliminate poor hygiene practices. However, positive attitudes among food supervisors/nutritionists toward food safety training could support the food handlers training program in the future.

4.2.2.2 Group three (Food Handlers who Working for Catering Companies)

In this study, all participants from groups three were working for catering operations. Therefore, they are considered as private sector employees. Group three included food handlers who contact food directly such as cooks and waiters and waitress. The members of this group were responsible for all food processing since receiving, preparing, cooking and delivering to the consumers.

- **Demographics**

Our results showed that, males represented high percentage in all three tests (Table 4.8). About 20% of the food handlers were under 24 years. Most of the food handlers were from Philippines and Bangladesh. These two nationalities are widely employed in food business sector in Saudi Arabia. Saudis were less than 20% of the participants and most of them were in RCH. All were females who worked as waitresses. In Saudi Arabia, females are not allowed to work as chefs. Obviously, the majority of the studies published in this field applied their research to domestic staff (home national), while this study included multi-nationalities. This is due to the work environment in Saudi Arabia as there is a shortage in Saudis manpower. About quarter of the respondents had a degree. Almost half of the food handlers had an experience between 2 to 5 years. The majority of people who replied worked as a waiters/waitress. High number of waiters is important in distributing food in hospital wards. The salaries of food services staff were very low. Most of the participants received less than 600 SR/month (about £100). Low salaries could reflect negatively on staff performance. Employees who receive this amount may be unaware about their duties or may have a poor attitude resulting from low pay. This includes food safety issues even if the staff are trained. Also, they may be involved in additional illegal jobs to increase their incomes. About 85% of the respondents here had work experience between 6 to 15 years.

Many food handlers here started work without a proper training. About quarter of the total food handlers said they did not receive any training before working. In Chest hospital, about 40% said they did not receive any hygiene training (Q3.8). In this hospital also, almost 62% of the participants thought that their managers do not support them to attend food safety training. In Rehab hospital, only half of the respondents received food safety training. In chest hospital, about 31% of the respondents stated that their managers do not advise them to attend food safety training. Those respondents have started their jobs without any food safety training. Lack of training could be due to the absence of accredited institutes that provide suitable courses in food safety. However, nutrition departments' managers said they try to contact international institutes to train their staff. Some of these institutes are not approved or accredited. Managers also said these institutes do not provide proper training as training is usually delivered in a language which doesn't fit with staff's language. Following food hygiene rules among food handlers mainly in healthcare institutions is vital for the prevention of foodborne diseases (Askarian, *et al*, 2004). Therefore, employing untrained staff may restrict HACCP implementation and also threaten patients' life. Results of a previous Iranian study (Askarian, *et al*, 2004) revealed about half of food services in selected hospitals had not received any food safety training. The staff in that study had also a lack of knowledge attributed to the absence of food safety training. Here, almost a quarter of the participants said they received no support from their managers to attend training courses. These replies could be inconsistent with groups one and two attitudes. The majority of managers and supervisors from groups one and two had positive attitudes regarding food safety training and most believed in the importance of training mainly for new employees (Table 4.26). Managers should encourage their staff and support them to attend training. Food supervisors in Saudi hospitals may not be aware about the importance of training. Some could not support their staff due to the lack of institutions providing food safety training programs.

- **Knowledge**

Our result showed more than half of the participants failed to answer cross-contamination questions (question 3.10, 3.11, 3.12 and 3.13 – Table 4.16). For example, only one third of the respondents knew the benefits of washing hands before touching raw food. One quarter of respondents thought washing hands is only to avoid spreading microbes to the raw food. About half of respondents thought using gloves is only to protect food from any contamination. These answers are partly right. However, raw food, particularly the animal products, can infect the food handler. Washing hands is certainly an important practice to prevent a foodborne outbreak which can be caused by cross contamination. Gloves could be considered as a barrier preventing the infection. A lack of the effectiveness of these barriers was noted in an outbreak report involving hands as the main transmission of pathogens (Todd, *et al*, 2009) where bare hands were described as a factor in 40% of the 816 outbreaks and food handlers were working without gloves in 1.3% of these outbreaks. Nevertheless, there is an argument regarding the benefits of using gloves to handle raw food or even during food processing. The prevailing idea is food prepared by gloved hands is safer than food prepared by bare hands as gloves prevent infection. Several authors emphasized that food handlers must wear gloves during food processing (Todd, *et al*, 2007 and Todd, *et al*, 2009). However, gloves might actually contain a high number of microbes. Long fingernails increase the likelihood of glove puncture, and this poses another risk. A Turkish study was conducted to determine the level of bacterial contamination on the hands of food handlers in a military hospital (Aycicek, *et al*, 2004). 180 samples were collected from bare and gloved hands before and during food preparation. High levels of *S. aureus* and *E. coli* were detected on samples taken from bare and as well gloved hands. The study noted that bacterial loads on gloved hand samples were found to be significantly lower ($p < 0:05$) than bare hand samples. Furthermore, it recommended that hands must be washed properly before gloves are worn.

However, food could be infected by contaminated bare hands even if the Bacterial loads on them are not high, as bacteria can multiply quickly in that food under the suitable conditions. Gloves are more likely to be dirty, hence, they should be changed it frequently. The question that concerned *E. coli* was also answered improperly (question 3.14). Only one quarter of the participants answered this question correctly, and 36% thought that *E . coli* can be transmitted by flies only (Table 4.16). Less than a quarter (22%) said this bacterium can be transmitted by raw meat and vegetables only. These beliefs can easily provide suitable conditions to support food contamination incidents. Based on these beliefs, food handlers may ignore some factors contributing to the spread of *E. coli* or other pathogens. A Portuguese study has reported same results (Martins, *et al,* 2012); this study investigated knowledge of catering staff with regard to food hygiene. They found that, most participants showed poor knowledge about microorganisms as more than half of them were unable to recognise *S aureus* present in foods and about a third failed to definite food groups related with botulism (Martins, *et al,* 2012). In contrast, Giritlioglu, *et al,* (2011) presented that three quarters of the participants knew *salmonella* was a type of bacterium which causes food illness. Food handlers should be aware about the main pathogens and its transmission methods. On the other hand, about half of the food handlers (50%) in our study did not know why they must separate raw food and cooked food (Q3.13). Almost one quarter (23.6%) said the flavour may be affected and 17% thought that the kitchen will be more organised (Table 4.16). Obviously, staff may agree with the importance of keeping raw food away from cooked but they do not know why. This point was considered in the training program. Cross-contamination chances were described. Bolton, *et al,* 2008 investigated chefs and food managers opinions about food hygiene practices, and showed (92%) of the participants reported correctly about the separating raw meat from ready to eat food. This study measured the staff attitude about storing food but it did not investigate if the participants were aware of the reason for separation. In question

3.15, 90% of the respondents said that they can recognise food contaminated with pathogens by smelling, tasting and their experience. In groups one and two (managers and supervisors), about three quarters of the participants answered the same question incorrectly. This percentages were higher than reported by Martins, *et al*, (2012), Gomes- Neves *et al*. (2007), Walker *et al*. (2003) and Jevsnik *et al* (2008) (64.4 % 55.7%, 57% and 52.5%, respectively). It is assumed that, foodservices staff have a misunderstanding about spoilage food and contaminated food. Scientifically, there is a difference between spoiled food and those foods contaminated with harmful microbes. Food spoilage can be defined as any changes in the sensory characteristics of food such as texture, smell and taste, which make food unacceptable to consume (Doyle, 2007). These foods can be spoiled by enormous types of organisms some of which do not cause illness to human. Thus, spoiled food could be safe to eat but contaminated foods with pathogens are not. Spoiled food can be recognised easily by smell or taste while other contaminated foods appear to be physically normal. In the same field, almost 46% of the staff refused reusing meals being not sure about its safety (Q3.16). Commonly, a number of redundant meals would be returned in food carts to the hospital's kitchen. Some staff might resubmit these meals again to the patients in the next serving. This practice might reduce cost on the caterer but it contains a risk. Distributing patients meals could take up to two hours in large hospitals, thus, pathogens may have a chance to multiply if the temperature control is fundamentally lacking.

With regard to the questions that related to temperature control (questions 3.17, 3.18 and 3.19 – Table 4.16), our results showed considerable confusion concerning the correct temperature of storing food. Less than half of the food handlers (46.6%) identified the required internal temperature for cooking chicken (Q3.17). One third knew the correct temperature for fridges (Q3.18) and the same for holding food in heaters (Q3.19). Question 3.19 was used the questionnaire for groups one and two (it was question 1.14/2/14- Table 4.13). Almost half of

group one (48%) and 42% of group two participants failed to answer that question correctly. This could be due to the absence of using thermometers in the hospitals kitchens. Using thermometers can reinforce information about acceptable critical limits. Abusing temperature is a serious indicator of poor food safety control. The significance of storing foods at the right temperatures has been widely proved and is a basic step in the implementation of HACCP and food safety legislation (Buccheri1, *et al*, 2007). Similar results indicating lack of knowledge about temperature have been stated among foodservice employees in hospitals in Italy, Iran and Turkey (Angelillo *et al*., 2001; Askarian *et al*., 2004; Bas, Temel, Ersun, & Kıvanç, 2005; Buccheri *et al*., 2007). Poor knowledge of correct temperature for holding hot food was also indicated by Walker *et al*. (2003) and Bas *et al*. (2006).

The food handler can contribute to food contamination in kitchen. Infectious diseases can be brought in by workers who continue to work while sick. Pathogens can be transmitted to food from dirty hands as well as from coughing and sneezing unless precautions are taken. Question 3.20 has asked respondents if they can handle food while there have any infectious diseases symptoms (Table 4.16). Almost two thirds of them said they will go to a doctor and then continue work normally. The doctor however, may not aware about the type of work that food handler doing and so he could not ask him/her to stop working. About 7% will work without treatment. Less than a quarter said they will report illness to their managers and about 2% will be afraid to report because will be stopped work without salary. Similar results were reported by Walker, *et al*, (2003) as 7% of respondents would not report their illness to their supervisors and consequently continue to work in a high-risk area (Walker, *et al*, 2003). In a study by Greene *et al*. (2005) about 5% of food handlers reported working while sick with diarrhoea or vomiting. Evans *et al.* (1998) stated that food handler has been defined as a contributing factor in 12% of foodborne outbreaks in England and Wales. However, it is not known whether those food handlers were themselves victims of the outbreak rather than

contributors to the cause of outbreaks (Evans, *et al*, 1998). Different results were found in a Mexican study conducted in hospitals foodservices (Ramírez, *et al*, 2011). Participating staff were aware about the risk of working while sickness. About two third of the respondents will not work when they have illness and about one third will do. The same level of awareness was reported in a Slovenian study (Jevsnik, *et al*, 2008). Some catering companies in Saudi Arabia do not pay their employees during their sick leave. Other companies may allow the employee to work even if he is ill. This behaviour needs strict action from the MOH supervisors. MOH staff should supervise food handlers and stop anyone who seems ill. Act 8.3.3 in the nutrition contract states that, fines equals to the daily wage of the worker plus 20% must be deducted from the caterer's monthly bills if he hires the worker while he/she is ill (MOH nutrition contract, 2011).

One question to this group concerned HACCP (Q3.21). About 65% of the participants were familiar with the basic principle of HACCP. The same result was reported by Jevsnik, *et al*, (2008). However, our result may not reflect the real understanding of the staff with regard to HACCP. This could need more investigation includes an observation method. On the other hand, almost 30% of the staff did not know why they should not smoke in the working area (Table 4.16). During data collection, lots of food workers were found to be smoking on the kitchens entrances. As it is difficult to prevent smoking, it is recommended to have a small hands wash basin at the kitchen entrance with a sign which asks staff to wash their hands.

- **Self-reported Behaviours**

The self-reported food hygiene behaviours and staff attitudes yielded somewhat better results. At the baseline, the majority of staff reported washing hands before and after touching unwrapped food. Similar results were reported by Oteri and Ekanem (1989) and Angelillo *et al* (2000). One of the important rules in food production is that the food handlers should wear protective cloth such as caps and masks in order to prevent contamination. Todd, *et al*, (2007) reported that, one quarter of food handlers in the USA did not always wash their hands and one-third did not always change their gloves between touching cooked and raw food. Todd, *et al*, (2007) noted also that, more than half did not wear gloves at all when touching cooked food. Most participants in our study stated that they wear masks and caps during food preparation and distribution. Giritlioglu, *et al*, (2011) found similar results in their study. On the other hands, some disturbing findings were from our results. Nearly a quarter of respondents (23.1%) said they use a thermometer some times to check food temperature (Table 4.22). About 16% said that they do not use it at all. Two thirds said they always use a thermometer. However, this result may not reflect the real situation. A number of chefs and waiters were asked in the participating hospitals and some of them said they don't have their own thermometers. Other staff reported that the chief cooks is the only person who has a thermometer. In general, cooks and waiters should both have thermometers. Cooks are required to check the food temperature during cooking and after serving food on the heaters. Waiters/waitresses also should take temperature when food is placed in the cart and as when arriving to the patients wards. Tray line processes and food distribution might take more than one or two hours in the large hospitals, so exposing food to a fluctuating temperature during holding on the trays line or distributing on the food cart can support bacterial growth. Controlling food temperature is a part of prerequisite programs and HACCP system. Greene

et al. (2005) reported that, more than half of the participants reported that a thermometer was not the way they used most often to check the food temperature.

- **Attitude**

Food handlers in this study showed positive attitudes toward all statements favouring food hygiene at the baseline (Table 3.28). This agreed with earlier observations (Angelillo, *et al* 2000, 2001). The results here reported that, the majority of staff believed in the importance of good hygiene practices to preventing foodborne diseases. Also the participants thought that poor hygiene could threaten the patient's life. However, question 3.31 was answered improperly. Almost 42% of respondents thought that, their behaviours during food preparation were more hygienic when their supervisor is present. This suggests that, poor hygiene could be practiced if the supervisors are not monitoring the employees. In hospital kitchens, it is difficult to supervise food workers at all times especially since MOH supervisors have another duties. Furthermore, hospitals kitchens are usually running 24 hours a day and contain several units. Educating staff could change their attitude and enhance the self-supervision. A Malaysian study (Oinee and Sani, 2011) investigated the level of knowledge, attitudes and practices among food handlers at Universiti Kebangsaan regarding food safety and hygiene. The majority of the participants reported positive attitudes when handling foods. About three quarters of them said that, safe food handling was an important part of their job responsibilities. Also 72% stated that learning more about food hygiene was imperative for them. More than half agreed to participate in any training courses (HACCP, GMP, GHP, etc.) if provided.

However, it should be considered that the figures of food safety practices are based on self-reports and not actual observations. These results suggest a discrepancy between knowledge and practices towards food hygiene and it could reveal the same inconsistency between staff

knowledge and their attitudes. Similar results have been reported in previous studies conducted in hospitals foodservices (Askarian *et al*., 2004; Buccheri *et al.,* 2007).

Our study included food handlers from different countries. Staff's cultures and beliefs could vary according to their backgrounds. Food handlers could change their beliefs according factors around them. Work environment may be effected mainly on non-domestic staff. Some food handlers may have worked in different places than hospitals, such as public restaurants. When they became a member of healthcare staff their attitude could be change based on the nature of the work place and the patients they deal with. Hospitals usually provide their staff with different courses and lectures about healthcare. These courses, which are maybe not related to food safety issues, explain to them how they have to deal with patient's needs. Therefore, staff attitudes toward a specific concept might be altered. Peers also could affect others beliefs as workers come from different background, thus they may affect each other and share some different attitudes. In the hospitals, most staff have a long work experience in healthcare sittings. These employees, including nurses and even dietary staff, are usually carful about their work. Thus, their attitudes, and also maybe their practices, could affect other food handlers who do not have that experience in hospitals. According to Tokuc, *et al*, (2009), safe practices and positive attitude could be based on skills acquired in work. The relation between staff knowledge, behaviours and attitudes will be discussed later.

4.2.2.3 Group Four (Cleaners and Stores Keepers)

Our study included foodservices cleaners and stores keepers. In Saudi hospitals, food handlers are not usually involved in cleaning tasks. The nutrition contract requires food caterer to employ cleaners who are responsible for all cleaning issues in the kitchen. Food caterers are also required to employ a store keeper who is responsible for food stores and stock. The main tasks of the cleaners are limited to cleaning kitchens facilities, carrying supplies and organising the stores while store keepers are responsible for supervision on the stores and stock. Thus, the knowledge questions for this group focused on food hygiene and sanitation methods.

- **Demographics**

In our study, 29 (72%) cleaners and stores keepers answered the questionnaire. All of them were from the three hospitals; RCH (48.3%), Rehab hospital (34.5%) and Chest hospital (17.2%). This group was surveyed once only and was not involved in the training program as the task of this group is limited to cleaning, storing and cost control. Therefore the fourth hospital – P. Salman- was not included in the survey. All participants were males. This is based on nutrition contract which requires males only to occupy this type of jobs. The nationalities were Indian, Bangladesh and Sri Lanka. Only four participants worked as store keepers while twenty three worked as cleaners. In each hospital, one or two store keepers are enough to perform the required tasks. The results found that (20 %) of the participants here had degrees, nearly the same percentage as the third group (Table 4.10). About half had experience between 2 to 5 years. Similar to the third group, the majority of this group members received monthly salaries under SR 600/month (about £100). However, only two store keepers received salaries between SR 600/month and SR 1000/month (about £180). About 71 % of the participants confirmed that they received training in food safety and this was slightly less than that in the third group. Also, about 31% of the participants received no

support from their supervisors to attend any training course. Obviously, this percentage was higher than those in the third group. This could indicate that, food managers are not aware of the need to educate and train their cleaners and stores keepers. However, food safety training should be delivered to all foodservices staff including managers and cleaners as they work in the kitchen. The problem with this group is that, the nutrition contract does not require any specific qualification and standards to work as a cleaner. The only requirement is to be male. This could restrict the training. An illiterate cleaner will not benefit from traditional food safety training. Special training would need to be developed to account for their lack of literacy. However, all the respondents in this study were able to read and write as they were able to complete the survey. The importance of training for all food handlers is acknowledged by many studies, and several of the authors have suggested approaches that may result in improved food handling behaviours such as Bolton, *et al*, (2008).

- **Knowledge**

As the previous groups, this group had also a very poor knowledge (Table 4.17). The mean food safety knowledge scores 3.4/12 (28.3%). Therefore, this group obtained the lowest knowledge level comparing with the other three groups. The Kruskal Wallis test showed no differences between the participants practices in the three hospitals. This score was expected as this group's members do not usually receive any support from their managers.

With regard to cross-contamination and personal hygiene questions (Qs 4.10, 4.11, 4.14 and 4.21), participants showed poor knowledge in this area (Table 4.18). In question 4.10, only one participant (3.6%) knew the correct answer. This could indicate that, all the cleaners do not wash their hands or if they do it they do not know why. This could represent a serious danger. Foodservices cleaner is responsible for carrying garbage and refuse. At the same time, he is responsible for cleaning food contact surfaces, utensils, and as well carrying

foodstuff from and to the stores. Therefore, he is a potential source of food contamination in the kitchen, like other food handlers, if he unaware of hygiene issues. It is important to explain this point to the cleaner. When he knows the purpose of washing hands, he might practice that carefully. Only 2 (6.9%) of the respondents answered question 4.11 correctly. Almost 58% of them thought that, food poisoning bacteria can be brought into the kitchen only by people, while 34% said by insects only. This is linked to the previous question. When the food handler, or any staff member in foodservices department, understands how Bacteria can be introduced to the kitchen, he will be able to prevent its sources effectively. About 90% of the participants failed to know where they have to store fresh meat (Q4.14). Most said "in top of fridge". This aspect of hygiene was also considered in a Slovenian study (Jevsnik *et al*, 2008). In that study, about 386 food handlers from different food premises, such as food production, catering and retail units were surveyed about food safety knowledge and good practices. One question was about storing food in the refrigerator. Their result showed that, a quarter of the food handlers would store a bean salad in the wrong place if there was a large slice of fresh meat on the middle shelf (Jevsnik *et al*, 2008). Storing food is one of the main tasks of this group's members. It is known that, potential or actual cross-contamination in any food premises is considered a serious risk and needs strong preventive by action everyone in the premises. Therefore, any deficiency or misunderstanding among foodservices cleaners or stores keepers can lead to serious cross-contamination incidents. Question 4.21 indicated a serious misunderstanding about personal hygiene. Employees were asked about keeping gloves when they are using the toilet. The researcher included this question because he observed this behaviour, when he used to work in several hospitals, mainly among foodservices cleaners. When he asked one cleaner about that behaviour he said "gloves keep my hands clean". Thus it was a necessary to investigate this point. Our results indicated that, almost 83% of the participants said "Yes" they will

keep their gloves because it prevents diseases. This answer reflects the real poor employee's knowledge is poor. It could be due to the lack of training. Staff thought that, they have to wear gloves all time but they don't know why. It seems that, they follow their supervisors instruction only.

Temperature control questions (Q4.12 and Q.13) also indicated poor staff knowledge about this subject. Question 4.12, about refrigerator's temperature, was used also in group three questionnaire (Q3.18). In group four, only (17%) of the participants knew the right answer. This was less than those in group three where (33%) knew the correct answer. However, both groups had a poor knowledge of temperature control. Similar results of poor knowledge about temperature have been found among foodservice staff in hospitals in Italy, Iran and Turkey (Angelillo *et al*., 2001; Askarian *et al*., 2004; Bas, *et al*, 2005). However, the question about freezer's temperature (Q4.13) was answered much better than (Q4.12). Almost 80% of the cleaners knew the correct answer. Generally, temperature control is a shared responsibility among all foodservices staff. It is not should be limited to food supervisors or chefs. Cleaners are carrying goods to refrigerates, freezers and stores. Store keepers organize them in the appropriate places. Therefore, cleaners and store keepers must be aware of temperature control. For example, if the cleaner has that knowledge, he can report any fault in the refrigerator. Moreover, when HACCP is implemented in that hospital, cleaners and store keepers must be involved in HACCP plan and also any training related to it.

Question 4.15 was about hygiene procedure during illness. Participants were asked about what they have to do when they suffer fever, diarrhoea, or vomiting. This question was included in the group's three questionnaire (question 3.20). About 10% of group four respondents said they will continue to work normally (Table 4.18). Almost three quarters said they will go to a doctor and then continue work. The doctor maybe not aware about the nature of that person work, thus, he could not alert him to avoid touching food until he/she recovers.

Only one participant (3.6%) intended to report supervisor while 7% said they were really afraid to report to the manager because he may stop his work without pay. Comparing with group three, almost two thirds of them said they will go to a doctor and then continue their work normally. About 7% will work without treatment and less than quarter said they will report their managers. About 2% will be afraid to report because they will be stopped working without salary. In Walker, *et al*, (2003) study, only 7% of the food handlers hide their illness. As mention in group's three discussions, regulations and laws should be applied correctly. Sick food handler or any foodservices employ must be excluded from work until he/she recover. The excluding should be with a salary at least for a certain period to ensure public health is not compromised by economic considerations.

Cleaning methods questions indicated various results (questions 4.17, 4.18, 4.19 and 4.20 – Table 4.18). Question 4.17 indicates poor awareness of technical information. Staff were asked about the purpose of turning off the refrigerator and bringing it to room temperature when it needs to be cleaned. About half of them thought that this could make the process safe. Only one third selected the correct choice which was "disinfectant works best at room temperature". Question 4.18 was answered properly. Almost 71% of them knew that, insects may transfer contamination between floors and work surfaces, thus they have to keep floors clean over the night. All participants thought that, washing utensils with water and soap only kills all bacteria (Q4.19). Walker, *et al*, (2003) assessed food safety knowledge for four hundred and forty-four food handlers working in 104 small food businesses in the UK. They found that, 4.5 % of those staff thought that a scrubbing brush and cold water were the most effective way of killing bacteria. Also, only 12.5% thought that detergents kill bacteria. The researchers concluded that 20% of the food handlers participated in their study did not know how to effectively clean a work-surface (Walker, *et al*, 2003). In another study was conducted by Tebbutt, (1992) and indicated that, 29% of 75 food handlers were not aware

that disinfectants were used for reducing bacteria to a safe level. Basically, the physical washing with soap and water could remove some bacteria but will not destroy it. A number of cells could reside and multiply again when the conditions are suitable. Using disinfectants, after the physical washing, could destroy most of the bacterial colonies. In general, there is a difference between sanitizing and washing (FDA/CFSAN, 2006). Physical washing removes visible dirt and contamination while sanitizing destroys or reduces the number of harmful invisible bacteria (FDA/CFSAN, 2006). Therefore, both washing and then sanitizing is required for every surface that comes into contact with food to ensure safety (FDA/CFSAN, 2006). However, these chemical must be stored far away from the foodstuffs. In question 4.20, almost 95% of participants know that.

With regard to HACCP question (Q4.16), only half of the respondents recognised that system. This question was included in group's three questionnaire and 65% of those participants were familiar with the basic principle of HACCP. The same result was reported by (Jevsnik, *et al,* 2008). As mentioned before, all food services staff should aware enough about HACCP system. The awareness about this system should not be limited in food handlers or food supervisors. Foodservices cleaners are considered a possible contamination source as they work in food premises. Therefore, they have to be well educated about this system otherwise, they system will not be implemented correctly.

- **Behaviours**

Our results showed no differences between participants' practices levels in the three hospitals for group four. At first, this group had an accepted level of good practices (Table 4.23). Although the mean score was 5.6 /8 (70%), this score was the lowest comparing with the previous groups (group 1, 2, and 3). As one of the cleaners tasks is to receive and carry supplies and raw food, about 92% of them said that they always washed their hands before

and after touching unwrapped raw foods (Qs 4.22 and 4.24 – Table 4.24). However, the respondents had poor hygiene practices in some parts. For example, about 69% of the participants here said that they were always used the same cloth to clean several places in the kitchen (Q 4.23). This practice could spread bacteria over the kitchen places. The towel can carry enormous numbers of bacteria because it provides a suitable environment for bacterial growth. Bacteria in general prefer to grow in moist environments and a towel will contain water and as some food which provides bacteria with the essential nutrients. Therefore, it is important to change all towels/cloths frequently and to have designated cloths for specific high risk area. Single use disposable cloths are most hygienic.

In question 4.25, only 61% of group 4 always checked the concentration of sanitizing solutions. This problem has been reported in several studies. Ramírez, *et al*, (2011), surveyed knowledge and practices of one hundred twenty-seven foodservices staff in six public and private hospitals in Guadalajara, México. A part of that study was an observation in addition to a self-reported questionnaire. They found that, five of the six hospitals did not measure the amount of the sanitizing solutions or follow manufacturers procedures. This also was reported in a Turkish study whereas sanitizer concentrations were never measured or recorded in the hospital food service (Bas, *et al*, 2005).

It is known that poor cleaning and sanitizing surfaces/utensils is considered one of the main factors coursing foodborne incidents. It is important that sanitizer should be measured, otherwise it will not work effectively or the solution will be dangerous (FDA/CFSAN, 2006). The lack of appropriate cleaning and sanitizing procedures will lead to poor hygiene status in the kitchen. This could support food poisoning incidents. In general, there are two simple ways to measure the concentration. First one is with a paper test strip which indicates free chlorine. The colour of this paper test strips will change from white to a medium blue if the chlorine is at the right concentration- between 50 and 100 parts per million (FDA/CFSAN,

2006). The other way is to follow the manufacturer's instructions and this could be used with other types of disinfectants, which are not chlorine based such as quaternary ammonia or iodine (FDA/CFSAN, 2006). Bas, *et al*, (2006) assessed one hundred and nine food businesses in Turkey for HACCP-prerequisite programmes and food safety practices. They found that, 5 of the 109 food businesses failed to use test strips to check sanitizer concentration. This was the most common poor behaviour observed at those hospitals.

- **Attitude**

The results showed that the participants have positive attitudes toward food safety and hygiene (Table 4.30). The mean scores was 19.8/25 (79.2%), which was exactly same as the mean score of food handlers' (group 3) attitudes before the training ($p > 0.05$). All the participants in the three hospitals had a same level. Most of the respondents' attitudes were consistent with the previous group (group 3) particular with results in the pre training survey. About 93% of the cleaners believed that carrying out good hygienic practice at all times during food preparation is very important (Q.26). In question 4.27, only 67% strongly agreed that carrying out good hygienic behaviour at all times during food preparation can help to prevent food borne illness while 21% said they agreed. This is consistent with the previous group (group 3) where three quarters were strangely agreed and 19% agreed. In question 4.28, only half of the participants in group 4 thought it is highly possible for hospital patients to die as a result of eating food that was not hygienically prepared. In group 3, only 41% of them thought that. Question, 4.29 showed that 30% of the cleaners strongly agreed that their behaviour is more hygienic in the presence of their supervisors. In group 3, 42% strongly agreed that their behaviour is more hygienic in the presence of their supervisors. In the last question, almost three quarters of the cleaners said they were extremely likely to carry out good hygienic practice at all times during food preparation comparing with 66% of the previous group (group 3). As they had a positive attitude, improving knowledge could affect

their practices. This means that, if a good training program is provided, all food safety practices may be improved and applied correctly. In contrast, if they showed a negative attitude toward good practices, it would be difficult to change their beliefs. As mentioned above a positive reported attitude may not be reflected in good practices. For example Angelillo, *et al*, (2000) interviewed 411 food handlers regarding food hygiene practices and demonstrated that a positive attitude does not necessarily support good practices among food services staff.

4.2.3 Is there any Association Between food handlers Knowledge, Practices and Attitudes?

Our results showed a positive correlation between some aspects in some groups. However, there was no correlation observed in some other parts. In the first group (MOH staff), results indicated that a positive correlation between those staff's practices and attitudes (*r= 0.546)* (Table 4.31*).* Although the correlation was weak, this could indicate that staff with positive attitudes may behave more hygienically. Also, in the third group there was a positive correlation between food handlers knowledge and their practices (Table 4.32). It means that employees with high level of knowledge were more compliant with good practices. (Abd Patah, *et al*, 2009) assessed the food safety knowledge and attitude of culinary based students from four (4) public and private higher learning institutions in Malaysia. They found that, students' knowledge in avoiding cross contamination and avoiding food from unsafe sources were positive and significant in affecting on their food safety beliefs. In our study, the sections on self-reported practices and attitudes reported better scores than knowledge in all four groups. In groups two and four, there was no correlation observed, although these groups had no intervention and the results reflect the baseline survey situation only. However, several studies have shown that it is possible to improve knowledge with training but it is difficult to change behaviour. A number of studies conducted in Italy (Angelillo, *et al*, 2001)

and Iran (Askarian,, *et al,* 2004) reported slightly different results to our study. They found inconsistencies between knowledge, attitudes and practices among hospitals foodservices staff. Also they noted that, the better scores were observed in practices comparing to knowledge and attitudes. Buccheri, *et al,* (2007) attributed that to lack of training. Askarian, *et al*, (2004) stated that, imparting knowledge is not sufficient as behaviours did not always correlate with beliefs. Campbell *et a*l. (1998) have reviewed a number of studies on this subject and reported that while it is difficult to change behaviour, training still has a positive impact on improving food safety. Vergara, *et al*, (2000) investigated the effect of training on the hospitals food handlers in Valencia. They found training improved staff knowledge but it reflected less on attitudes. Acikel, *et al*, (2008) examined foodservice staff hands before and after the training and found a statistically significant negative correlation between the post-training scores and the number of colonies. Tokuc *et al*, (2009) evaluated the knowledge, attitudes and practices among foodservice staff with regards to food hygiene in hospitals in Edirne, Turkey. They show a discrepancy between attitudes and practices towards food hygiene. For example, they observed that while the participants believed safe food handling is an important part of their job responsibilities and using protective clothing has reduced the risk of food contamination all protective measures were not fully implemented in practice. However, they attributed this discrepancy to the lack of specific training. In our study, question 3.27 in the practices section asked food handlers how frequently they use a thermometer. Only 60% said they always use it. At the same time, in knowledge section only half knew the internal temperature for cooking chicken (question 3.17). As the thermometer was not used always by a high percentage of staff they failed to recognise the correct temperature in the knowledge part. This could reveal that, practices may affect knowledge well as knowledge affecting practices. It is suggests that refresher training to reinforce certain aspects may be valuable. Tang and Fong (2004) found that, about 98% of participants

indicated that they knew how to wash hands, but only one third of them knew the washing times and procedure correctly. In the study staff showed a positive attitude towered washing but because they were possibly not washing their hands enough, they failed to know the correct procedure.

The relation between knowledge (K), practices (P) and attitude (A) is still not understood completely. There is not consistency or agreement between researchers. According to Seaman and Eves [6], KAP model assumes that knowledge (K), of a person will influence the behaviour (Seaman and Eves 2006). Hence, improving knowledge will subsequently lead to a direct change in the attitude (A) and as a result change the practices (P). It has been suggested that the disparity between knowledge and practice occurs because most training is designed using the KAP model (Clayton *et al*., 2002). This concept assumes that an individual's practice is based on his level of knowledge (K) and proposes that providing information will lead to a change in attitude (A) and subsequently a change in behaviour (P = performance) (Worsfold, and Griffith, 2004). Thus, the assumption is that knowledge is the major precursor to behavioural change (Worsfold, and Griffith, 2004). The KAP model is a representative study of a specific group to gather some information on what is known in relation to a certain subject in order to understand the knowledge, attitude and practices in basic food handling (Lee, *et al*, 2012). The effectiveness of KAP is still argued in several studies. Rennie (1994) and Powell, *et al*, (1997), stated that the knowledge of food safety issues does not always change food handling practices among the food workers. However, attitude could play a role that will ensure the reduction in the trend of foodborne illnesses and by education on food safety to bring behavioural changes in addition to adoption of positive attitudes (Powell *et al*. 1997). Howes and other (1996) stated that there is a correlation between positive attitude and continued education of food workers towards the maintenance of good hygiene practices.

Chapter 5: Results and Discussion for Intervention Study

5.1 Intervention Results

Group three were used in the baseline study but also were used for the intervention study. As a consequence the demographic information was collected from Group three twice (control group, Prince Salaman Hospital and RCH), or three times (Rehab and Chest). The total number of staff in the first test was 111 (73%), while it was 129 (86%) in the second stage. Staff in the Rehab and Chest hospitals were tested a third time when 20 (50%) food handlers answered the questionnaire. RCH was excluded from the third test. Then the intervention's group results was analysed in two ways. The first one included all participants in the three hospitals. The second one included Rehab and Chest hospitals staff only as they were assessed three times. In the control group, 25 food handlers were answered the questionnaire and then the same participants were asked to answer it again in the second test after eight months.

5.1.1 Staff Demographics

First section: demographics characteristics

a- The Intervention Group: Overall, this group included food handlers from RCH, Rehab hospital and Chest hospital. Although most of the respondents participated in the first and second survey, it was necessary to investigate and describe their demographics characteristics in each test. That was important as some of the participants' demographics characteristics may change during the time where the duration between the tests could be up to 2 years. Furthermore, a number of new staff did not participate in the first survey and they only involved in the post training stage after attending the training course.

- **Second Survey:** the majority of the participants were from RCH as it was the largest hospital. The males represented high percentage in both tests. Almost 69 (62.2%) of the participants were between 25 to 34 years old in the first test. However, this age range declined in the second test to 46 (35.7%). About half of the food handlers were under 24 years in the second stage and that was due to the new staff who participated in this stage only. It was clear to find that, most of the food handlers were from the Filipinos and Bangladesh in both tests. Most of the Filipinos worked in RCH. The Saudis were only about 16 (14.4%) and 25 (19.4%) in the first and the second surveys respectively and all were females working as waitresses. As showed at Table 5.1, no Egyptians staff participated in the second survey. Only 24 (21.6%) of the replies in the first test had a degree, while this decreased into 15 (11.6%) in the second survey. Only one (0.9%) of the food handlers from Bangladesh had an experience more than 25 years. Approximately 45% of the food handlers had between 2 to 5 years' experience. The majority of the replies worked as a waiters/waitress. The cooks represented only 9% in the first stage and 14.7% in the second survey. All of the cooks and their assistants were males, as the females' jobs are limited in foodservices as waitress only –or dieticians in supervision jobs. This rule is based on the Ministry of Health's foodservices contract. The salaries of food services staff were very low. Most of the participants received less than 600 Riyals/month (about £100). Only 19 (17.1%) participants in the first stage and about 30 (23.3%) in the second received between 1000 SR (about £180) and 2000 SR (about £ 350) and most of them were the Saudis females and cooks.
- **Third survey:** it was necessary to include only the staff who participated in the previous surveys. All of the participants were from Chest hospital and Rehab hospital only. Therefore, the same staff from these two hospitals participated in three surveys.

RCH was excluded because it had a new catering company with a different staff. The majority of the participants were male while only 2 Saudis female replied (Table 5.2). Also the age range was between 25 to 34 years in the 70% of the respondents. The participants' nationalities in this survey were limited to Bangladesh (75%), Philippine (15%) and Saudi Arabia (10%). Such as the result in the second survey, about three quarter of the participants had attained school education level only. Similar to the previous results, most of the respondents worked as waiters/waitress. As presented Table 4.8 and 4.9 about 13 (65%) received monthly salaries under 600 SR (about £100) and only the two Saudis females, who worked as waitress, received more than 2000 SR (£350).

a- **The Control Group:** this group included food handlers working in Prince Salman hospital. Twenty five participants answered the questionnaire twice. As the respondents were the same in both tests, their demographics were almost the same. About ¾ were males. Only ¼ of them were between 35-44 years old in the first test. This increased to half in the second test. Like the intervention group, most of the food handlers were from the Philippines and Bangladesh. About ¼ were Indian and there were only two Saudis (females). More than half of the participants attended elementary schools. 40% of participants were waiters/waitress. More than half of them received a salary between 1000 SR (about £180) and 2000 SR (about £ 350) (Table 5.1).

Category	Intervention group			Control group	
	First test (pre-training Total N (111)	Second test (post-training) Total N (129)	Third test (after six months) Total N (20)	First test Total N (20)	Second test (eight months later) Total N (20)
Hospital					
Chest	16 (14.4%)	12 (9.3%)	10 (50 %)	-	-
Rehab	16(14.4%)	14 (10.9%)	10 (50%)	-	-
RCH	79 (71.2%)	103 (79.8%)	-	-	-
P. Salman	-	-	-	25	25
3.1 Gender					
Male	70 (63.1%)	84 (65.1%)	18 (80%)	18 (72%)	18 (72%)
Female	41 (36.9%)	45 (34.9%)	2 (20%)	7 (28%)	7 (28%)
3.2 Age					
a. 24>	22 (19.8%)	68 (52.7%)	2 (10%)	2 (8%)	2(8%)
b. 25-34	69 (62.2%)	46 (35.7%)	15 (75%)	17 (68%)	11 (44%)
c. 35-44	12 (10.8%)	5 (3.95%)	2 (10%)	6 (24%)	12 (48%(
d. 45-54	5 (4.5%)	8 (6.2%0	2 (5%)	-	-
3.3 Nationality					
a. Saudi	16 (14.4%)	25 (19.4%)	2 (10%)	2 (8%)	2 (8%)
b. Philippine	41 (36.9%)	47 (36.4%)	3 (15%)	10(40%)	10(40%)
c. Egypt	6 (5.4 %)	0	0	1(4%)	1(4%)
d. India	14 (12.6%)	19 (14.7%)	0	6(24%)	6(24%)
e. Bangladesh	32 (28.8%)	37 (28.7%)	15 (75%)	6(24%)	6(24%)
f. Sri lanka	1 (0.9%)	0	0	0	0
g. Nepal	0	1 (0.8%)	0	0	0
3.4 Education					
a. Elementary	48 (43.2%)	98 (76%)	7 (53.8%)	14 (56%)	14 (56%)
b. Diploma	27 (24.3 %)	11 (8.5%)	3 (23.1%)	5 (20%)	6 (24%)
c. Bachelors	24 (21.6%)	15 (11.6)	3 (23.1%)	3 (12%)	3 (12%)
d. Other	6 (5.4%)	2 (1.6%)	0	3 (12%)	2 (8%)
3.5 Years of experience					
a. 1>	14 (12.6%)	36 (27.9%)	0	4 (16%)	0
b. 2_5	50 (45%)	62 (48%)	3 (15%)	11 (44%)	15 (60%)
c. 6_15	33 (29.7%)	26 (20.2%)	17 (85%)	10 (40%)	10 (40%)
d. 16_25	12 (10.8%)	4 (3.1%)	0	0	0
e. >25	1 (0.9%)	0	0	0	0
3.6 Work Activity					
a. Chief cook	5 (4.5%)	1 (0.8%)	0	1 (4%)	1 (4%)
b. Cook	10 (9%)	19 (14.7%)	5 (25%)	8 (32%)	8 (32%)
c. Assistant cook	4 (3.6%)	6 (4.7%)	2 (10%)	2 (8%)	2 (8%)
d. waiter/Waitress	80 (72.1%)	94 (72.95)	13 (65%)	10 (40%)	10 (40%)
e. Other	11 (9.9%)	8 (6.2%)	0	4 (16%)	4 (16%)
3.7 Salary(SR)					
a. <600	71 (64%)	61 (47.3%)	12 (60%)	8 (32%)	6 (24%)
b. 600_1000	18 (16.2%)	34 (26.4%)	4(20%)	13 (52%)	14 (56%)
c. 1000_2000	19 (17.1%)	30 (23.3%)	2 (10%)	2 (8%)	3 (12%)
d. >2000	3 (2.7%)	2 (1.6%)	2 (10%)	2 (8%)	2 (8%)

Table 5-1 The demographics characteristics of the total food handlers (group 3) participated in three surveys

Category	First test (pre-training) Total: 32 Participants		Second test (post-training) Total : 24 Participants		Third test (after six months) Total: 20 Participants	
	Chest Hospital	**Rehab Hospital**	**Chest Hospital**	**Rehab Hospital**	**Chest Hospital**	**Rehab Hospital**
3.1 Gender						
Male	11 (68.8%)	14 (87.5%)	8 (80%)	14 (100%)	8 (80%)	10 (100%)
Female	5 (31.3)	2 (12.5%)	2 (20%)	-	2 (20%)	-
Total	16	16	10	14	10	10
3.2 Age						
a. 24>	-	3 (20%)	2 (20%)	2 (14.3%)	2 (20%)	-
b. 25-34	8 (50%)	9 (60%)	5 (50%)	9 (64.3%)	5 (50%)	10 (100%)
c. 35-44	7 (43.8%)	2 (13.3%)	2 (20%)	1 (7.1%)	2 (20%)	-
d. 45-54	1 (6.3%)	1 (6.7%)	1 (10%)	2 (14.3%)	1 (10%)	-
3.3 Nationality						
a. Saudi	2 (12.5%)	1 (6.3%)	2 (20%)	-	2 (20%)	-
b. Philippine	2 (12.5%)	1 (6.3%)	-	3(21.4%)	-	3 (3-%)
c. Egypt	3 (18.8%)	1 (6.3%)	-	-	-	-
d. India	-	-	-	-	-	-
e. Bangladesh	9 (56.3%)	13 (81.3%)	8 (80%)	11 (78.6%)	8 (80%)	7 (70%)
f. Sri lanka	-	-	-	-	-	-
g. Nepal	-	-	-	-	-	-
3.4 Education						
a. Elementary	8 (53.%)	9 (60%)	1 (80%)	9 (64.3%)	1 (80%)	6 (60%)
b. Diploma	3 (20%)	1 (6.3%)	1 (10%)	3 (21.4%)	1 (10%)	2 (20%)
c. Bachelors	3 (20%)	4 (26.7%)	1 (10%)	2 (14.3%)	1 (10%)	2 (20%)
d. Other	1 (6.7%)	1 (6.7%)	-		-	-
3.5 Years of experience						
a. 1>	1 (6.3%)	1 (6.7%)	-	-	-	-
b. 2_5	2 (12.5%)	3 (20%)	2 (20%)	4 (28.6%)	2 (20%)	1 (10%)
c. 6_15	10 (62.5%)	8 (53.3%)	8 (10%)	9 (64.3%)	8 (10%)	9 (90%)
d. 16_25	3 (18.8%)	2 (13.3%)	-	1 (7.1)	-	-
e. >25	-	1 (6.7%)	-	-	-	-
3.6 Work Activity						
a. Chief cook	3 (18.8%)	1 (6.3%)	-	1 (7.1%)	-	-
b. Cook	3 (18.8%)	4 (25%)	1 (10%)	4 (28.6%)	1 (10%)	4 (40%)
c. Assistant cook	1 (6.3%)	1 (6.3%)	2 (10%)	-	2 (10%)	-
d. waiter/Waitress	7 (43.8%)	6 (37.5%)	7 (80%)	6 (42.9%)	7 (80%)	6 (60%)
e. Other	2 (12.5%)	4 (25%)	-	-	-	
3.7 Salary(SR)						
a. <600	8 (50%)	13 (81.3%)	4 (40%)	10 (71.4%)	4 (40%)	8 (80%)
b. 600_1000	4 (25%)	1 (6.3%)	3 (30%)	3 (21.4%)	3 (30%)	1 (10%)
c. 1000_2000	3 (18%)	2 (12.5%)	1 (10%)	1 (7.1%)	1 (10%)	1 (10%)
d. >2000	1 (6.3%)	-	2 (20%)	-	2 (20%)	-

Table 5-2 The demographics characteristics of the food handlers (group 3) participated Chest and Rehab hospitals only

Second section (general questions)

a- The Intervention Group:

- ***Results as a whole group***: The findings have shown that, the percentage of staff who received food safety training increased gradually in the three tests during the two years. According to the results, in the pre training stage about 76% of the total participants have received food safety training and that improved to 96.6% after training and then 100% in the third survey. Question 3.9 showed that, about quarter of the total respondents in pre training stage did not receive any support from their managers to attend courses in food safety and hygiene. However, this percentage dropped to 6.4% in the post training stage. Table 5.3 illustrates the group 3 replies about this section.
- ***Chest and Rehab Hospitals Results only:*** In the first test, about 40% from Rehab hospital staff and half of Chest hospital staff said they did not receive any hygiene training. Also, almost two third of the participants from Chest hospital and 1/3 from Rehab hospital thought that their managers do not support them to attend food safety training. In the second test, 100% of the Chest hospital staff said they received training while 92% of the Rehab said that. In the third test, which was 6 months later, 100% the food services staff in both hospitals stated that, they received training in food safety and their managers encourage them to attend food safety training programs. This indicated possible improvement in the food supervisors' attitude with regard to the food safety training (Table 5.4).

b- Control Group:

In the first test, about 84% of this group members said they received food safety training. This percentage improved slightly in the second test. In question 3.9, about third of the respondents in the first test stated that their managers do not advise them to attend food safety training. This is similar to the staff replies in Chest and Rehab hospitals. This percentage declined to 16% in the second test (Table 5.3).

Questions	Experimental group			Control group	
	First test (pre training)	Second test (post training)	Third test (after six months)	First test	Second test (after eight months)
3.8 Have you received any training course about food safety?					
Yes	85 (76.6%)	122 (96.6%)	20 (100%)	21 (84%)	23 (92%)
No	24 (21.6%)	7 (5.4%)	0	4 (16%)	2 (8%)
3.9 Have your manager required you to attend any food safety training?					
Yes	82 (73.9%)	122 (96.6%)	20 (100%)	17 (68%)	21 (84%)
No	27 (24.3%)	6 (4.7%)	0	8 (32%)	4 (16%)

Table 5-3 Second sections replies of food handlers (group 3)

Questions	First test (pre-training)		Second test (post-training)		Third test (after six months)	
	Chest Hospital	Rehab Hospital	Chest Hospital	Rehab Hospital	Chest Hospital	Rehab Hospital
3.8 Have you received any training course about food safety?						
Yes	9 (60%)	8 (50%)	10 (100%)	13 (92.9%)	10 (100%)	10 (100%)
No	6 (40%)	8 (50%)	-	1 (7.1%)	-	-
3.9 Have your manager required you to attend any food safety training?						
Yes	6 (37.5%)	11 (68.8%)	10 (100%)	12 (92.3%)	10 (100%)	10 (100%)
No	10 (62.5%)	5 (31.3%)	-	1 (7.7%)	-	-

Table 5-4 Second sections replies of food handlers (group 3) in Chest and Rehab hospitals only

5.1.2 Knowledge

Food safety knowledge was tested for the food handlers who work in the four hospitals. The food handlers who work at RCH, Rehab hospital and Chest hospital, were subjected to a training program. The results showed an improvement in the staff knowledge after delivering the training program. The participants who worked at P. Salman hospital were considered the control group and no training program was delivered to them.

In general, the staff at all hospitals had very low baseline knowledge about most aspects of food safety, according to the results obtained from the first survey. A training program was developed which covered all food safety principles. When the food handlers' knowledge was tested after the training programme using the same questionnaire, their scores were higher after training than before it (*p-value* < *0.01*) but this slightly reduced after six months. The scores from food safety knowledge questionnaire before the training, after the training and six months later are presented at Tables 5.5, 5.6, 5.7 and 5.8.

a- The Intervention Group

1- ***Results as a whole group:*** There was a great improvement in food handlers' knowledge after attending the training program. At the pre training stage, the level of the total employees' knowledge was very low with a mean score of 4.8/13 (36%,). Statistically, there was no significant difference in the knowledge level between the staff in the three hospitals since the *p-value* > *0.05*. After the training, the mean scores of the total scores of trained staff improved to 9.8/13 (75.3 %,) (Table 5.5). However, there was a significant difference between the first test and the second one (after the training) as the *p-value* < 0.05.

   In general, less than 50% of the respondents answered this part correctly before the training (Table 5.8). After the training, the results showed a significant differences in the

mean score percentages of the most questions (*p-value < 0.01*). As presented at Table 5.8, there were a higher number of correct answers to all questions after the training compared to the initial responses. For instance, before the training about half of the food handlers thought that the benefit of using gloves was just to protect food from contamination and only 39% answered the question correctly (Q3.12). After the training, the correct answers improved and more than 64% replied correctly. However, not all questions showed the same improvement. For example in Q3.15, about 40 % of the food handlers before the training said that they would recognise contaminated food by smelling it and while this had decreased after the training, still 20% were making this error. This means that 80% still did not understand that it is impossible to recognise contaminated food. Only about 10% of respondents answered this question correctly before the training. Also, in Q3.17, about cooking temperature, there was an obvious improvement in the second test (82.9%). The majority of the participants were unable to define the required refrigeration, cooking and holding food before training. On the other hand, before training 3.7% of the participants said that they will reuse a cooked food to reduce the cost on the caterer even if they doubted its safety. Question 3.20 demonstrated that, although the majority gave the correct answer, 1.9% of the respondents in the first survey tried to hide their illness because they were afraid to be suspended from work without salary and this percentage increased to 5.5% in the second test. The awareness of the food handlers toward patients' safety perhaps increased after improving their knowledge. This could indicate that, the staff after training were more honest when they answer this question after the training. Many of the food handlers answered the HACCP question (Q3.21) properly and this question had the highest number of correct answers in the pre training survey.

2- ***Chest and Rehab Hospitals Results only***: the improvement after the training was but it was not consistent across all three hospitals. Although there was no significant difference between the levels of participants knowledge in the three hospitals, Rehab hospital staff had the lowest mean score in the first test. Also, the staff of this hospital had a little improvement after the training and their level stay stable after six months. In Chest hospital, the improvement was greater than Rehab hospital as the mean scores increased from 4.2/13 (32.3%) before the training to 8.5/13 (65.4%). This decreased slightly to 6.7/13(51.5%) in the third test. The mean scores for both hospitals (as one group) was improved from 4.1/13 (31.5%) before the training to 6.7/13 (51.5%) after the training and there was a significant different between both tests (Table 4.7and 4.8). After six months the mean scores decreased to 6.1/13(46.9%) and there was no significant difference between the second and the third tests.

b- Control Group

Control group had also low baseline knowledge about most aspects of food safety. In the second test, staff knowledge remained low and was similar to the first test. There was no significant difference between staff level in both tests comparing to the first test in the intervention group. Table 5.6 shows the differences between the control group and the intervention group. Staff choices were mainly the same of what the intervention group did in pre training test. Even after eight months, the standard of the control group knowledge were the same.

	Intervention Group			Control Group	
	Pre training	Post training	After six months	First test	Second test
Minimum score	**0 / 13**	**2 / 13**	**4 / 13**	**1/13**	**1/13**
Maximum score	**11 /13**	**13 / 13**	**12 /13**	**9/13**	**11/13**
Mode	**4**	**12**	**8**	**7**	**5**
Mean scores	**4.8 (36.9%)**	**9.8 (75.4%)**	**6.1/13 (46.9%)**	**5.6 (43.1%)**	**5.9 (45.4%)**
St. deviation	**2.5**	**2.9**	**1.8**	**2.1**	**2.6**
Kruskal-Wallis	**Comparing the three tests *: p-value < 0.01***			**Comparing both tests *p-value >0.05***	

Table 5-5 The mean scores , differences and improvement of food handlers (group3) knowledge

	Intervention group Pre training	Intervention group Post training	Control group First test	Control group Second group
Pre training	*X*	*p-value 0.00*	*p –value :>0.05*	*p –value :>0.05*
Post training	*p-value 0.00*	*X*	*p –value :0.00*	*p –value :0.00*
After six months	*p-value :0.078*	*p –value :0.00*	*p –value :0.00*	*p –value :0.00*

Table 5-6 The differences between the intervention groups and control group (group 3)

	Knowledge mean before the training	Knowledge mean after the training	Knowledge mean after six months
Chest Hospital	4.2/13 (32.3%)	8.5/13 (65.4%)	6.7/13(51.5%)
Rehab Hospital	3.8/13 (29.3%)	5.5 /13(42.3%)	5.6/10(43.1%)
Both hospitals as an one group	4.1/13 (31.5%)	6.7/13 (51.5%)	6.1/13(46.9%)

Table 5-7 The improvement of staff knowledge in Chest and Rehab hospitals (group 3)

Questions	Answers	Intervention group's replies			Control group 's replies	
		Pre training First test	Post training second test	Third test after 6 months	First test	Second test
3.10 Cross contamination is the transfer of harmful microorganism from:	a- Food to food only	21 (20.2%)	3 (2.3%)	0	1 (4.3%)	5 (20%)
	b -Person to food only	16 (15.4%)	6 (4.7%)	2 (10 %)	6 (26.1%)	3 (12%)
	c - Contact surfaces to food only	13 (12.5%)	6 (4.7%)	1(5 %)	0	7 (28%)
	d- All above	**46 (44.2%)**	**112 (87.5%)**	**17(85%)**	**14 (60%)**	**9 (36%)**
	e -Do not know	8 (7.7%)	1 (0.8%)	0	2 (8.7%)	1 (4%)
3.11 Why is it important to wash your hands after handling raw meat?	a. To prevent spread of bacteria/germs	28 (25.7%)	22 (17.1%)	3 (15%)	11 (44%)	14 (56%)
	b. To avoid cross contamination	33 (30.3%)	4 (3.1%)	1 (5%)	1 (4%)	1 (4%)
	c. To avoid food poisoning	7 (6.4%)	4 (3.1%)	2(10%)	1 (4%)	2 (8%)
	d. All the above	**38 (34.9%)**	**98 (76%)**	**14 (70%)**	**12 (48%)**	**8 (32%)**
	e. Do not Know	3 (2.8%)	1 (0.8%)	0	0	0
3.12 Using gloves during preparing food is to	a. protect food from any contamination	51 (46.4%)	38 (29.9%)	3 (15%)	15 (60%)	11 (44%)
	b. Protect me from any contamination	11 (10%)	4 (3.1%)	1(5%)	1 (9%)	1 (4%)
	c. Both of a and b	**43 (39.1%)**	**82 (64.6%)**	**14 (70%)**	**9 (36%)**	**10 (40%)**
	d. No benefit of using gloves and it is restrict my work	4 (3.9%)	2 (1.6%)	1 (5%)	0	1 (4%)
	e. Don't know	1 (.9%)	1 (.8%)	1 (5%)	0	2 (8%)
3.13 During food preparation and refrigeration, raw and cooked food must be separated because	a. Kitchen will be more organised	19 (17.3%)	5 (3.9%)	2 (10%)	0	3 (12%)
	b. The flavour may be affected	26 (23.6%)	12 (9.3%)	3 (15%)	4 (16.7%)	3 (12%)
	c. To avoid cross-contamination	**55(50%)**	**101 (78.3%)**	**13 (65%)**	**17 (70.8%)**	**15 (60%)**
	d. Ministry's employees require that	5 (4.5%)	0	1 (5%)	1 (4.2%)	2 (8%)
	e. Do not Know	5 (4.5%)	11 (8.5%)	1 (5%)	2 (8.3%)	2 (8%)
3.14 *E. coli* bacteria can be transmitted by	a. Fly only	36 (33.3%)	12 (9.3%)	4(20.8%)	7 (28%)	5 (20%)
	b. Human only	11 (10.2%)	2 (1.6%)	2 (10%)	2 (8%)	0
	c. Raw meats and vegetables only	24 (22.2%)	9 (7%)	2 (10%)	7 (28%)	5 (20%)
	d. All the above	**26 (24.1%)**	**105 (81.4%)**	**12 (60%)**	**8 (32%)**	**15 (60%)**
	e. Do not Know	11(10.2%)	1 (.8%)	0	1 (4%)	0
3.15 You can recognise food contaminated with poisoning bacteria by	a. Smelling it	41 (40.6%)	25 (20.5%)	7(35%)	8 (44%)	14 (56%)
	b. Tasting it	31 (30.7%)	66 (54.1%)	5 (25%)	7 (38%)	4 (16%)
	c. My experience	10 (9.9%)	7 (5.7%)	2 (10%)	1 (4%)	4 (16%)
	d. None of those	**9 (9.9%)**	**24 (19.7%)**	**4 (20%)**	**1 (4%)**	**0**
	e. Do not know	10 (9.9%)	0	2 (10%)	1 (4%)	3 (12%)
3.16 When you are in doubt about the safety of a previously cooked food, do you	**a. Report it to the Ministry's supervisor**	**50 (46.3%)**	**113 (90%)**	**17 (85%)**	**10 (43.5%)**	**8 (32%)**
	b. Reuse it directly to reduce the cost	4 (3.7%)	0	0	1 (4.3%)	1 (4%)
	c. Reheat it to kill microorganism then reuse it	13 (12%)	7 (5.6%)	3 (15%)	1 (4.3%)	1 (4 %)
	d. Throw it out	39 (36.1%)	5 (4%)	0	10 (43.5%)	11 (44%)
	e. Do not know	2 (1.9%)	0	0	1 (4.3%)	4 (16%)

3.17. When you cooking chicken, the internal temperature should be at least:	a. 55 C	19 (17.4%)	1 (0.8%)	0	1 (4.3%)	0
	b. 65 C	14 (12.8%)	10 (7.8%)	5 (25%)	11 (47.8%)	9 (36%)
	c. 75 C	**51 (46.8%)**	**107 (82.9%)**	**10 (55 %)**	**7 (30.4%)**	**6 (24%)**
	d. 100 C	13 (11.9%)	11 (8.5%)	4 (20%)	3 (13%)	8 (32%)
	e. Do not know	12 (11 %)	0	1 (5%)	1 (4.3%)	2 (8%)
3.18 The correct temperature for a refrigerator is	a. 10 C - 15 C	28 (26.2%)	13 (10.1%)	3 (15%)	1 (4.3%)	1 (4%)
	b. 5 C – 10 C	27 (25.2%)	17 (13.2%)	4 (20%)	8 (34.8%)	4 (16%)
	c. 1 C – 5 C	**36 (33.6%)**	**96 (74.4%)**	**13 (65%)**	**10 (43.5%)**	**13 (52%)**
	d. Below 0 C	7 (6.5%)	2 (1.6%)	1 (5%)	0	5 (20%)
	e. Do not know	9 (8.4%)	1 (0.8%)	0	4 (17.4%)	2 (8%)
3.19 Hot ready to eat foods should be maintained in the Bain Marie at	a. 25 C	24 (22.6%)	3 (2.3%)	0	3 (13%)	4 (16%)
	b. 50 C	32 (30.2%)	1 (0.8%)	0	3 (13%)	5 (20%)
	c. 65 C	**35 (33%)**	**117 (91.4%)**	**16 (80%)**	**16 (69%)**	**14 (56%)**
	d. 100 C	2 (1.9%)	5 (3.9%)	4 (20%)	1 (4.3%)	0
	e. Do not know	13 (12.3%)	2 (1.6%)	0	0	2 (8%)
3.20 When you suffer fever, diarrhoea, or vomiting, will you:	a. Continue working normally	7 (6.5%)	2 (1.6%)	1 (5%)	1 (4.3%)	0
	b. Report Ministry's employees	**25 (23.4%)**	**100 (78.1%)**	**12 (60%)**	**12 (52%)**	**14 (56%)**
	c. Go to doctor then continue working normally	72 (67.3%)	19 (14.8%)	3 (15%)	10 (43%)	10 (40%)
	d. Afraid to report because they stop your work without salary	2 (1.9%)	7 (5.5%)	3 (15%)	0	0
	e. Do not know	1 (1.9%)	0	1 (5%)	0	1 (4%)
3.21 What do you understand by "Hazard Analysis critical control Points" (HACCP) ?	a. Food safety system by using computer	4 (3.8%)	4 (3.1%)	1 (5%)	1 (4.2%)	1 (4%)
	b. Process control	17 (16%)	7 (5.5%)	3 (15%)	1 (4.2%)	2 (8%)
	c. Temperature control	7 (6.6%)	12 (9.4%)	2 (10%)	5 (20.8%)	3 (12%)
	d. System to ensure safe food by identifying and controlling specific hazards	**69 (65.1%)**	**104 (81.3%)**	**16 (80%)**	**14 (85.3%)**	**17 (72%)**
	e. Don't know	9 (8.5%)	1 (0.8%)	0	3 (12.5%)	2 (8%)
3.22 Smoking is unacceptable practice in kitchen because	a. Cigarettes smell may transfer to food	4 (15.8%)	20 (15.5%)	2 (10%)	4 (16%)	0
	b. Bacteria in mouth may transfer to figures thus to food	17 (12.9%)	3 (2.3%)	1 (5%)	4(20%)	2 (8%)
	c. It may cause fire in kitchen	7 (20.8%)	3 (2.3%)	1 (5%)	1(4%)	1 (4%)
	d. Al of the above	**69 (43.6%)**	**103 (79.8%)**	**15 (75%)**	**13 (52%)**	**19 (76%)**
	e. Do not know	9 (6.3%)	0	1 (5%)	2 (8%)	3 (12%)

Table 5-8 A full description of food handlers (group 3) answers for knowledge questions after intervention

5.1.3 Food Safety Practices

There was an improvement in group 3 behaviours after training program (P<0.001). The control group also reported a good practices but without any improvement in the second test.

a- Intervention group

- **Results as a whole group:** In general, the majority of the respondents showed high awareness with regard to hygiene practices even before the training. The mean scores for the questions was 8.7 /10 (87%), 9.7 /10 (97%) for the pre training, and post training respectively (Table 5.9). Despite the initial high scores in the respondents behaviours, the nonparametric test used here (Kruskal Wallis) showed a significant difference between both surveys (*p-value* $\leq$ *0.05) (*Table 5.10). The self-reported hygienic practices indicated that more 90 % of participants in the first survey washed their hands before touching unwrapped food and this percentage increased to about 100% after the training (Table 5.12). Also, before the training 83.8% of the food handlers always wore caps when they prepare unwrapped foods. This percentage improved to 97.7% after the training. However, only 60% the respondents said they were always using thermometers to check food and although this improved to 92% after training.
- ***Chest and Rehab Results only:*** staff in both hospitals reported very good practices. There was no difference between the participants level in both hospitals. The mean of total scores improved slightly from 8.8/10(88%) before the training to 9.5/10 (95%) and then it was stable same in the third test (Table 5.11).

b- Control Group :

This group had a good standard in hygiene section. The mean score was 8.8 (87%) which was the same as the intervention group had before training (Table 5.9). No significant differences noted between the first test and the second one in control

group. Also no significant differences between the control group and the intervention group before the training. There was a significant difference between the control group and the intervention one mainly in the post training test (Table 5.10). In general, the control group practices reported the same one in the intervention group. Also, they had reported poor temperature control as only 56% of this group participants used the thermometer always (Table 5.12).

	Intervention Group			Control Group	
	Pre training	Post training	After six months	First test	Second test
Minimum score	**4/10**	**4/10**	**7/10**	**4/10**	**3/10**
Maximum score	**10/10**	**10/10**	**10/10**	**10/10**	**10/10**
Mode	**10**	**10**	**10**	**10**	**10**
Mean scores	**8.7(87%)**	**9.7 (97%)**	**9.5 (95%)**	**9 (90%)**	**8.8(88%)**
St. deviation	**1.6**	**0.82**	**0.74**	**1.5**	**1.5**
Kruskal-Wallis		***p-value < 0.05***		***p-value >0.05***	

Table 5-9 The mean scores of the food safety practises for group 3

	Intervention Group Pre training	Intervention Group Post training	Control group First test	Control group Second group
Pre training	*X*	*p-value 0.00*	*p-value >0.05*	*p-value 0.05*
Post training	*p-value 0.00*	*X*	*p-value 0.00*	*p-value 0.00*
After six months	*p-value :0.00*	*p –value :0.00*	*p-value 0.00*	*p-value 0.00*

Table 5-10 the differences between three surveys in practices part (group 3)

	Practices mean before the training	Practices mean after the training	Practices mean after six months
Chest Hospital	9.2/10 (92%)	9.5/10 (95%)	9.7/10 (97%)
Rehab Hospital	8.6/10 (86%)	9.4 /10(94%)	9.3/10 (93%)
Both hospitals as an one group	8.8/10(88%)	9.5/10 (95%)	9.5 /10(95%)

Table 5-11 The mean scores of the food safety practises for group 3 (Chest and Rehab hospitals only)

Questions	Choices	Intervention group's replies n. (valid %)			Control group's replies	
		Pre training First test	Post training second test	Third test after 6 months	First test	Second test
3.23 Do you wash your hands before touching unwrapped foods?	Always	100 (90.0%)	128 (99.2%)	20 (100%)	23 (92%)	24 (96%)
	Sometimes	10 (9.1%)	1 (0.8%)	0	2 (8%)	0
	Never	0	0	0	0	1 (4%)
3.24 Do you use mask when you prepare or distribute unwrapped foods?	Always	102 (94.4%)	126 (100%)	18 (85%)	23 (92%)	21 (84%)
	Sometimes	4 (3.7%)	0	2 (15%)	2 (8%)	4 (16%)
	Never	2 (1.9%)	0	0	0	0
3.25 Do you wash your hands after touching unwrapped foods?	Always	99 (92.5%)	126 (97.7%)	20 (100%)	22 (88%)	22 (88%)
	Sometimes	6 (5.6%)	3 (2.3%)	0	3(12%)	3 (12%)
	Never	2 (1.9%)	0	0	0	0
3.26 Do you wear a cap or head covering when you prepare or distribute unwrapped foods?	Always	93 (83.8%)	125 (98.4%)	20 (100%)	22 (88%)	21 (84%)
	Sometimes	5 (5%)	2 (1.6%)	0	3(12%)	1 (4%)
	Never	2 (2%)	0	0	0	3 (12%)
3.27 Do you use a thermometer to monitor the temperature of food?	Always	63 (60.6%)	118 (92.2%)	16 (75%)	15 (60%)	14 (56%)
	Sometimes	24 (23.1%)	5 (3.9%)	4 (25%)	5 (20%)	9 (36%)
	Never	17 (16.3%)	4 (3.1%)	0	5 (20%)	2 (8%)

Table 5-12 Group three answers for the practices questions

5.1.4 Attitude

a- Intervention Group

- ***Results as a whole group***: The results showed a positive attitude of the food handlers before the training, and after the training. The mean scores of both tests were 19.8/25 (79.2%), 21.1/25 (84.4%) respectively (Table 5.13). The Kruskal Wallis test indicated that there was a significant difference between both tests (*p-value* < *0.05*) (Table 5.14). The majority of staff had a positive attitude in the three surveys. However, some attitude changed after the training. For example, in statement 3, about 40% of the food handlers said it is highly possible that *hospital patients may die as a result of eating food that was not hygienically prepared.* This attitude supported by 70% of the respondents after the training (Table 5.16). On the other hands, some attitudes were stable pre and post the training. For instance, before the training about 42% the respondents strongly agreed that their behaviour during food preparation is more hygienic when their supervisor is present and this percentage was almost steady after the training.
- ***Chest and Rehab Hospitals Results:*** in Chest Hospital, staff showed positive attitudes toward good practices before the training with mean scores of 20.2/25 (80.8%). After the training this percentage dropped to 66%. This because of a number of participants in here did not complete answering all this part's questions. In the third test, the mean scores increased to 19.8/25 (79.2%). In Rehab hospitals staff also showed positive attitudes in all statements (Table 5.15).

b- Control Group

As the intervention group, these group members had positive attitudes in most statements. The mean score was 19.4 (77.6%) which the same one in the intervention group before the training and also after six months (Table 4.13). There was no significant difference between

the first test and the second one result in the control group as no improvement was noted. A significant difference was observed between the control group and the intervention group after the training (Table 4.14).

	Intervention Group			Control Group	
	Pre training	Post training	After six months	First test	Second test
Minimum score	**3/25**	**5/25**	**13/25**	**14/25**	**10/23**
Maximum score	**25/25**	**25/25**	**24/25**	**24/25**	**23/25**
Mode	**21**	**21**	**18**	**21**	**21**
Mean scores	**19.8 (79.2%)**	**21. 1(84.4%)**	**19.4 (77.6%)**	**17.3 (69.2%)**	**19.4 (77.6%)**
St. deviation	**2.9**	**2.8**	**3.1**	**6.9**	**3.05**
Kruskal-Wallis		***p-value < 0.01***		***p-value >0.05***	

Table 5-13 the mean scores of group 3 attitudes

	Intervention Group Pre training	Intervention Group Post training	Control group First test	Control group Second group
Pre training	X	*p-value : 0.00*	*p –value : >0.05*	*p –value : >0.05*
Post training	*p- value : 0.00*	X	*p –value : 0.00*	*p –value : >0.00*
After six months	*p-value : 0.4*	*p –value : 0.03*	*p –value : >0.05*	*p –value : >0.05*

Table 5-14 The differences between the group 3 attitudes in the during the three tests

	Mean scores of attitudes before the training	Mean scores of attitudes after the training	Mean scores of attitudes after six months
Chest Hospital	20.2/25 (80.8%)	16.6 /25(66.4%)	19.8/25 (79.2%)
Rehab Hospital	20.1/25 (80.4%)	19.1 /25(76.4%)	19.1/25 (76.4%)
Both hospitals as an one group	20.1/25 (80.4%)	18.1/25 (72.4%)	19.4 /25(77.6%)

Table 5-15 : the mean scores of group 3 attitudes (Chest and Rehab hospitals only)

Questions	Answers	Intervention groups replies n. (valid %)			Control's group	
		Pre training (First test)	Post training (second test)	Third test (after 6 months)	First test	Second test
3.28 I believe that carrying out good hygienic practice at all times during food preparation is :	1. Very important	97 (92.4%)	116 (93.5%)	12 (60%)	19 (76%)	21 (84%)
	2. Important	6 (5.7%)	6 (4.8%)	7 (40%)	3 (12%)	1 (4%)
	3. Neither important or not	2 (1.9%)	2 (1.6%)	1 (5%)	0	2 (8%)
	4. Unimportant	0	0	0	0	0
	5. Very unimportant	0	0	0	0	1 (4%)
3.29 I believe that carrying out good hygienic behaviour at all times during food preparation can help to prevent food borne illness	1. Strongly agree	75 (74.3%)	110 (91.7%)	17 (85%)	18 (72%)	18 (72%)
	2. Agree	19 (18.8%)	9 (7.5%)	2 (10%)	3 (12%)	5 (20%)
	3. Neither agree nor disagree	0	0	0	0	1 (4%)
	4. Disagree	1 (1%)	0	0	1 (4%)	1 (4%)
	5. Strongly disagree	6 (5.9%)	1 (0.8%)	1 (5%)	0	0
3.30 It is possible that hospital patients may die as a result of eating food that was not hygienically prepared	1. Highly possible	42 (41%)	86 (70.5%)	5 (25%)	2 (8%)	6 (24%)
	2 . Possible	41 (39.8%)	30 (24.6%)	7 (35%)	14 (56%)	10 (40%)
	3.Neither possible or not	6 (5.8%)	4 (3.3%)	0	4 (16%)	4 (16%)
	4.Impossible	7 (6.8%)	1 (0.8%)	1 (5%)	0	4 (16%)
	5. Highly impossible	7 (6.8%)	1 (0.8%)	7 (35%)	0	0
3.31 I believe that my behaviour during food preparation is more hygienic when my supervisor is present	1. Strongly agree	43 (42.2%)	56 (45.9%)	2 (10.5%)	7 (28%)	14 (56%)
	2. Agree	38 (37.3%)	34 (27.9%)	10 (52.6%)	12 (48%)	5 (20%)
	3. Neither agree nor disagree	2 (2%)	14 (11.5%)	2 (10.5%)	0	0
	4. Disagree	7 (6.9%)	2 (1.6%)	0	2 (8%)	6 (24%)
	5. Strongly disagree	12 (11.8%)	16 (13.1%)	5 (26.3%)	1 (4%)	0
3.32 I intend to carry out good hygienic practice at all times during food preparation	1. Extremely likely	68 (66%)	111 (90.2%)	19 (95%)	16 (64%)	20 (80%)
	2. Likely	34(33%)	7 (5.7%)	0	3 (12%)	3 (12%)
	3.Neither likely nor unlikely	1 (1%)	1 (0.8%)	1 (5%)	1 (4%)	2 (8%)
	4. Unlikely	0	4 (3.3%)	0	1 (4%)	0
	5. Extremely unlikely	0	0	0	1 (4%)	0

Table 5-16 Group 3 beliefs and attitudes

5.2 Intervention Study Discussion

This section discusses the influence of training on foodservices knowledge, practices and attitudes. Group three demographic slightly changed over the couple years of the data collection period (Table 5.1). This change was expected due to the length of data collection period and also to normal staff movement and turnover. Catering companies run usually across several hospitals and some companies move an employee to cover any staff shortage. However, to replace or change any employee an approval should be taken from the MOH's supervisors (Article 4-1-16, nutrition contract, MOH 2011). Workers also could be excluded by the MOH's staff. This action is usually taken when a very poor behaviour committed.

5.2.1 Second Assessment for the intervention group (after the training program)

All staff who participated in the first test were asked to attend a specially developed training program described in section (3.6). The participants were assessed after one month post training. A few staff, who enrolled the training program and participated in the second test, did not participate in the first survey as they were on their annual holidays during the first data collection time. Some also were new and received their jobs after the first survey. Therefore, some data has slightly changed in the demographic characteristics part. For example, about half of the food handlers were under 24 years in the second stage comparing to only 19% in the first test and that was due to the new staff who participated only in this stage. The percentage of participants who hold degrees declined to 11%. Three quarters of the respondents said they attended only elementary schools. This may indicate that, catering companies tend to employ staff with low education level to reduce the cost. However, the nutrition contract doesn't required high qualifications to occupy food handlers jobs comparing with the professional jobs such as nutritionists and dieticians (Act 4.2, MOH Nutrition contract). This statute, indeed, might need to be reviewed for several reasons. Work

environment in healthcare institutions requires criteria that may slightly differ than other places. In general, specific standards for hospitals that related to education, training, and awareness of emergencies and disasters are requested from healthcare staff. All hospitals staff should have fundamental skills and knowledge to provide patients with best services and as well to secure their life. These skills need to be developed frequently; hence, employees are required to pass various courses and training programs such as those related to patients health and safety. Therefore, hospitals staff, including foodservice staff, should have a suitable education level to meet their job requirements. In Saudi's hospitals, English is the first language besides Arabic. Nutrition contract requires all foodservices staff to speak both languages (Act 4.2, MOH nutrition contract), but this term is not applied properly. A number of workers were unable to participate in the questionnaires or the attending training program as they were illiterate. Illiterate workers will definitely face difficulty when they attend any other hygiene courses.

It is clear that, staff knowledge improved significantly after attending food safety training (Tables 5.5 and 5.8). This improvement should influence their practices and attitudes. In our findings, the total mean scores for staff who attended the training course improved from 36.9% to 75.4%. However, question 3.15 had a low improvement. Respondents were still confused about how they recognise food contaminated with pathogens though it this point was explained carefully during the training program. Park, *et al*, (2010) has reported the same result as the level of knowledge improved significantly. However, the improvement did not include all the three hospitals. Rehab hospital did not get a significant improvement. This is discussed in later in this chapter.

In this study, the self-reported food hygiene practices and staff attitudes results indicated also a significant improvement in the three hospitals. Although staff reported high scores in these

parts before the training course, both parts improved after the training. The total scores of staff behaviours improved from 8.7(87%) to 9.7(97%) while the attitudes changed from 19.8 (79.2%) to 21.1 (84.4%). Question 3.27 was improved significantly (Tables 5.9 and 5.12). Before the training about 60% of the respondents said they always use thermometers to check the food temperature. This percentage increased to 92% after the training. Staff attitudes also improved. Only question 3.31 did not improve, most staff still believe that, their behaviours will be more hygienic in present of their supervisors. This point could pose a risk to patient's health. As mentioned above, hospitals kitchens are working 24 hours per day all year, so it is difficult to supervise food processing all the time especially at public holidays. In addition, the sample showed a lack of food safety management in some parts such as records and documentation. Training staff on food safety principles and then educating them to control their behaviour is an important step to improve this point.

As mentioned before, the results of the behaviour survey are based on self-reports and not actual observations. Therefore, these findings could support the possibility that staff assessed their food safety behaviours as higher than their real situation. Park, *et al*, (2010) examined the extent of improvement of food safety knowledge and behaviours of foodservices staff through food safety training. They found that, staff knowledge improved significantly after the training program. Nevertheless, they did not observe any significant difference in staff behaviours between the pre and post training as the scores of this part rated highly (103 points in the pre-test and 102 points in the post-test of 125 points, equivalent to 81.9%). They concluded that employees may evaluate their practices as higher than their actual practices deserved. A similar result has been reported by Tokuç, *et al, (*2009). Food handlers answered their behaviours toward food-borne illness prevention as always in terms of use of gloves, washing hands and use of protective clothing in work. Here however the improvement was significant in staff knowledge, behaviours and attitudes. This data supports that the idea that

training will have a positive effect on all three parts; knowledge, behaviours and attitudes and this can be demonstrated clearly when the baseline standards are low enough to allow a measurable improvement.

5.2.2 The Influence of Food Safety Training on Staff's Knowledge, Practices and Attitude

There is an argument regarding the effect of training on food handlers' knowledge, practices and attitudes. In some previous studies, no differences were detected in staff knowledge, behaviours and attitudes after food safety training. A number of studies have reported that although training could improve knowledge of food safety this does not always increase food handler practices (Jevsnik, *et al*, 2008, Bas *et al*, 2006). Acikel, *et al*, (2008) evaluated the level of information and attitudes of 83 staff handling food at hospitals kitchens pre and post training. They found no differences in the participants' attitudes on the one month post training check and the only attitude that has changed positively was towards 'wearing jewellery and watches'. Also, Park, *et al*, (2010) investigated the sanitation performance for an intervention group before and after training. They found no statistically significant differences although the performance scores increased from 57.2 to 63.7 after the training. They concluded that food safety training is no more than a knowledge-delivery; and therefore does not usually improve staff practices.

Food safety training might be useless in some cases. Courses which are poorly designed and delivered, ignoring trainees' differences and needs may not achieve the desired improvement. Tokuc, *et al, (*2009) suggested that training of food workers is more likely to be successful in changing food hygiene behaviours if it is based on a deep understanding of learning and behaviour change theories. Ehiri, *et al*, (1997) indicated that designing food safety training with the only purpose of producing certificated employees is unlikely to change food hygiene

behaviour. They suggested that knowledge alone may be inadequate to improve safe practices and positive attitudes. This situation has been observed in our study. One foodservices supervisor in one of our sample hospitals said that "we just implemented HACCP system and we are now trying to obtain ISO22000 certificate", while the food safety management system in that hospital, indeed, was not sufficient. Staff were not trained well to deal with HACCP system.

Workplace hygiene training is a more beneficial way to deliver training. In our study, the participants were educated and trained in the hospitals kitchens. The training course included different methods such as practical training, groups work as well as using short videos. Worsfold *et al*. (2004) believed that the training on job will improve behaviour change. In an evaluation of a fast food management training programme, Jackson *et al* (1977) pointed out that management training could be effective if it is supported by the managers, delivered on a continuous basis, and includes regular follow-up.

In this study, the awareness of the importance of training was promoted. This can be seen clearly in our results (Table 5.3). Before the training about one quarter of the staff said they had not received any food safety training. Also one quarter said they did not receive any motivation or support from their managers to attend training courses. This percentage decreased to almost 3% in both questions after the training. However, there are no official institutes in Saudi Arabia providing this particularly type of training. Food safety training is not mandatory yet; therefore hospitals may use unofficial trainers to provide staff with the required courses. The local authorities in Saudi Arabia, such as Food and Drug Authority and Ministry of Health, should amend the constitution relating to food safety. Food safety training must be included as a prerequisite before enrolling any work related to food public health. This should include all types of business providing foodservices to the public. Also it is

necessary to establish governmental organizations that responsible for organising and evaluating the quality of food safety course such as the Royal Environmental Health Institute of Scotland (REHIS) and the Chartered Institute of Environmental Health (CIEH) in the UK. Commercial institutes that provide food safety courses should be under the supervision of these governmental organizations.

The impact of the training on the intervention group can be observed clearly (Table 5.8). Before the training in Q3.12 about half of the food handlers thought that the benefit of using gloves was just to protect food from contamination and only 39% answered it correctly. After the training, the correct answers improved and more than 64% replied correctly. Also, in Q3.17, which was about cooking temperature, there was an obvious improvement in the second test (82.9%). Before the training, 3.7% of the participants said that they would reuse cooked food to reduce the cost on the caterer even if they doubted its safety. However, this percentage dropped to zero in the second test. Question 3.20 demonstrated that, although most gave the correct answer, 1.9% of the respondents in the first survey tried to hide their illness because they were afraid to be suspended without salary. This percentage increased to 5.5% in the second test. In Q3.15, about 40 % of food handlers before training said that they can recognise contaminated food by smelling it and while this had decreased after the training, still 20% were making this error. Only about 10% of respondents answered this question correctly before the training and 19% after the training. This means that 80% still did not understand that it is impossible to recognise contaminated food.

Our results indicate that food safety training has a positive impact on staff knowledge (Table 5.8). The same result has been reported by Acikel, *et al*, (2008) where a knowledge of food handlers was evaluated before, right after and a month after a food safety training. They found that, the level of knowledge right after and a month after the food safety training statistically significantly improved compared with the level before the training. They

concluded that, refresher training courses on food safety will maintain the level of knowledge high and increase the level of food handler's information. However, results of Acikel, *et al*, (2008) were inconsistent with our results in the self-reported behaviours as they did not report a difference between pre-training and post-training tests. In our study, although the staff reported high level of hygiene practices before the training, this level improved as well after the training. The total mean scores for all questions was 8.7 /10 (87%), 9.7 /10 (97%) for the pre training, and post training surveys respectively. An Egyptian study (El Derea, *et al*, 2008) conducted in hospitals and reported the same result. They showed that, food safety training improved foodservices practices as there was a significant difference between staff level before and after attending a developed training program.

As mentioned above, self-reported questionnaire could not reflect the real situation of the respondent as he/she would like to be seen as compliant. However, training program could identify any lack especially if the program contained a practical part in addition to a theoretical part. For example, in our study most of the employees stated they do wash their hands always, but during training when the researcher asked a number of volunteers to wash their hands all of them did it improperly.

Campbell and others (1998) reviewed a number of studies on this topic and reported that training still has a positive impact on growing food safety. The evaluation studies of food handler training provide evidence for the usefulness of food safety training programs in increasing knowledge of the right food safety behaviours. Six studies of the eight they have reviewed had a positive alteration in post-test measures (compared with pre-test measures) after involvement in a food safety training intervention. However, the previous study has recommended that, scheduled inspection (at least once annually) of food premises and selected community-based education programs, in addition to food safety training, can improve public knowledge of food safety and reduce the risk of foodborne illness.

The situation in Saudi Arabia is different. As mentioned before, food safety training is not obligatory for foodservices staff, so, there are no official schools that provide this type of courses. Catering companies will not spend money on training while it is not required. However, to meet international standards large food manufacturers and international food companies usually have their own food safety programs and instructors to train their staff. Some other catering companies, such as those working with the Ministry of Health, may use unaccredited schools to train their staff. This type of school is just a certificate selling option rather than providing proper training programs. Most of the participants in the first test said that they had received food safety training. This issue was investigated further. According to a foodservices manager, the training was delivered in Arabic, while most of the staff do not speak well. Another foodservices manager said that, the instructor came without a projector, gave the lecture orally and after finishing the sessions provided certificates to the staff without any assessment. This could not give positive results as the communication tool was absent. However, this unofficial training, which is used in Saudi's hospitals, may help as the staff showed positive attitudes toward good practices and thus may have an interest to learn more about food safety. Furthermore, some staff may have been trained before in their original countries. In group three, cross tabulation and Kruskal Wallis tests were used to compare the mean scores of knowledge, practices and attitudes based on question 3.8. This question asked the food handlers if they have received any training before. The results showed that, there were significant differences between said "Yes" and those who said "No". In the pre training stage, the mean scores of knowledge for staff who have received training was 5.2/13, while it was 3.6/13 for those who haven't received any training before. Glanz & Lewis, (2002) reported that knowledge is enhanced through education and training processes, which might be official or unofficial. However, in Buccheri1, *et al*, (2007) study, 20% of the respondents had attended educational course on food hygiene and foodborne disease. Those

who have attended at least one course had a significantly higher knowledge but only about risk associated to temperature control and preparation of food in advance.

The solution for this matter is between two governmental bodies in Saudi Arabia which are; The Saudi Food and Drugs Authority (SFDA) and The Technical Institutes and Vocational Training Cooperative (TIVT). The SFDA is a governmental authority responsible for regulating food law and controlling food industries in addition to drug and medical devices. It is also responsible for supervising license procedures for food, drugs and medical devices factories. The TIVT (for the Private Sector) is also a governmental body, but responsible for organising and supervising the training activities of the various private sectors in Saudi Arabia. This body also accredits training programs under its regulations. Until now most of the assessed training programs are in administration and computer field and no course have been approved in food safety yet. The SFDA is required to set a new food regulation that forces all food businesses to train their staff and links their licences with the staff training. If this regulation is applied, many schools will consequently provide courses in food safety and public health field. TIVT should then support these schools and also facilitate international institutes to participate in providing this type of training course. The TIVT also should assess these courses and review it then to verify from its outcomes.

5.2.3 Did the Food Handlers Maintain the Same Level After Six Months of Training?

Food handlers (group 3) in Chest and Rehab hospitals were assessed three times; before the training, after a month and six months later. As staff of these two hospitals were assessed three times, it was necessary to release their results and discussion as separate parts. This is to verify the impact of the training after six months and to see if the employees still have the same knowledge and practices that they learnt from the training program. The sample here was the same group of participants who had answered the questionnaire over the first two tests. However, the groups were not treated as matched pairs since some participates were missed in the second and third tests. No new participants were involved in these tests. Most of the respondents were males. The participants' nationalities were Bangladesh (75%), Philippine (15%) and Saudi Arabia (10%). As in the second survey, about three quarter of the participants had attained school education level only. Similar to the previous results, most of the respondents worked as waiters/waitress. About 13 (65%) received monthly salaries under 600 SR/month (about £100). Almost 80% of Rehab hospital's employees receive this salary. This income is considered very low in Saudi Arabia. With regard to questions 3.8, about 40% from Rehab hospital staff and half of Chest hospital staff said they did not receive any hygiene training in the first test. Almost two third of the participants from Chest hospital and 1/3 from Rehab hospital thought that their managers do not support them to attend food safety training (Q3.9). In the second test, 100% of the Chest hospital staff said they received training before while 92% of the Rehab said that. In the third test, which was six months later, 100% the food services staff in both hospitals stated that, they received training in food safety and their managers encourage them to attend food safety training programs. This indicated possible improvement in the food supervisors' attitude with regard to the food safety training.

The first survey showed food handlers had a very low knowledge level. The total mean scores was 4.1/13(31.3%). This level was similar in both hospitals as Chest hospital was 4.2(32.3%) and 3.8 (29.3%) in Rehab hospital. The lack of knowledge included all aspects of food safety as the most of them failed to answer the questionnaire questions correctly. Similar results have been reported among foodservice staff in hospitals in Italy, Iran and Turkey (Angelillo *et al*., 2001; Askarian *et al*., 2004; Bas, *et al*, 2005). On the other hand, staff in both hospitals reported very good practices and reported positive attitudes. However, in Chest hospital the level was slightly lower in the second test as a number of participants there did not answer all attitude questions.

After the training there was an improvement in the total mean scores of both hospitals (as one group). It increased from 4.1/13 (31.5%) to 6.7 (51.5%) after the training. Although there was a significant difference between both assessments, knowledge level was still unsatisfactory after the training. However, the staff in Chest hospital had a great improvement comparing with those in Rehab Hospital. It is clear to observe that, the mean scores of Chest hospital increased from 4.2(32.3%) before the training to 8.5 (65.4%) after the training, whilst staff knowledge in Rehab hospital increased from 3.8 (29.3%) before the training to 5.5 (43.3%) after attending the training. Although there was a significant difference between the knowledge mean scores in Rehab hospital, the level of staff remained poor. Poor improvement may due to some factors related to staff demographics. When the researcher was collecting the data he noted that, participates seemed very depressed in this hospital. Most of them talked about the salary issues. About 80% of staff there were given salaries under SR 600/month (£ 100). This situation could not support staff awareness about their jobs duties including food safety practices. With this income, staff will be forced to find another job to increase their salaries. Some of them could work in a poor environment which may

contribute to transfer several infectious diseases to hospital's patients when those staff serve the patients.

After six months the total mean scores in both hospitals (as one sample) remained at the same level. There was no difference in the mean scores of staff practices and attitudes after six months as they had a very good level. The total of knowledge scores also remained and there was no significant difference between the second test and the six month survey. It was 6.7/13 (51.5%) in the second test and reduced slightly to 6.1/13 (46.9%) in the third survey. Most of the staff's answers were same in the second test. As an example, in question 3.15, only about 10% of respondents answered this question correctly before the training. Although this percentage improved slightly to 19% after the training, it was remaining stable after six months. This means that, 80% still did not understand that it is impossible to recognise contaminated food. As mentioned above this level was still poor although the staff kept the acquired knowledge for more than six months post the training. Rehab hospital staff showed a little improvement comparing with the Chest hospital. The law level of Rehab hospital staff has affected the total mean scores of both hospitals. The mean scores of knowledge in Chest hospital decreased slightly from 8.5/13 (65.4%) after the training to 6.7/13 (51.5%) in the third test. This indicated that, staff could keep the acquired knowledge from training program and try to apply it. This could be improved by refresher training courses. In our study, all the participants, who answered the third survey, were trained. One study has shown similar results. Acikel, *et al*, (2007) have conducted an interventional study in Turkey that assessed 83 food handlers working in a number of hospitals before, right after and a month after a food safety training and with preliminary and final tests. The level of knowledge right after the training and a month later was found to be statistically significantly higher than the level before the training. Park, *et al*, (2010) noted that, the positive effect of training could be verified if the continuous and specific-aim of the training is provided to food handlers,

hygiene practices such as health checking, correct hand-washing, controlling of cross-contamination, or proper hygiene techniques might be easily improved.

5.2.4 Control Group Discussion

In this study the control group and the intervention group were used to assess the validity of training. This section will discuss and compare between the intervention group (as a whole group) and the control group with regard to their level of knowledge, practices attitudes. Third test were not included in the comparison as the control group was evaluated twice therefore, both groups should be treated equally. Food handlers (group 3) in Prince Salman hospital were selected as a control group. This hospital has similar conditions to the other three. It is under the Ministry of Health management and operated by a national catering company. Size and capacity are also the same as the Rehab hospital and Chest hospital. Although there was a difficulty to collect our data from this hospital, the same staff were included in the second test. Staff's demographics were mainly the same as other hospitals. Twenty five food handlers here (83.3% of the total staff) were involved. 72% were males, and only 24% were between 35-44 years old in the first test. This increased to half in the second test (Table 5.1). Like the intervention group, most of the food handlers were from the Philippines and Bangladesh. About ¼ were Indian and there were only two Saudis (females). More than half of the participants had attended elementary schools. Almost 40% of the participants were waiters/waitress. More than half of them received a salary between SR 1000/month (about £180) and 2000 SR (about £ 350). Approximately 84% of this group members said they received food safety training. This percentage improved slightly in the second test. This was same to intervention group where almost 85% said they received a training before. As mentioned before, the type of training delivered to staff was a basic training by unaccredited institutes. In question 3.9, about third of the respondents in the first

test stated that their managers do not advise them to attend food safety training, similar to replies from the Chest and Rehab hospitals. This percentage declined to 16% in the second test. Our results showed a significant difference between the control group and the intervention group with regard to staff knowledge, practices and attitude. However, in the first test staff's levels were mainly same in both groups and no significant differences were observed. In the second test, there was a significant improvement in the intervention group comparing with the control group. The control group's level was stable in both tests and the same as the first test. These conclusions are discussed in detail below.

a- ***Knowledge's questions*** :

Our results showed no significant differences between the staff in the first test ($p > 0.05$). The total mean scores for the control group was 5.6/13 (43.1%) while it was 4.8 (36.9%) for the intervention group. In the second test, there was a significant difference between the control group and the intervention group level. The total mean scores for the control group was almost the same (45.4%), while it improved significantly in the intervention group after attending training (Table 5.5). Results showed that the level of knowledge on food safety from the trained group improved more than that of the no-trained group. This is in line with a study that has used the same method to investigate the effect of training on food handlers. Park, *et al,* (2010), evaluated the extent of improvement of food safety knowledge and practices among food handlers in Korean restaurants. They split their sample into two groups as in our study: an intervention group with training, and a control group without food safety training. Results showed that knowledge on food safety from the trained group improved significantly compared to the control group (Park, *et al,* 2010). The improvement included knowledge on personal hygiene dimension, and handling methods on finished products service in food hygiene (Park, *et al,* 2010). Another similar study in Scotland reported

measurable difference between control and intervention groups. Ehiri, and others (1997), investigated the effectiveness of food hygiene training in Scotland using the same method. They used a training course of the Royal Environmental Health Institute of Scotland (REHIS) with the intervention group. They concluded that in some parts, the control group performed worse than the intervention group in the post-test, suggesting that no learning was occurring even as a result of repeating the test. Their study results did not show any statistically significant difference between the pre-test and post-test performance of the control group.

Consideration of specific key questions

- **Cross-contamination questions** (question 3.10, 3.11, 3.12 and 3.13- Table 5.8): in question 3.10, approximately 60% of the respondents in the control have selected the correct answer in the first test comparing with 44% before the training in the intervention group. In the second test, the percentage dropped to 36% in the control group, while it improved to 85% in the intervention group. About half of the respondents in the control group failed to know the importance of washing hands (question 3.11) in the first test comparing to two third of the intervention group. In the second test, this percentage increased in the control group and decreased significantly in the intervention one. Question 3.12 had the same percentage in both groups in the first test. However, it improved in the intervention group after the training and remained in the same level in the control group. Most of the control group respondents (70%) knew the important of the separation between raw and cocked food comparing with half of the other group in the first survey. In the second survey this percentage was slightly smaller in the control group, while it improved significantly in the experimental group. Our result in cross-contamination questions is different than the previous study (Ehiri, *et al*, 1997). They found that, the level of the intervention group in the area of cross contamination worsened

significantly after the training while the control group had a slightly better level in the post-test. This result reflects differences in the content or delivery of the training interventions used in each study. In the Ehiri's study, it is not clearly understood why course participants' knowledge related to cross contamination decreased after the training while it was slightly better for the control group. This could have been due to the approach that was used during the delivery of the training program. Information about cross-contamination could have been delivered insufficiently or maybe not given as much attention during the training. In our study we focused on cross-contamination during training program as an important cause of food poisoning. However, the performance of the intervention group in the Ehiri study was significantly better than that of the control group in all other tested areas of food safety.

- **Food microbiology question** (question 3.14 –Table 5.8): In this question about one third of the control group selected the right answer in the first assessment comparing with one quarter of the intervention group. Poor knowledge about food microbiology among food handlers have been reported by a number of studies such as Martins, e*t al*, (2012). In the second test, the percentage of correct answers increased in both groups. However, the improvement was greater in the intervention group than the control group. In the control one, about two third of the participants answered this question correctly comparing with 81% from the trained group. In the Ehiri, *et al*, (1997) study, the intervention group and control group were asked about certain food-borne disease pathogens. Five organisms (*Salmonella, Clostridium perfingens, Staphylococcus aureus, Campylohatter;* and *Listeria*) were included and were asked to indicate those they were aware. Almost all participants in both groups demonstrated a high level of awareness about *Salmonella and Listeria* and no significant differences were observed in the pre-test and post-test. However, the awareness about the three other pathogens varied.

- **Temperature control questions** (questions 3.17, 3.18 and 3.19- Table 5.8): This part was one of most the important in the questionnaire. As mentioned above, temperature control abuse was observed in all four hospitals. In general, the staff reported poor knowledge about temperature control in both groups in the first test. Several studies reported the same results among hospitals foodservices staff (Angelillo *et al*., 2001; Askarian *et al*., 2004; Bas, *et al*, 2005; Buccheri *et al*., 2007). In question 3.17, only one third of the control group knew the correct internal temperature for cooking chicken compared with half of the intervention group before the training. In the second assessment, the percentage decreased in the control group to one quarter. In contrast, there was a significant improvement in the intervention group after the training. In question, 3.18, almost 43% of the control group knew the right temperature for the refrigerators and one third from the other group did. In the second test this percentage increased substantially in the control group (52%) while it improved significantly in the intervention group where about three quarters of the participants replied this question correctly. In question 3.19, almost 69% of the control group respondents answered it properly in comparison with on third also in the intervention group. In the second assessment, this percentage decreased in the control group to 56%, while it was raised significantly in the experimental group (91%). The results reported by Ehiri, *et al, (*1997) indicated partly the same results to ours. Their results showed that the performance of the intervention group was significantly better after the training than that of the control group. However, in the previous study there was no significant differences in the control group between both tests (first and second) while in our study there was.
- **Food spoilage and contamination question** (question 3.15- Table 5.8): the awareness about this question was very poor in all groups in both tests. Also this question showed less improvement after the training comparing with other questions. Only about 4% and

10% of respondents (control group and intervention group respectively) answered this question correctly in the first assessment. This percentage improved slightly to 20% after the training in the intervention group, and dropped clearly in the control group to zero in the second test. Confusion about recognising spoilt food was reported in several studies some of which used the same question as used here (Martins, *et al*, 2012) , Gomes- Neves *et al*. (2007), Walker *et al*. (2003) and Jevsnik *et al* (2008) .

- **Questions about safety and hygiene procedures** (questions 3.16, 3.20 and 3.22 –Table 5.8). In the control group, 43% of the respondents indicated the correct answer and about half of the respondents in the intervention group answered correctly in question 3.16. In the second test, the percentage decreased in the control group while it raised substantially in the intervention group. In question 3.20, about half of the control group respondents said they will report illness to their managers. This percentage remained mainly stable in the second test. In the intervention group, only one quarter will report to their illness to their managers and this increased to three quarters after training. Similar result was reported by (Walker, *et al*, 2003). Greene *et al*. (2005) stated that, about 5% of the food handlers reported working while sick with diarrhoea or vomiting. In question 3.22, about half of the control group's participants in the first test knew that smoking is unacceptable in kitchen. Almost 43% of the respondents from the other group selected the correct answer in the same test. In the second test, there was an improvement in both groups and no significant difference was observed between them. There was a similar question to our question (Q3.22) in the study of Ehiri, *et al*, (1997). Their result showed no significant differences between the two groups in their responses as both groups showed high level of awareness about the danger of smoking in the kitchen.
- **HACCP question** (question 3.21- Table 5.8): there was only one question which concerned HACCP. This question was a general question about HACCP principles. Both

groups showed a high level of knowledge of HACCP principles. However, there was a substantial improvement in the intervention group level after the training comparing with the control group respondents. Similar result reported by Ehiri, *et al*, (1997). Their result noted that the number of respondents with awareness about HACCP in the intervention group increased from (27%) before training to (77%) after the training.

b- Practices questions

Our results showed that, staff had a high score in self-reported behaviours questionnaire. There was no difference between both groups in the first test ($p>0.05$) (Table 5.9). The mean scores for the control group was 9/10(90%) and 8.7/10(87%) for the intervention group. Although both groups showed a high level of good practices, there was a significant improvement after the training in the intervention group ($p <0.05$). After the training, the total mean scores for the intervention group increased to 9.7/10(97%) while those for the control group showed a minor decrease to 8.8 (88%). The study conducted by Park, *et al*, (2010) showed some different results. The scores of food handlers' practices showed similar levels in the intervention group and control group in both tests. Food handlers in the previous study obtained high scores in the self-reported questions (81%) and no significant difference between the pre and post training was observed. However, in that, study food safety practices of the intervention group showed minor positive changes, but not significant improvement compared with the control group who did not demonstrate any changes in the first and second test ($p > 0.05$). Park *(*2010) pointed out that, although there was a significant increase in the intervention group's knowledge, this was not reflected in the behaviour score in spite of the initial high results in sanitation behaviour. Park *(*2010) concluded that this result supported the possibility that foodservices staff may evaluate their behaviours higher than their real practices deserved. In our study this could be partly right. Staff could have overstated their answers as they obtained high scores. However, after the training the level of practices

improved significantly in all elements of the intervention group while it remained the same in most elements of the control group (although it was high). Nevertheless, practices in general need to be assessed by observation in addition to a questionnaire method. This is because it is difficult to measure the real behaviours without observation as staff could rate themselves more highly in comparison to what is actually seen in reality. Therefore, the true impact of the training could be seen as somewhat incomplete at this part of the study.

c- Attitude questions

Our results showed that, foodservices staff had positive attitudes regarding food hygiene issues. Both groups (control and intervention) obtained high level initially, although of the intervention group's attitudes had a significant improvement after training ($p< 0.01$). The mean scores for the intervention group was 19.8 (79.2%) before the training and increased to 21.1(84.4%) after (Table 4.13). In contrast, no significant difference was observed in the control group. The level of the control group was the same as the intervention group's level before the training. This indicates that, food safety training can also affect staff's attitudes. A similar result was reported by Ehiri, *et al*, (1997) since they did not detect any improvements in the control group's knowledge, attitudes and opinions in the pre and post-tests. Other study investigating food handlers attitudes found that the majority of the study samples have positive believes regarding food safety and hygiene (Oinee and Sani 2011).

Chapter 6: Conclusion

6.1 Introduction

Providing safe meals for the public is considered a challenge for food operators mainly for those who do not implement food safety management systems properly. The challenge would be greater in the healthcare sector where most of the consumers there have less immunity than the other normal individuals. In Saudi Arabian hospitals, food safety and hygiene issues have become important. Recently, HACCP system became compulsory in the governmental hospitals which are managed by the Ministry of Health. Therefore, the hospitals nutrition contract has been amended to be fit with the new regulations. The new regulations require all hospitals catering companies to provide their services in accordance with HACCP system. Supervision on this system is a sharing responsibility between catering companies staff and food supervisors who work for the Ministry of Health. Foodservices staff, therefore, play an important role in developing food safety management systems. However, implementing HACCP system could face a number of barriers such as lack of pre-requisites programs and staff knowledge. Coinciding with implementing this system, the hygiene status of Saudi hospitals needs more investigation. Staff also need to be assessed with regard to food safety and hygiene knowledge, practices and attitudes. Food safety training is an important tool to increase staff's knowledge about food safety issues. Until now, training is not mandatory in Saudi Arabia. Therefore, it is important to highlight the importance of food safety training. Globally, HACCP implementation in healthcare sector needs more research. Limited studies were conducted in this area. The results of this study will be helpful for several bodies and organisations. National and international hospitals could use the results of the baseline study in HACCP implementation. The results of the importance of food safety training programs will be interesting to the Saudi Food and Drugs authority. Also, the results into the effect of the training within foodservices on staff knowledge, behaviours and attitude could be used by

national and international educational bodies to develop new programs in food the safety field.

6.2 General Aim

The aim of this study was to establish the extent to which PRP's are implemented in Saudi Arabian Hospitals. Also, this study investigated whether a bespoke hygiene training programme can improve the knowledge; self-reported behaviour and attitude of food handlers working in Saudi hospital kitchens.

6.3 Methodology

The study was designed in two parts. The first was as a survey of existing conditions which would act as a baseline for the Ministry of Health. The second part was an interventional study by using food safety training program on a sample of foodservices staff. The research sample of this study included four governmental hospitals in Saudi Arabia. Kitchens and about 300 foodservices staff in these hospitals were evaluated by using different types of audit form and questionnaires. Food services staff were divided in four groups: MOH staff (group 1), Caterers supervisors (group two), Food handlers (group three) and foodservices cleaners (group four). Each group had a different questionnaire. Group three were subject to the intervention (training). A developed training program was used to train a group of staff and those employees were reassessed again after the training. This to measure the impact of training on food handlers knowledge, practices and attitudes.

6.4 Results and Discussion

This study provides the Ministry of Health in Saudi Arabia with a useful database in regard to the current status of hospital food hygiene. The results convey useful information about HACCP and PRPs implementation for national and international hospitals. Also this study demonstrates important findings about the impact of training on the staff working within

foodservices. The baseline survey which was used to inspect the hygienic status of the hospitals kitchens showed important results about food safety procedure in those hospitals. In general, the hospitals kitchens have a reasonable structure and good facilities. Two hospitals were implementing a HACCP system. The hygiene status was same in all four hospitals. However, there was a lack in applying food safety management system. This included poor temperature control, absence of staff training and lack in records and documentation. Therefore, implementing PRPs must be reviewed before implementing HACCP system.

The baseline survey also showed that, food services staff had a poor knowledge about food safety. This included all four groups. No differences were observed between the staff in any participating hospitals. However, those staff indicated good practices and positive attitude with regard to food safety. The results reported a positive correlation between staff knowledge, practices and attitudes. One the other hand, the results have reported some variations between staff demographics characteristic in all groups. An association between some demographic characteristics of the staff and their responses were observed.

With regard to the intervention group, the result indicated that food safety training has a positive impact on staff's knowledge. The same result has been reported by (Acikel, *et al*, 2008). Food handlers knowledge, practices and attitudes were improved significantly after the training. The results showed that, there were significant differences between the level of knowledge, practices and attitudes before and after the training. This indicated that food safety training must be considered in all foodservices activities to ensure food safety.

6.5 Conclusion

As a conclusion, since there was a lack in pre-requisites programs, the HACCP system will not be implemented properly. Most foodservices staff had a limited understanding of the food safety systems. There is necessity that Ministry of Health to review the decision which

requires hospitals to implement HACCP system. This should be delayed until after improving the PRPs and as well staff understanding to ensure uniformity in the implementation of HACCP system. Nutrition contract terms needs to be reviewed mainly those which related to staff education background and training. Poor knowledge about food safety is the main factor restricting HACCP implementation and as well any other food safety system. The bespoke training program had a positive impact on staff knowledge, practices and attitudes. There was a significant improvement after attending the training program. The information gathered from this study suggests the necessity of improving staff knowledge and that will effect on staff practices and attitude positively. This will be only by applying a rigorous training program on all foodservices staff. The results here could be interesting to international food safety training bodies in developing and planning suitable training programs for hospital foodservices. It could also encourage national bodies to establish food safety training programs in Saudi Arabia. At the end, the first hypothesis which was: Hospitals in Saudi Arabia have implemented the PRPs and have a sufficiently high standard of hygiene to be able to successfully implement HACCP, is rejected. While the second one which was: A bespoke hygiene training programme can improve the knowledge; self-reported behaviour and attitude of food handlers working in Saudi hospital kitchens, is accepted.

6.6 Recommendations

As pre-requisites programs are not implemented properly in the selected hospitals, HACCP will not be implemented successfully. Therefore, MOH need to investigate the hygiene status in all other hospitals prior to include HACCP in Nutrition Contract. Food Safety and Hygiene department in MOH is required to visit hospitals foodservices departments and check the extent of the implementation of pre-requisites programs in those hospitals. Staff should have suitable knowledge about food safety in general. After acquiring the required knowledge, training on HACCP can be applied. Therefore, MOH should review Nutrition contract and

include staff training as a condition before starting work in foodservices. Training should include all foodservices staff who work for catering companies and as well as MOH staff. Also, catering companies should hire workers with appropriate education background. To support food safety training in Saudi Arabia in general, governmental authorities, such as SFDA and TVTC, should support establishing national and international schools that provide food safety training. Also they should set up a new regulation requires all food business to train their staff before starting work.

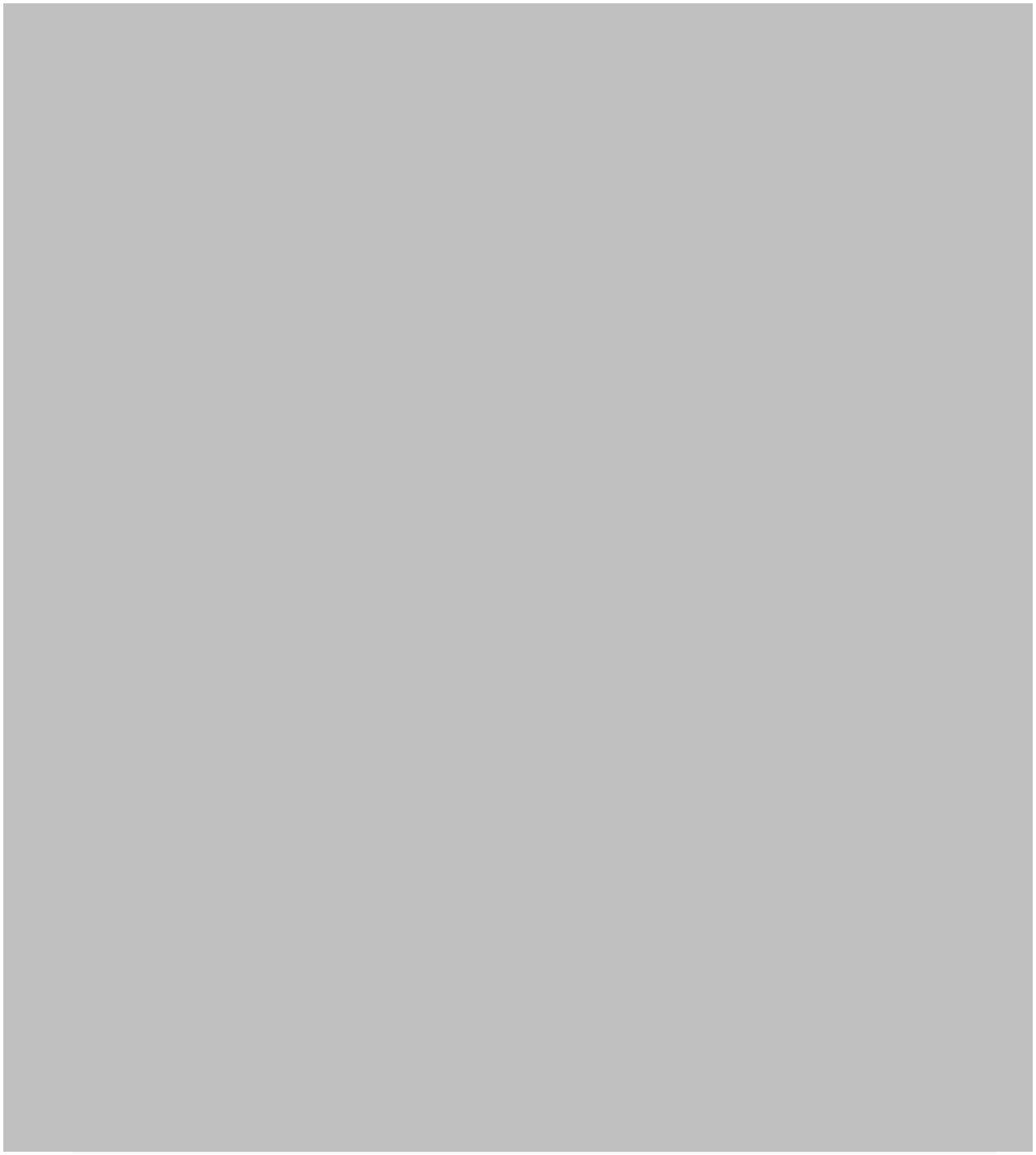
6.7 Future work

Although the results presented here have demonstrated the current status of hospitals food hygiene, more research is needed in this field. It is recommend applying the intervention on the foodservices managers and catering supervisors. This is by using a high level of training program such as training on HACCP system. This is because those supervisors showed poor knowledge in food safety. It could also use the observation method instate of self-reported questionnaires mainly to assess staff behaviours. As the Ministry of Health will have a copy of this research, this may support applying the observation method. This could be applied in small hospitals with low work's stress.

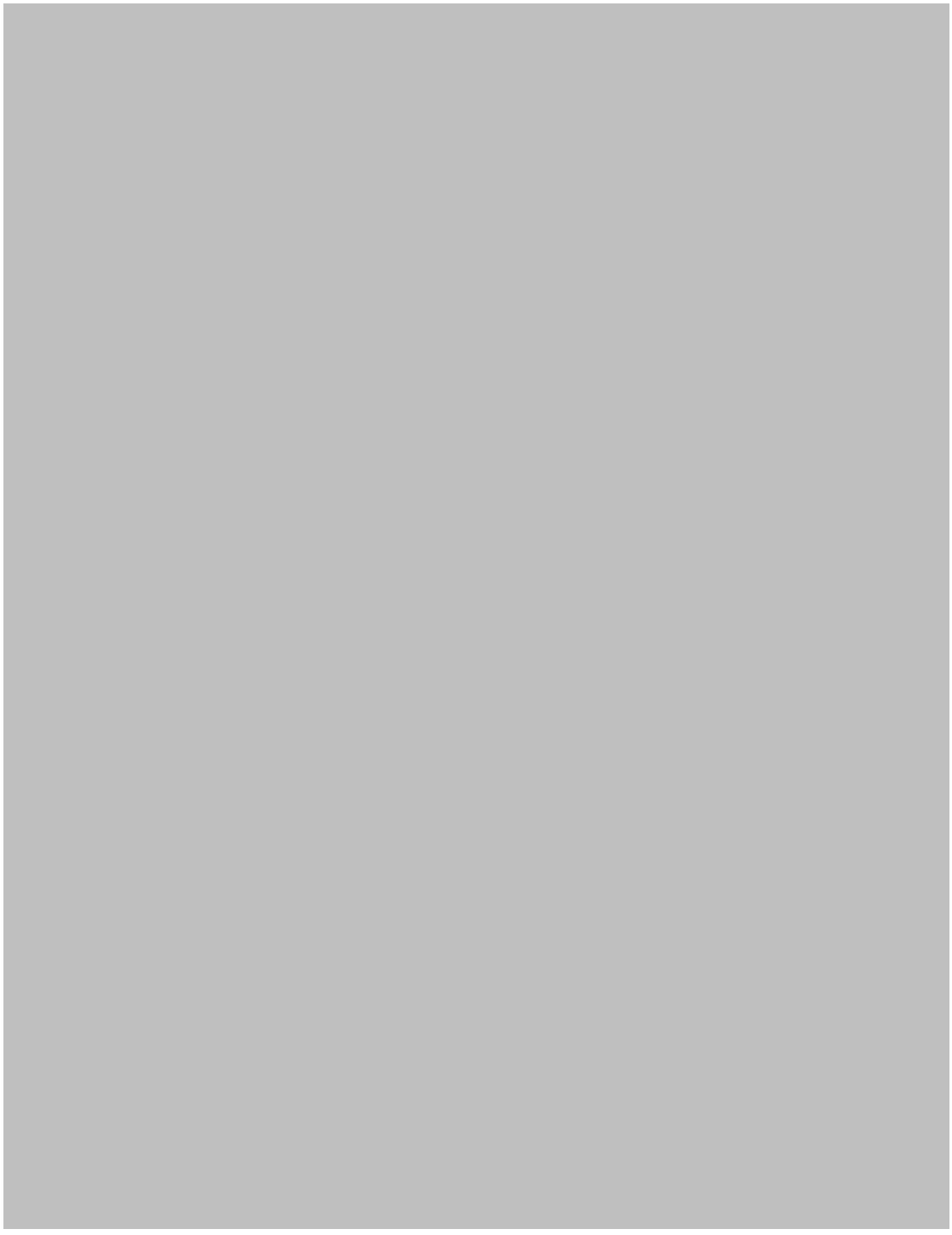
Hospitals in rural areas also need more focus. It is recommended to investigate some and compare between them with those in the cities. It is suggested also to include self-catering hospitals in future work. The self-catering system is mainly applied in the private hospitals and also in the semi-governmental hospitals. The nutrition contract (MOH) is not adopted in those type of hospitals. Therefore, the hygiene status of those hospitals needs more investigation.

Appendices

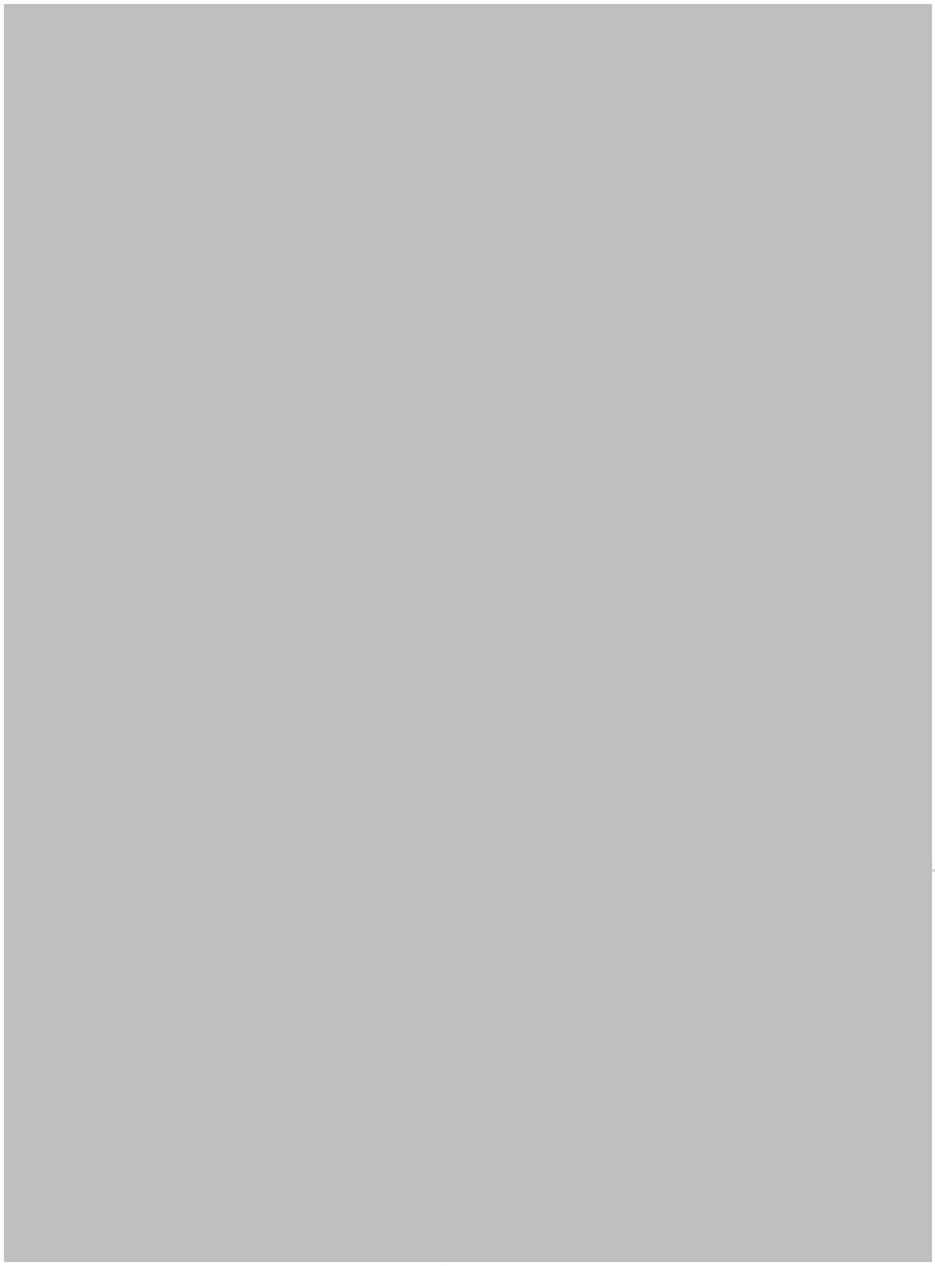
APPENDIX 1: ETHICAL LETTER



University of Birmingham Edgbaston Birmingham B15 2TT United Kingdom
w: www.eng.bham.ac.uk







APPENDIX 2: INFORMED CONSENT FORM (ENGLISH VERSION)

Informed Consent Form for Dieticians and Foodservices Staff

Thank you for taking an interest in this questionnaire. Before you start here is some information you should know.

- This questionnaire is a part of a Ph D study which is designed to determine the readiness of nutrition's departments in a number of Saudi's hospitals for implementing "Hazard Analyses Critical Control Point" (HACCP) system. In this research, we would like to obtain some information from the volunteers regarding food hygiene issues.

- There are no right or wrong answers to any of the following questions, simply try to ensure that your answers are as honest as possible. We will not be sharing information about your answers outside of the research team. The information that we collect from this research project will be kept confidential.

- Any data/ results from the study will be used for statistical purposes in the project. Questionnaires will be numerically coded to maintain anonymity; the completed questionnaires will be stored safely and not made available to anyone not directly involved in this project.

- At the end of this project, the Ministry of Health in Saudi Arabia will be provided with a copy of this research and the researcher undertakes in collaboration with the Ministry of Health to provide any further clarification.

- We are keen to receive your answers to this questionnaire so please feel free to contact us with any queries you may have on this email : [redacted]

- By signing this form you agree to take part in the study. Please note, however, that you are free to stop taking part at any time, without giving any reason, and your questionnaire will be destroyed.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this study.

Subject's signature _____Date _____

APPENDIX 2: INFORMED CONSENT FORM (ARABIC VERSION)

تعهد

يتعهد الباحث / محمد عبدالرحمن المحيذيف بما يلي :

- **جميع المعلومات والبيانات المتحصل عليها من عينة الدراسة ستكون سرية وسوف تستخدم فقط لأغراض إحصائية في هذا البحث العملي .**

- **لن يكون هناك أي افصاح من الباحث عن أي معلومات تدل على شخصية المشارك او مكان عملة ولمزيد من السرية سيتم ترميز الاستبيانات والأجوبة أثناء جمع المعلومات ، وللمشارك الحرية في الإشارة إلى اسمه أو التوقف عن الإجابة في أي وقت من دون أدنى مسؤولية منه .**

- **عند الانتهاء من البحث سيتم تسليم نسخه للإدارة العامة للبحوث الطبية بوزارة الصحة وذلك للاستفادة منها مستقبلا .**

- **يتعهد الباحث بالتعاون مع لجنة البحوث الطبية بتقديم أي إيضاحات مستقبليه تطلبها اللجنة بشأن خطوات البحث .**

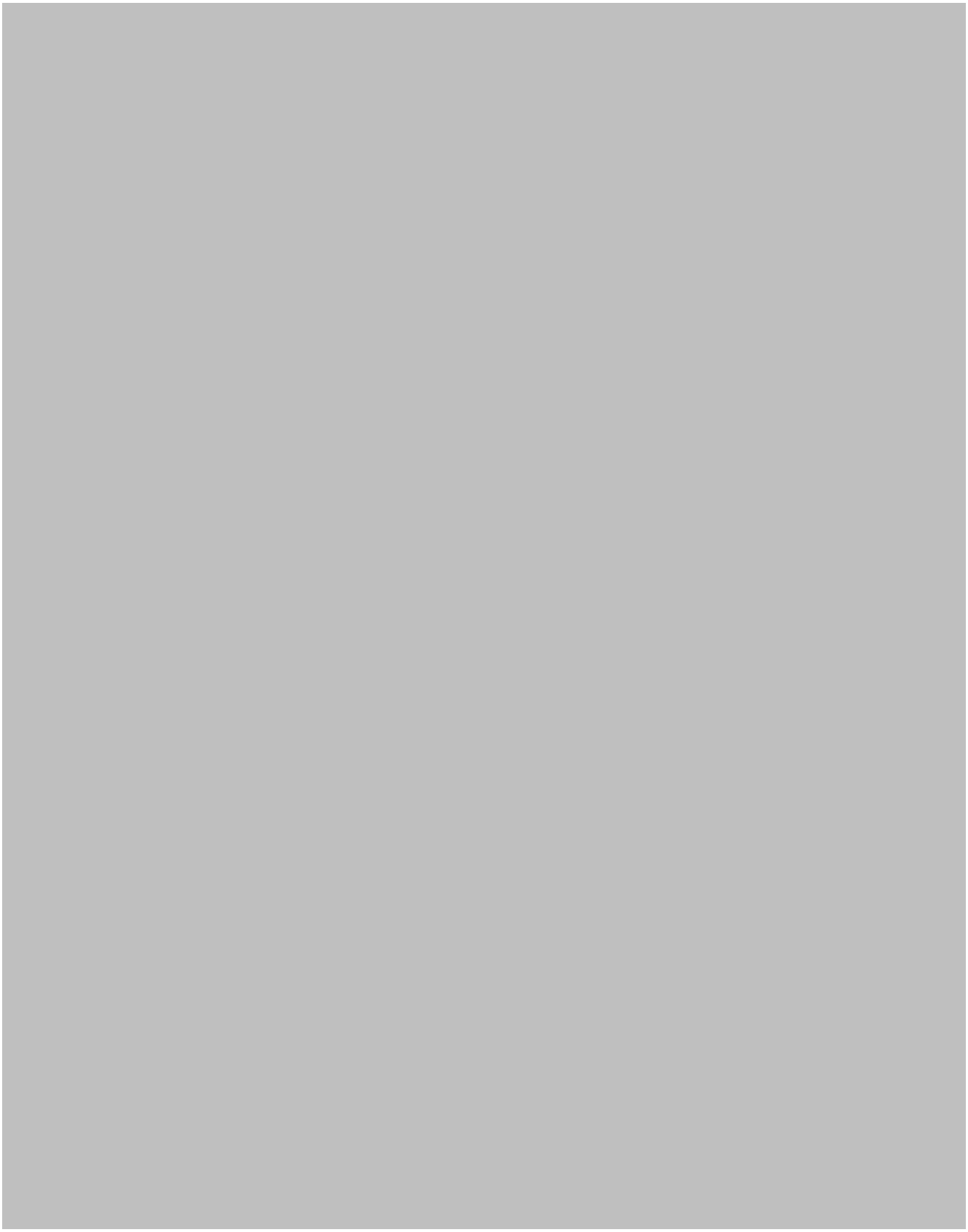
- **لمزيد من المعلومات او لوجود ملاحظات يرجى عدم التردد في مراسلة الباحث على الايميل التالي**

لقد قرأت المعلومات السالفة الذكر ، أو تم قراءتها لي. وقد أتيحت لي الفرصة لطرح الأسئلة حول هذا الموضوع وأنا موافق/ موافقة على المشاركة طوعا كمشارك في هذه الدراسة .

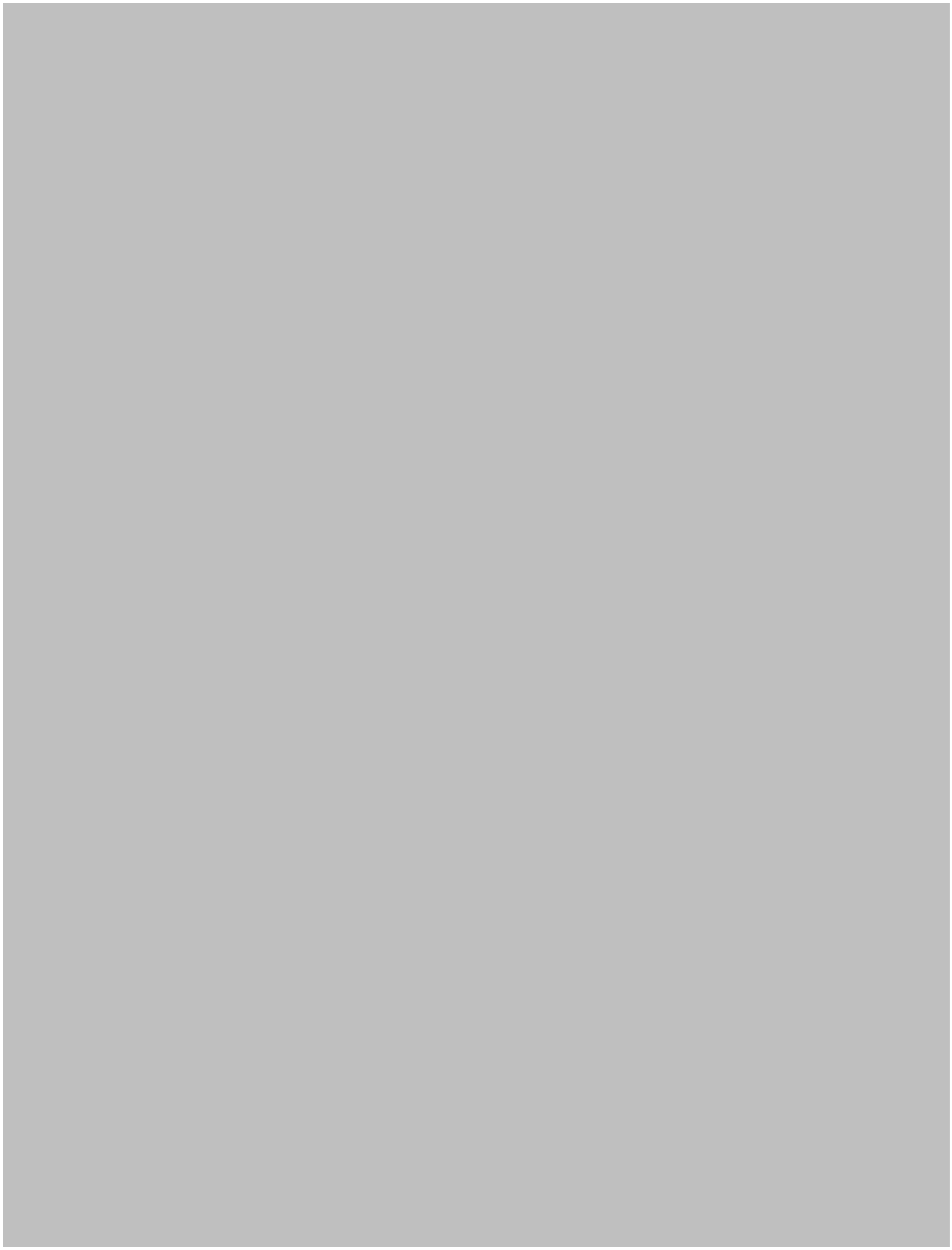
- اسم المشارك :_____ التوقيع _____

محمد عبد الرحمن المحيذيف
طالب دكتوراه – جامعة بيرمنجهام
بريطانيا

APPENDIX 3: THE DIRECTORATE GENERAL OF NUTRITION IN THE MINISTRY OF HEALTH LETTER FOR NOMINATING HOSPITALS



APPENDIX 4: THE AUTHORISATION LETTER ISSUED BY MEDICAL RESEARCH CENTRE IN THE MINISTRY OF HEALTH



Questionnaire for Group 1 (Foodservices Managers and Supervisors)

Thank you for taking an interest in this questionnaire. Before you start, here is some information you should know. This questionnaire is part of a project which is designed to determine the readiness of Saudi's hospitals for HACCP implementation by evaluating pre-requisites programmes in a number of hospitals in Riyadh region- Saudi Arabia. We are keen to receive your answers to this questionnaire so please feel free to contact us with any queries you may have. Please select one answer. Don't worry; there are no right or wrong answers to any of the following questions, simply try to ensure that your answers are as honest as possible.

Your responses will remain confidential and completely anonymous, so please do not write your name.

Thank you for your participation

M. Almohaithef

A- <u>Demographic characteristics</u>

1.1 Gender:

a- Male b- Female

……..……..……....

1.2 Age Group:

a- Under 24 b- 25-34 c- 35-44 d- 45-54 e- Over 55

……..…….……..

1.3 Nationality:

a- Saudi b- other (please classify) ……...……

……..……...…….

1.4- Position holder ……..

……..……..…….

1.5- Education and Qualifications:

a- Diploma (Sanitarian/ Food Technician) b- Bachelors (Home economy)

c- Bachelors (Food Sciences) d- Bachelors (Dietetics)

i. Other (please classify)…….

……..……..……

1.6- Years of Work Experiences

a- <5 b- 5-15 c- 15-25 d- >25

……

1.7- Do you think that HACCP can be successfully implemented in your department? Please justify

a-Yes b- No

1-……

2-……

……..

1.8 Do you think you need more information about HACCP implementation? Please justify

a- Yes b- No

1- …….

2-……

……..……

1.9- What do you think are the main contraventions regarding hygiene practices committed by staff?

1- …….

2-…….…...……

……

1.10 How do you think staff can be motivated to change hygiene behaviour?

1- ……

2- ……....

B. Knowledge

1.11- The most important factors to control the growth of bacteria are:

a- Light and oxygen
b- Time and temperature
c- Oxygen and temperature
d- None of these
e- I don't know

1.12- The optimum Water Activity (aw) that support the growth of most pathogens is

a- 1
b- 0.95
c- 0.75
d- 0
e- I don't know

1.13- Most pathogens are likely to grow at pH range of:

a- 1
b- 4-7
c- 2-4
d- Above 7
e- I don't know

1.14 - Hot ready to eat foods should be maintained in the Bain Marie at :

a- 25 C
b- 50 C
c- 65 C
d- 100 C
e- Do not know

1.15- The most common pathogens associated with chicken is:

a- Bacillus cereus
b- Vibrio Cholera spp
c- Campylobacter jejuni
d- Shigella spp
ii. I don't know

1.16- Why must food be cooled before refrigeration?

a- To avoid smell developing
b- To improve the quality of the food
c- The refrigerator temperature doesn't increase
d- To avoid cross contamination
e- I don't know

1.17- It is easy to recognise food contaminated with pathogens by:

a- Tasting it
b- Smelling it
c- Looking it (changes in colour and
d- None of these
e- I don't know

1.18- Food poisoning can be divided into two categories: intoxication or infection and the difference between them is :

a. Intoxication is caused only by the ingestion of high dose of pathogenic cells
b. Intoxication is caused only by the consumption of chemical toxins
c. Intoxication is caused by the consumption of microbial or chemical toxins
d. There is no different between them
e. I don't know

1.19- What is the purpose of HACCP plane?

a- To control specifically microbial hazards in food
b- To organise food preparation process
c- To reduce cost and effort in food production
d- To provide safe food by identifying a specific hazard and implementing measures to control it
e- I don't know

1.20- Principle 4 of HACCP, which concerns with monitoring procedures, requires:

a- Monitoring hygiene practices for all employees
b- Recording refrigerators and freezers temperatures
c- Monitoring activities to ensure that the process is under control at critical points
b. None of the above
a- I don't know

1.21- Verification ensures the HACCP plan is :

a- Adequate and working properly
b- Recording all CCPs
c- Using appropriate corrective actions
d- All of the above
e- I don't know

C. Duties and Responsibilities

1.22 – Do you inspect all deliveries and supplies which enter your department?

a. Always b. Sometimes c. Never

1.23 – Do you wash your hand before inspecting the new supplies?

a. Always b. Sometimes c. Never

1.124 - Do you wash your hand after inspecting the new supplies?

a. Always b. Sometimes c. Never

1.125– Do you wear gloves when you inspect food during preparation ?

a. Always b. Sometimes c. Never

1.126 - In emergency cases; such as food shortage, do you accept food with unapproved sources?

a. Always b. Sometimes c. Never

1.127 - Do you use thermometer to check cooked food temperature?

a. Always b. Sometimes c. Never

1.28 – Do you stop any employee working when suffering any of the following symptoms: diarrhoea, fever, vomiting, jaundice and sore throat with fever?

a. Always b. Sometimes c. Never

1.29 – Do you request all foodservices staff to wash their hand all hours of operations?

a. Always b. Sometimes c. Never

iii. Attitude

1.30- I believe that good employee hygiene can help to prevent food borne illness

1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree

1.31– I believe that, my responsibility is to control my department's hygiene

1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree

1.132– I believe that the new catering companies staff need food hygiene training before starting the work

1. Extremely important 2. Important 3. Neither important nor not 4. Unimportant 5. Extremely unimportant

1.33- I believe that courses in food hygiene are important for Ministry's staff

1. Extremely important 2. Important 3. Neither important nor not 4. Unimportant 5. Extremely unimportant

1.34- I believe that refresh courses in food hygiene are important for all foodservices staff

1. Extremely important 2. Important 3. Neither important nor not 4. Unimportant 5. Extremely unimportant

1.35– I believe that unhygienic behaviour should be punished with sentencing

1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree

APPENDIX 6: QUESTIONNAIRE FOR GROUP 1, MOH STAFF (ARABIC VERSION)

Arabic Version Group 1

شكرا لتفضلك بالمشاركة بهذا الاستبيان ، قبل البدء بالإجابة هناك بعض المعلومات حول هذه الدراسة يفضل معرفتها . هذا الإستبيان هو جزء من بحث دكتوراه حول تطبيق نظام (الهاسب) في مستشفيات منطقة الرياض حيث تود وزارة الصحة ممثلة بمديرية الشئون الصحية بمنطقة الرياض تطبيق نظام (الهاسب) واضافته كبند اساسي في عقود التغذية .يهدف هذا المسح الى قياس و جمع بعض المعلومات العامة المتعلقة بنظام (الهاسب) بالاضافة الى الاشتراطات والممارسات الصحية الاخرى لدى موظفين أقسام التغذية . نحن حريصون ومهتمون بأخذ رأيك واجاباتك ، وللمعلومية ، لا يوجد اجابة خاطئة او صحيحة في أي من الاسئلة لذا نرجو منك اختيار اجابة واحدة حسب وجهة نظرك وقناعتك ومعلوماتك الشخصية . جميع الاجابات ستعامل بسرية تامة لذا نرجو عدم ذكر الأسماء . الإجابات ستخدم فقط لأهداف إحصائية وتطويرية لمصلحة العمل والمريض .

محمد المحيذيف

[redacted]

أ المعلومات الديموغرافية

1.1 – الجنس :

أ – ذكر ب- أنثى

.....

1.2 - الفئة العمرية :

أ- اقل من 24 ب- 25-34 جـ- 35 -44 د- 45-54 هـ- أعلى من 55

.....

1.3 - الجنسية :

أ- السعودية ب ، أخرى (ارجو التحديد).....

.....

1.4 – الوظيفة .....

.....

1.5 – المؤهلات الدراسية :

أ- دبلوم (علم الصحة / فني تغذية) ب- بكالوريوس (اقتصاد منزلي / علوم أطعمة)

ج- بكالوريوس (علم الغذاء والتغذية) د- بكالوريوس (تغذية وصحة مجتمع)

هـ- أخرى (ارجو التحديد).....

.....

1.6 - سنوات الخبرة في مجال التغذية

أ- اقل من 5 سنوات ب - 5- 15 سنة جـ- 16-25 سنة د- اعلي من 25 سنة

.....

1.7 - هل تعتقد أن نظام تحليل المخاطر (الهاسب) يمكن تطبيقه بشكل صحيح في قسمكم؟ يرجى ذكر الأسباب

أ- نعم ب- لا

1 --.....

2 --.....

.....

1.8 - هل تعتقد أنك بحاجة لمزيد من المعلومات حول تنفيذ نظام (الهاسب) في المستشفيات تحديدا ؟ يرجى ذكر الاسباب

أ – نعم ب- لا

1 --.....

2 --.....

.....

1.9 – برأيك الشخصي ما هي اهم المخالفات الصحية الشائعة التي يرتكبها الموظفون إثناء إعداد الوجبات (يشمل ذلك جميع العمليات مثل الاستلام الطبخ التوزيع .. الخ) ؟

1 --.....

2 --.....

.....

1.10- بنظرك ، كيف يمكن تحفيز عمال التغذية لتغيير بعض سلوكياتهم تجاه الممارسات الصحية ؟

1 --.....

2 --.....

ب - المعلومات والمعارف

1.11 - أهم العوامل المؤثرة على نمو ونشاط الإحياء الدقيقة الممرضة هو :
أ- الضوء و الأوكسجين
ب - الوقت ودرجة الحرارة
ج- الأوكسجين ودرجة الحرارة
د- الماء
هـ - لا تتوفر لدي إجابة

1.12 – درجة النشاط المائي (aw) الأمثل لنمو اغلب الممرضات هو :
أ - 1
ب- 0.95
ج - 0.75
د - صفر
هـ - لا تتوفر لدي إجابة

1.13 - معظم الإحياء الدقيقة الممرضة تميل للنمو في درجة حموضة :
أ – 1 pH
ب - 4- 7 pH
ج - 2-4 pH
د- اعلى من 7 pH
هـ- لا تتوفر لدي إجابة

1.14- **الوجبات الساخنة والمحفوظة في سخانات الغذاء (باين ماري) يجب أن تحفظ على درجة :**
أ- 25 درجة مؤوية
ب- 50 درجة مؤوية
ج – 65 درجة مؤوية
د- 100 درجة مؤوية
هـ - لا تتوفر لدي إجابة

1.15 – أكثر انواع البكتيريا المرتبطة بالدواجن هي :
أ- *Bacillus cereus*
ب-*Vibrio Cholera spp*
ج- *Campylobacter jejuni*
د- *Shigella spp*
هـ- لا تتوفر لدي إجابة

1.16 - لماذا يجب تبريد الطعام أولا قبل وضعة في الثلاجة؟
أ - لتجنب تسرب الرائحة إلى الأطعمة الأخرى
ب – للمحافظة على جودة و نوعية الغذاء
ج- لتجنب زيادة درجة حرارة الثلاجة
د – لتجنب التلوث ألخلطي
هـ- لا تتوفر لدي إجابة

1.17 –قد يمكن التعرف على الاغذية الملوثة بالاحياء الدقيقة الممرضة عن طريق :
أ- التذوق
ب –الشم
ج – بالنظر (حدوث تغيرات باللون او القوام)
د – يستحيل ذلك !
هـ- لا تتوفر لدي إجابة

1.18 – أسباب حدوث التسمم الغذائي تختلف عن تلك المسببة للعدوى الغذائية وذلك لأن :
أ- التسمم الغذائي ينتج بسبب هضم جرعة عالية من الإحياء الدقيقة الممرضة
ب- التسمم الغذائي ينتج فقط بسبب استهلاك المواد الكيمائية بينما العدوى تنتج بسبب استهلاك السموم الميكروبية
ج- التسمم الغذائي ينتج بسبب استهلاك السموم الكيمائية أو السموم الكيمائية المفرزة بواسطة الإحياء الدقيقة
د- لا يوجد أي اختلاف بينهما
هـ - لا تتوفر لدي إجابة

1.19 – بشكل عام ، ما هو مفهوم نظام (الهاسب) ؟
أ- التحكم في المخاطر الميكروبية فقط إثناء إعداد الأغذية ومنع حدوثها
ب- إعداد وتنظيم الأغذية بشكل منظم ومجدول
ج- تقليل الجهد والمال اثناء الانتاج الغذائي
د – توفير غذاء آمن من خلال تحديد جميع المخاطر المتوقعة إثناء الإعداد وتنفيذ تدابير وقائية للسيطرة عليها
هـ - لا يتوفر لدي إجابة

1.20 - المبدأ الرابع من نظام (الهاسب) ، والذي يعنى بالرصد ، يتطلب ما يلي :
أ- رصد ومراقبة الممارسات الصحية لجميع العاملين إثناء إعداد الأغذية
ب- تسجيل ورصد درجة حرارة الثلاجات والمجمدات
ج - القيام بمشاهدات أو قياسات إثناء العمليات الغذائية للتأكد من أن نقطة التحكم الحرجة تحت السيطرة
د- لا يوجد إجابة صحيحة أعلاه !
هـ- لا يتوفر لدي إجابة

1.21 – القاعدة السادسة من نظام (الهاسب) تقوم بـ :
أ- التأكد من أن نظام الهاسب يعمل بشكل مناسب
ب. تسجيل جميع نقط التحكم الحرجة
ج - استخدام بعض الإجراءات التصحيحية عند اللزوم
د- جميع ما ذكر أعلاه
هـ- لا يتوفر لدي اجابة

ج - المسؤوليات والممارسات الصحية

1.22 هل تقوم باستقبال وتفحص جميع المواد الغذائية والطلبيات التي تدخل قسمك ؟

أ- دائما ب- أحيانا ج- أبدا

1.23 هل تقوم بغسل يديك قبل استلام و تفحص المواد الغذائية ؟

أ- دائما ب- أحيانا ج- أبدا

1.24 هل تقوم بغسل يديك بعد أستلام وتفحص المواد الغذائية ؟

أ- دائما ب- أحيانا ج- أبدا

1.25 هل تقوم بارتداء القفازات عند تفحص المواد الغذائية أثناء الاعداد والتحضير ؟

أ- دائما ب- أحيانا ج- أبدا

1.26 في الحالات الطارئة ، مثل نقص المواد الغذائية ، هل تقوم باستقبال توريد مواد غذائية غير معروفة المصدر؟

1.26.1 دائما ب- أحيانا ج- أبدا

1.27 هل تستخدم ميزان الحرارة (الترمومتر) لقياس حرارة الوجبات الساخنة ؟

أ- دائما ب- أحيانا ج- أبدا

1.28 هل تقوم بإيقاف أي موظف عن العمل تظهر عليه أعراض مرضية مثل : القي ، الإسهال ، الحرارة ، الطفح الجلدي ؟

أ- دائما ب- أحيانا ج- أبدا

1.29 هل تطلب من الموظفين غسل أيديهم خلال ساعات العمل وتحضير الطعام ؟

1.30 دائما ب- أحيانا ج- أبدا

د- الاعتقاد والسلوك

1.30 أنا أؤمن بأن النظافة الشخصية للمتعاملين مع الغذاء تساهم في منع انتقال الإمراض المعدية

1- أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

1.31 - أنا أؤمن بأن مهمتي الرئيسية هي المحافظة على صحة ونظافة قسم التغذية

1- أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

1.32 أنا أومن بأن موظفين شركات التغذية الجدد يحتاجون تدريب في الممارسات الصحية والتعامل مع الأغذية قبل بدء العمل

1- مهم جدا 2- مهم 3- غير متأكد 4- غير مهم 5 – غير مهم أبدا

1.33 أنا أؤمن بأن الدورات التدريبية في مجال صحة وسلامة الغذاء مهمة لأخصائيي التغذية العاملين لدى وزارة الصحة

1- مهم جدا 2- مهم 3- غير متأكد 4- غير مهم 5 – غير مهم أبدا

1.34 أنا أؤمن بأن الدورات التدريبية التذكيرية في مجال صحة وسلامة الغذاء مهمة لجميع الموظفين العاملين بأقسام التغذية

1- مهم جدا 2- مهم 3- غير متأكد 4- غير مهم 5 – غير مهم أبدا

1.35 أنا أؤمن بأنه يجب تطبيق العقوبات بشكل مباشر على الشركة عند حدوث أي مخالفات ضد الممارسات الصحية

1- أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

1.36 - أنا أومن بأن مدير الموقع لا يطالب الموظفين بالعمل وفق الاشتراطات الصحية السليمة

1- أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

APPENDIX 7: QUESTIONNAIRE FOR GROUP 2, CATERERS SUPERVISORS (ENGLISH VERSION)

Questionnaire for group 2 (Nutritionists/ Food Supervisors -Companies Staff)

Thank you for taking an interest in this questionnaire. Before you start, here is some information you should know. This questionnaire is part of a project which is designed to determine the readiness of Saudi's hospitals for HACCP implementation by evaluating pre-requisites programmes in a number of hospitals in Riyadh region- Saudi Arabia. We are keen to receive your answers to this questionnaire so please feel free to contact us with any queries you may have. Please select one answer. Don't worry; there are no right or wrong answers to any of the following questions, simply try to ensure that your answers are as honest as possible.

Your responses will remain confidential and completely anonymous, so please do not write your name.

Thank you for your participation

M. Almohaithef

Email : [redacted]

A- Demographic characteristics

2.1- **Gender**:

a- Male b- Female

……..……..……....

2.2- Age Group:

a- Under 24 b- 25-34 c- 35-44 d- 45-54 e- Over 55

……..…….……..

2.3- Nationality:

a- Saudi b- other (please classify) ……...……

……..……...…….

2. 4- Position holder ……..

……..……..…….

2.5- Education and Qualifications:

a- Diploma (Sanitarian/ Food Technician) b- Bachelors (Home economy)

c- Bachelors (Food Sciences) d- Bachelors (Dietetics)

e. Other (please classify)…….

……..……..……

2.6- Years of Work Experiences

a- <1 b- 2- 5 c- 6 -15 d- 16-25

……

2.7- Do you think that HACCP can be successfully implemented in your department? Please justify

a-Yes b- No

1-……

2-……

……..

2.8- Do you think you need more information about HACCP implementation? please justify

b- Yes b- No

1- …….

2-……

……..……

2.9- What do you think are the main contraventions regarding hygiene practices committed by staff?

1- …….

2-…….…...……

……

5.1 - How do you think staff can be motivated to change hygiene behaviour?

1- ……

2-……....

B. Knowledge

2.11- The most important factors to control the growth of bacteria are:

a. Light and oxygen
b. Time and temperature
c. Oxygen and temperature
d. None of these
e. I don't know

2.12- The optimum Water Activity (aw) that support the growth of most pathogens is

a. 1
b. 0.95
c. 0.75
d. 0
e. I don't know

2.13- Most pathogens are likely to grow at pH range of:

a. 1
b. 4-7
c. 2-4
d. Above 7
e. I don't know

2.14- Hot ready to eat foods should be maintained in the Bain Marie at :

a. 25 C
b. 50 C
c. 65 C
d. 100 C
e. Do not know

2.15- The most common pathogens associated with chicken is:

a. Bacillus cereus
b. Vibrio Cholera spp
c. Campylobacter jejuni
d. Shigella spp
e. I don't know

2.16- Why must food be cooled before refrigeration?

a. To avoid smell developing
b. To improve the quality of the food
c. The refrigerator temperature doesn't increase
d. To avoid cross contamination
e. I don't know

2.17- It is easy to recognise food contaminated with pathogens by:

a. Tasting it
b. Smelling it
c. Looking it (changes in colour and
d. None of these
e. I don't know

2.1 8- Food poisoning can be divided into two categories: intoxication or infection and the difference between them is :

a. Intoxication is caused only by the ingestion of high dose of pathogenic cells
b. Intoxication is caused only by the consumption of chemical toxins
c. Intoxication is caused by the consumption of microbial or chemical toxins
d. There is no different between them
e. I don't know

2.19- What is the purpose of HACCP plane?

a. To control specifically microbial hazards in food
b. To organise food preparation process
c. To reduce cost and effort in food production
d. To provide safe food by identifying a specific hazard and implementing measures to control it
e. I don't know

2.20- Principle 4 of HACCP, which concerns with monitoring procedures, requires:

a- Monitoring hygiene practices for all employees
b- Recording refrigerators and freezers temperatures
c- Monitoring activities to ensure that the process is under control at critical points
d- None of the above
e- I don't know

2.21- Verification ensures the HACCP plan is :

a. Adequate and working properly
b. Recording all CCPs
c. Using appropriate corrective actions
d. All of the above
e. I don't know

C. Duties and Responsibilities

2.22 - Do you inspect all deliveries and supplies which enter your department?

a. Always b. Sometimes c. Never

2.23 - Do you wash your hand before inspecting the new supplies?

a. Always b. Sometimes c. Never

2.24 - Do you wash your hand after inspecting the new supplies?

a. Always b. Sometimes c. Never

2.25- Do you wear gloves when you inspect food during preparation ?

a. Always b. Sometimes c. Never

2.26 - In emergency cases; such as food shortage, do you accept food with unapproved sources?

a. Always b. Sometimes c. Never

2.27- Do you use thermometer to check cooked food temperature?

a. Always b. Sometimes c. Never

2.28 - Do you stop any employee working when suffering any of the following symptoms: diarrhoea, fever, vomiting, jaundice and sore throat with fever?

a. Always b. Sometimes c. Never

2.29 - Do you request all foodservices staff to wash their hand all hours of operations?

a. Always b. Sometimes c. Never

D. Attitude

2.30 I believe that good employee hygiene can help to prevent food borne illness

1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree

2.31- I believe that my responsibility is to reduce cost on the company

1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree

2.32- I believe that the new catering companies staff need food hygiene training before starting the work

1. Extremely important 2. Important 3. Neither important nor not 4. unimportant 5. Extremely unimportant

2.33- I believe that courses in food hygiene are important for Ministry's staff

1. Extremely important 2. Important 3. Neither important nor not 4. unimportant 5. Extremely unimportant

2.34- I believe that refresh courses in food hygiene are important for all foodservices staff

1. Extremely important 2. Important 3. Neither important nor not 4. unimportant 5. Extremely unimportant

2.35- I believe that unhygienic behaviour should be punished with sentencing

1. Strongly agree 2. Agree 3. Neither agree nor disagree 4. Disagree 5. Strongly disagree

APPENDIX 8: : QUESTIONNAIRE FOR GROUP 2, CATERERS SUPERVISORS (ARABIC VERSION)

استبيان رقم 2 (خاص بمشرفي التغذية التابعين لشركات التموين)

Arabic Version Group 2

شكرا لتفضلك بالمشاركة بهذا الاستبيان ، قبل البدء بالإجابة هناك بعض المعلومات حول هذه الدراسة يفضل معرفتها . هذا الإستبيان هو جزء من بحث دكتوراه حول تطبيق نظام (الهاسب) في مستشفيات منطقة الرياض حيث تود وزارة الصحة ممثلة بمديرية الشئون الصحية بمنطقة الرياض تطبيق نظام (الهاسب) واضافته كبند اساسي في عقود التغذية .يهدف هذا المسح الى قياس و جمع بعض المعلومات العامة المتعلقة بنظام (الهاسب) بالاضافة الى الاشتراطات والممارسات الصحية الاخرى لدى موظفين أقسام التغذية . نحن حريصون ومهتمون بأخذ رأيك واجاباتك ، وللمعلومية ، لا يوجد اجابة خاطئة او صحيحة في أي من الاسئلة لذا نرجو منك اختيار اجابة واحدة حسب وجهة نظرك وقناعتك ومعلوماتك الشخصية . جميع الاجابات ستعامل بسرية تامة لذا نرجو عدم ذكر الأسماء . الإجابات ستخدم فقط لأهداف إحصائية وتطويرية لمصلحة العمل والمريض .

محمد المحيذيف

أ- المعلومات الديموغرافية

2.1 - الجنس :

أ – ذكر ب- أنثى

.....

2.2 - الفئة العمرية :

ب- اقل من 24 ب- 25-34 جـ- 35 -44 د- 45-54 هـ- أعلى من 55

.....

2.3 - الجنسية :

أ- السعودية ب ، أخرى (ارجو التحديد).....

.....

2.4 – الوظيفة .....

.....

2.5 – المؤهلات الدراسية :

أ- دبلوم (علم الصحة / فني تغذية) ب- بكالوريوس (اقتصاد منزلي / علوم أطعمة)

ج- بكالوريوس (علم الغذاء والتغذية) د- بكالوريوس (تغذية وصحة مجتمع)

هـ- أخرى (ارجو التحديد).....

.....

2.6 - سنوات الخبرة في مجال التغذية

أ- اقل من 5 سنوات ب - 5- 15 سنة جـ- 16-25 سنة د- اعلي من 25 سنة

.....

2.7 - هل تعتقد أن نظام تحليل المخاطر (الهاسب) يمكن تطبيقه بشكل صحيح في قسمكم؟ يرجى ذكر الأسباب

أ- نعم ب- لا

1 --.....

2 --.....

.....

2.8 - هل تعتقد أنك بحاجة لمزيد من المعلومات حول تنفيذ نظام (الهاسب) في المستشفيات تحديدا ؟ يرجى ذكر الاسباب

أ – نعم ب- لا

1 --.....

2 --.....

.....

2.9 – برأيك الشخصي ما هي اهم المخالفات الصحية الشائعة التي يرتكبها الموظفون إثناء إعداد الوجبات (يشمل ذلك جميع العمليات مثل الاستلام الطبخ التوزيع .. الخ) ؟

1 --.....

2 --.....

.....

2.10- بنظرك ، كيف يمكن تحفيز عمال التغذية لتغيير بعض سلوكياتهم تجاه الممارسات الصحية ؟

1 --.....

2 --.....

ب - المعلومات والمعارف

2.11 - أهم العوامل المؤثرة على نمو ونشاط الإحياء الدقيقة الممرضة هو :
أ- الضوء و الأوكسجين
ب - الوقت ودرجة الحرارة
ج- الأوكسجين ودرجة الحرارة
د- الماء
هـ - لا تتوفر لدي إجابة

2.12 – درجة النشاط المائي (aw) الأمثل لنمو اغلب الممرضات هو :
أ - 1
ب- 0.95
ج - 0.75
د - صفر
هـ - لا تتوفر لدي إجابة

2.13 - معظم الإحياء الدقيقة الممرضة تميل للنمو في درجة حموضة :
أ – 1 pH
ب - 4- 7 pH
ج - 2-4 pH
د- اعلى من 7 pH
هـ- لا تتوفر لدي إجابة

2.14- الوجبات الساخنة والمحفوظة في سخانات الغذاء (باين ماري) يجب أن تحفظ على درجة :
أ- 25 درجة مؤوية
ب- 50 درجة مؤوية
ج – 65 درجة مؤوية
د- 100 درجة مؤوية
هـ - لا تتوفر لدي إجابة

2.15 – أكثر انواع البكتيريا المرتبطة بالدواجن هي :
أ- *Bacillus cereus*
ب-*Vibrio Cholera spp*
ج- *Campylobacter jejuni*
د- *Shigella spp*
هـ- لا تتوفر لدي إجابة

2.16 - لماذا يجب تبريد الطعام أولا قبل وضعة في الثلاجة؟
أ - لتجنب تسرب الرائحة إلى الأطعمة الأخرى
ب – للمحافظة على جودة و نوعية الغذاء
ج- لتجنب زيادة درجة حرارة الثلاجة
د – لتجنب التلوث ألخلطي
هـ- لا تتوفر لدي إجابة

2.17 –قد يمكن التعرف على الاغذية الملوثة بالاحياء الدقيقة الممرضة عن طريق :
أ- التذوق
ب –الشم
ج – بالنظر (حدوث تغيرات باللون او القوام)
د – يستحيل ذلك !
هـ- لا تتوفر لدي إجابة

2.18 – أسباب حدوث التسمم الغذائي تختلف عن تلك المسببة للعدوى الغذائية وذلك لأن :
أ- التسمم الغذائي ينتج بسبب هضم جرعة عالية من الإحياء الدقيقة الممرضة
ب- التسمم الغذائي ينتج فقط بسبب استهلاك المواد الكيمائية بينما العدوى تنتج بسبب استهلاك السموم الميكروبية
ج- التسمم الغذائي ينتج بسبب استهلاك السموم الكيمائية أو السموم الكيمائية المفرزة بواسطة الإحياء الدقيقة
د- لا يوجد أي اختلاف بينهما
هـ - لا تتوفر لدي إجابة

2.19 – بشكل عام ، ما هو مفهوم نظام (الهاسب) ؟
أ- التحكم في المخاطر الميكروبية فقط إثناء إعداد الأغذية ومنع حدوثها
ب- إعداد وتنظيم الأغذية بشكل منظم ومجدول
ج- تقليل الجهد والمال اثناء الانتاج الغذائي
د – توفير غذاء آمن من خلال تحديد جميع المخاطر المتوقعة إثناء الإعداد وتنفيذ تدابير وقائية للسيطرة عليها
هـ - لا يتوفر لدي إجابة

2.20 - المبدأ الرابع من نظام (الهاسب) ، والذي يعنى بالرصد ، يتطلب ما يلي :
أ- رصد ومراقبة الممارسات الصحية لجميع العاملين إثناء إعداد الأغذية
ب- تسجيل ورصد درجة حرارة الثلاجات والمجمدات
ج - القيام بمشاهدات أو قياسات إثناء العمليات الغذائية للتأكد من أن نقطة التحكم الحرجة تحت السيطرة
د- لا يوجد إجابة صحيحة أعلاه !
هـ- لا يتوفر لدي إجابة

2.21 – القاعدة السادسة من نظام (الهاسب) تقوم بـ :
أ- التأكد من أن نظام الهاسب يعمل بشكل مناسب
ب. تسجيل جميع نقط التحكم الحرجة
ج - استخدام بعض الإجراءات التصحيحية عند اللزوم
د- جميع ما ذكر أعلاه
هـ- لا يتوفر لدي اجابة

ج - المسؤوليات والممارسات الصحية

2.22 هل تقوم باستقبال وتفحص جميع المواد الغذائية والطلبيات التي تدخل قسمك ؟

أ- دائما ب- أحيانا ج- أبدا

2.23 هل تقوم بغسل يديك قبل استلام و تفحص المواد الغذائية ؟

أ- دائما ب- أحيانا ج- أبدا

2.24 هل تقوم بغسل يديك بعد أستلام وتفحص المواد الغذائية ؟

أ- دائما ب- أحيانا ج- أبدا

2.25 هل تقوم بارتداء القفازات عند تفحص المواد الغذائية أثناء الاعداد والتحضير ؟

أ- دائما ب- أحيانا ج- أبدا

2.26 في الحالات الطارئة ، مثل نقص المواد الغذائية ، هل تقوم باستقبال توريد مواد غذائية غير معروفة المصدر؟

أ- دائما ب- أحيانا ج- أبدا

2.27 هل تستخدم ميزان الحرارة (الترمومتر) لقياس حرارة الوجبات الساخنة ؟

أ - دائما ب- أحيانا ج- أبدا

2.28 هل تقوم بإيقاف أي موظف عن العمل تظهر عليه أعراض مرضية مثل : القي ، الإسهال ، الحرارة ، الطفح الجلدي ؟

أ- دائما ب- أحيانا ج- أبدا

2.29 هل تطلب من الموظفين غسل أيديهم خلال ساعات العمل وتحضير الطعام ؟

أ- دائما ب- أحيانا ج- أبدا

د- الاعتقاد والسلوك

2.30 - انا أؤمن بأن النظافة الشخصية للمتعاملين مع الغذاء تساهم في منع انتقال الإمراض المعدية

1- أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

2.31 - أنا أؤمن بأن مهمتي الرئيسية هي المحافظة على صحة ونظافة قسم التغذية

1- أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

2.32 - أنا أومن بأن موظفين شركات التغذية الجدد يحتاجون تدريب في الممارسات الصحية والتعامل مع الأغذية قبل بدء العمل

1- مهم جدا 2- مهم 3- غير متأكد 4- غير مهم 5 – غير مهم أبدا

2.33 - أنا أؤمن بأن الدورات التدريبية في مجال صحة وسلامة الغذاء مهمة لأخصائيي التغذية العاملين لدى وزارة الصحة

1- مهم جدا 2- مهم 3- غير متأكد 4- غير مهم 5 – غير مهم أبدا

2.34 - أنا أؤمن بأن الدورات التدريبية التذكيرية في مجال صحة وسلامة الغذاء مهمة لجميع الموظفين العاملين بأقسام التغذية

1- مهم جدا 2- مهم 3- غير متأكد 4- غير مه 5 – غير مهم أبدا

2.35 - أنا أؤمن بأنه يجب تطبيق العقوبات بشكل مباشر على الشركة عند حدوث أي مخالفات ضد الممارسات الصحية

1- أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

APPENDIX 9: QUESTIONNAIRE FOR GROUP 3, FOOD HANDLERS (ENGLISH VERSION)

Questionnaire for group 3 (Cooks, and waiters,)

Thank you for taking an interest in this questionnaire. Before you start here is some information you should know. This questionnaire is part of a project which is designed to determine the readiness of Saudi's hospitals for HACCP implementation by evaluating pre-requisites programmes in a number of hospitals in Riyadh region- Saudi Arabia. We are keen to receive your answers to this questionnaire so please feel free to contact us with any queries you may have. Don't worry; there are no right or wrong answers to any of the following questions, simply try to ensure that your answers are as honest as possible.

Your responses will remain confidential and completely anonymous, so please do not write your name.

Thank you for your participation

M. Almohaithef

Email : [redacted]

A- Demographic characteristic

3. 1- Gender:

a- Male b- Female

……

3.2- Age Group:

a- Under 24 b- 25-34 c- 35-44 d- 45-54 e- Over 55

……..

3.3- Nationality:

a- Saudi b- other (please classify) ……..

……

3.4- Education and Qualifications:

a- Elementary b- Diploma

c- Bachelors d- Other (please classify) …….

……

3.5- Years of Work Experiences

a- < 1 b- 2 - 5 c- 6-15 d- 16-25 e- >25

……

3. 6- Work activity

a- Chief cook b- Cook
c- Asst. Cook d- Waiter/ Waitress
d- Other.....

……

3.7- Salary :

a- < 600 SR b- 600 – 1000 SR

c- 1000 – 2000 SR d- > 2000 SR

……..

3.8- Have you received any hygiene training?

a- Yes b- No

……

3.9- Have your managers required of you to attend any food hygiene training course?

a- Yes b- No

……

B- <u>Knowledge</u>

3.10. Cross contamination is the transfer of harmful microorganism from:

a. Food to food only
b. Person to food only
c. Contact surfaces to food only
d. All above
e. Do not know

3.11. Why is it important to wash your hands after handling raw meat?

a. To prevent spread of bacteria/germs
b. To avoid cross contamination
c. To avoid food poisoning
d. All above
e. Do not Know

3.12. Using gloves during preparing food is to:

a. protect food from any contamination
b. Protect me from any contamination
c. Both of a and b
d. No benefit of using gloves and it is restrict my work
e. Don't now

3.13. During food preparation and refrigeration, raw and cooked food must be separated because :

a. Kitchen will be more organised
b. The flavour may be affected
c. To avoid cross-contamination
d. Ministry's employees require that
e. Do not Know

3.14. *E. coli* bacteria can be transmitted by:

a. Fly
b. Human
c. Raw meats and vegetables
d. All above
e. Do not Know

3.15. You can recognise food contaminated with poisoning bacteria by :

a. Smelling it
b. Tasting it
c. My experience
d. None of those
e. Do not know

3.16. When you in doubt about the safety of a previously cooked food, Do you

a. Report it to the Ministry's supervisor
b. Reuse it directly to reduce the cost
c. Reheat it to kill microorganism then reuse it
d. Throw it out
e. Do not know

3.17. When you cooking chicken, the internal temperature should be at least:

a. 55 C
b. 65 C
c. 75 C
d. 100 C
e. Do not know

3.18. The correct temperature for a refrigerator is

a. 10 C - 15 C
b. 5 C – 10 C
c. 1 C – 5 C
d. Below 0 C
e. Do not know

3.19. Hot ready to eat foods should be maintained in the Bain Marie at :

a. 25 C
b. 50 C
c. 65 C
d. 100 C
e. Do not know

3.20. When you suffer fever, diarrhoea, or vomiting, will you:

a. Continue working normally
b. Report Ministry's employees
c. Go to doctor then continue working
d. Afraid to report because they stop your work without salary
e. Do not know

3.21. What do you understand by "Hazard Analysis critical control Points" (HACCP) ?

a. Food safety system by using computer
b. Process control
c. Temperature control
d. System to ensure safe food by identifying and controlling specific hazards
e. Don't know

3.22. Smoking is unacceptable practice in kitchen because

a. Cigarettes smell may transfer to food
b. Bacteria in mouth may transfer to figures thus to food
c. It may cause fire in kitchen
d. Al of the above
e. Do not know

……

C. Practices

3.23 Do you wash your hands before touching unwrapped foods?

a. Always b. Sometimes c. Never

3.24 . Do you use mask when you prepare or distribute unwrapped foods?

a. Always b. Sometimes c. Never

3.25. Do you wash your hands after touching unwrapped foods?

a. Always b. Sometimes c. Never

3.26. Do you wear a cap or head covering when you prepare or distribute unwrapped foods?

a. Always b. Sometimes c. Never

3.27. Do you use a thermometer to monitor the temperature of food?

a. Always b. Sometimes c. Never

D. Attitudes

3.28 Carrying out good hygienic practice at all times during food preparation is

1. Very important 2. Important 3. Neither important or not 4. Unimportant 5. Very unimportant

3.29 Carrying out good hygienic behaviour at all times during food preparation can help to prevent food borne illness

1. Strongly agree 2. Agree 3. Neither agree or disagree 4. Disagree 5.strongly disagree

3.30 It is possible that hospital patients may die as a result of eating food that was not hygienically prepared

1. Highly possible 2.Possible 3.Neither possible or not 4.Impossible 5. Highly impossible

3.31 My behaviour during food preparation is more hygienic when my supervisor is present

1. Highly possible 2.Possible 3.Neither possible or not 4.Impossible 5. Highly impossible

3.32 I intend to carry out good hygienic practice at all times during food preparation

1. Extremely likely 2. Likely 3.Neither likely nor unlikely 4. Unlikely 5. Extremely unlikely

APPENDIX 10: QUESTIONNAIRE FOR GROUP 3, FOOD HANDLERS (ARABIC VERSION)

استبيان رقم 3 (موظفي الشركات : الطباخين ، معدي الاغذية ، موزعي الطعام)

شكرا لتفضلك بالمشاركة بهذا الاستبيان ، قبل البدء بالإجابة هناك بعض المعلومات حول هذه الدراسة يفضل معرفتها . هذا الإستبيان هو جزء من بحث دكتوراه حول تطبيق نظام (الهاسب) في مستشفيات منطقة الرياض حيث تود وزارة الصحة ممثلة بمديرية الشئون الصحية بمنطقة الرياض تطبيق نظام (الهاسب) واضافته كبند اساسي في عقود التغذية .يهدف هذا المسح الى قياس و جمع بعض المعلومات العامة المتعلقة بنظام (الهاسب) بالاضافة الى الاشتراطات والممارسات الصحية الاخرى لدى موظفين أقسام التغذية . نحن حريصون ومهتمون بأخذ رأيك واجاباتك ، وللمعلومية ، لا يوجد اجابة خاطئة او صحيحة في أي من الاسئلة لذا نرجو منك اختيار اجابة واحدة حسب وجهة نظرك وقناعتك ومعلوماتك الشخصية . جميع الاجابات ستعامل بسرية تامة لذا نرجو عدم ذكر الأسماء . الإجابات ستخدم فقط لأهداف إحصائية وتطويرية لمصلحة العمل والمريض .

محمد المحيذيف

أ- المعلومات الديموغرافية

3.1 - الجنس :

أ – ذكر ب- أنثى

.....

3.2 -الفئة العمرية :

ت- اقل من 24 ب- 25-34 جـ- 35 -44 د- 45-54 هـ- أعلى من 55

.....

3.3 - الجنسية :

أ- السعودية ب ، أخرى (ارجو التحديد).....

.....

3.4 – المؤهلات الدراسية :

أ- شهادة دراسية (ابتدائي, متوسط, ثانوي) ب- دبلوم بعد الشهادة الدراسية

ج- بكالوريوس د- اخرى (ارجو التحديد) .....

.....

3.5 - سنوات الخبرة في مجال التغذية

أ- اقل من سنة واحدة ب – 2-5 سنة جـ- 6-15 سنة د- 16-25 سنة

.....

3.6- الوظيفة

أ- رئيس الطهاة ب- طاهي

ج – مساعد طاهي د- موزع / موزعة طعام

د - أخرى (أرجو التحديد) .....

.....

3.7- الراتب (تقريبا)

أ- اقل من 600 ريال ب - 600 – 1000 ريال

ج- 1000-2000 ريال د- اكثر من 2000 ريال

.....

3.8- هل تلقيت أي تدريب أو دورات متعلقة بالصحة والسلامة الغذائية ؟

أ- نعم ب- لا

.....

3.9- هل سبق وان طالبك مدير الموقع او رئيس القسم بحضور دورات في الصحة والسلامة الغذائية ؟

أ- نعم ب- لا

.....

ب- المعلومات والمعارف

3.10 " التلوث ألخلطي " يمكن ان يعرف بأنه عبارة عن انتقال البكتيريا الضارة من :

أ- الغذاء للغذاء
ب- الإنسان للغذاء
ج- الأسطح الملامسة للغذاء الى الغذاء
د- جميع ما ذكر أعلاه
هـ- لا تتوفر لدي إجابة

.....

3.11 لماذا يكون من المهم غسل اليدين بعد التعامل مع اللحوم النيئة ؟

أ- لمنع انتقال البكتيريا والجراثيم الى اليدين
ب- لتجنب التلوث ألخلطي
ج - لتجنب التسمم الغذائي
د- جميع ما ذكر مسبقا
هـ- لا تتوفر لدي إجابة

.....

3.12 الغاية من استخدام قفازات اليدين أثناء تحضير الوجبات هي :

أ- حماية الغذاء من أي تلوث .
ب- حماية الأيدي من أي تلوث
ج- جميع ما ذكر في الفقرة أ و ب
د – لا يوجد أي فائدة من استخدام القفازات بل بالعكس لبسها يعيق تحضير الغذاء
هـ- لا تتوفر لدي إجابة

.....

3.13 عند إعداد الغذاء وتبريده في الثلاجة ، الأغذية النيئة يجب أن تكون مفصولة عن المطبوخة وذلك لأن :

أ- مكان الإعداد والثلاجة يكونان أكثر تنظيما
ب- النكهة قد تتأثر
ج- لتجنب التلوث ألخلطي
د- مشرف الوزارة يطلب مني ذلك
هـ- لا تتوفر لدي إجابة

.....

3.14 بكتيريا *E. coli* (الاي كولاي) قد تنتقل عن طريق

أ- الحشرات
ث- الإنسان
ج - اللحوم والخضروات النيئة
د- جميع ما ذكر مسبقا
هـ- لا تتوفر لدي إجابة

.....

3.15 قد يكون من الممكن أن أتعرف على الغذاء الملوث بالبكتيريا الممرضة عن طريق :

أ- تغير الرائحة (الشم)
ب- تغير الطعم (التذوق)
ج- من خلال خبرتي
د – ولا واحد مما ذكر
هـ- لا تتوفر لدي إجابة

.....

3.16 عندما تشك في سلامة وجبة محضرة مسبقا فهل تقوم ب :

أ- إبلاغ مشرف الوزارة
ب- إعادة استخدامها وإرسالها للمريض مباشرة لتقليل التكلفة
ج – تسخينها لقتل الجراثيم ومن ثم أعادة استخدامها
د – التخلص منها فور ا
هـ- لا تتوفر لدي إجابة

.....

3.17 عند طبخ الدجاج ، درجة الحرارة الداخلية يجب أن تكون :

أ- 55 درجة مؤوية
ب- 65 درجة مؤوية
ج- 75 درجة مؤوية
د – 100 درجة مؤوية
هـ- لا تتوفر لدي إجابة

.....

3.18 درجة حرارة الثلاجة يجب أن تكون :

أ- 10 – 15 درجة مؤوية
ب- 5- 10 درجة مؤوية
ج- 1- 5 درجة مؤوية
د – اقل من صفر
هـ- لا تتوفر لدي إجابة

.....

3.19 الوجبات الساخنة والمحفوظة في سخانات الغذاء (باين ماري) يجب أن تحفظ على درجة :

أ- 25 درجة مؤوية
ب- 50 درجة مؤوية
ج – 65 درجة مؤوية
د- 100 درجة مؤوية
هـ - لا تتوفر لدي إجابة

.....

3.20 عندما تعاني من بعض المشاكل الصحية مثل : الحرارة ، الإسهال، القي فإنك تقوم ب :

أ- الاستمرار بالعمل بشكل طبيعي
ب- إبلاغ المشرف عن ذلك
ج- الذهاب للطبيب ومن ثم الاستمرار بالعمل
د – عدم إبلاغ المشرف لان ذلك قد يؤدي إلى إيقافك عن العمل بدون راتب
هـ - لا تتوفر لدي إجابة

.....

3.21 ما هو مفهومك لنظام " تحليل المخاطر ونقاط التحكم الحرجة " (هاسب) ؟

أ- نظام سلامة الغذاء باستخدام الكمبيوتر
ب – نظام لمراقبة العمليات الغذائية
ج – نظام للسيطرة على درجة حرارة الغذاء
د- نظام لضمان سلامة الغذاء من خلال تحديد ومراقبة المخاطر المحددة
هـ - لا تتوفر لدي إجابة

.....

3.22 التدخين هو عادة غير مقبولة في المطبخ لأن :

أ- رائحة التدخين قد تنتقل إلى الغذاء
ب- من الممكن أن يسبب حريق في المطبخ
ج- البكتريا الموجودة في الفم قد تنتقل إلى الأصابع ومنها إلى الغذاء
د- جميع ما ذكر مسبقا
هـ - لا تتوفر لدي إجابة

.....

ج- الممارسات الصحية

3.23- هل تقوم بغسل يديك قبل لمس الأغذية غير المغلفة أو المغطاة ؟

أ- دائما ب- أحيانا ج – أبدا

3.24- هل تستخدم قناع الوجه (الكمامة) عند تحضير أو توزيع الأغذية ؟

أ- دائما ب- أحيانا ج – أبدا

3.25- هل تقوم بغسل يديك بعد لمس الأغذية غير المغلفة ؟

أ- دائما ب- أحيانا ج – أبدا

3.26- هل تقوم بلبس غطاء الرأس عند تحضير أو توزيع الوجبات غير المغلفة أو المغطاة؟

أ- دائما ب- أحيانا ج – أبدا

3.27- هل تستخدم ميزان الحرارة (التيرمومتر) لقياس حرارة الغذاء ؟

أ- دائما ب- أحيانا ج – أبدا

.....

د- الاعتقاد والسلوك .

3.28- أنا أؤمن بأن التقيد بالممارسات الصحية (دائما) أثناء إعداد الوجبات الغذائية هو

ب- مهم جدا 2- مهم 3- غير متأكد 4- غير مهم 5 – غير مهم أبدا

3.29- أنا أؤمن بأن التقيد بالممارسات الصحية الجيدة (دائما) أثناء إعداد الوجبات قد تساهم في منع الأمراض المنقولة بالغذاء

1-أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

3.30- من الممكن أن المرضى في المستشفيات قد يموتون نتيجة استهلاكهم أغذية معدة تحت شروط غير صحية .

1- ممكن جدا 2- ممكن 3- غير متأكد 4- غير ممكن 5- مستحيل

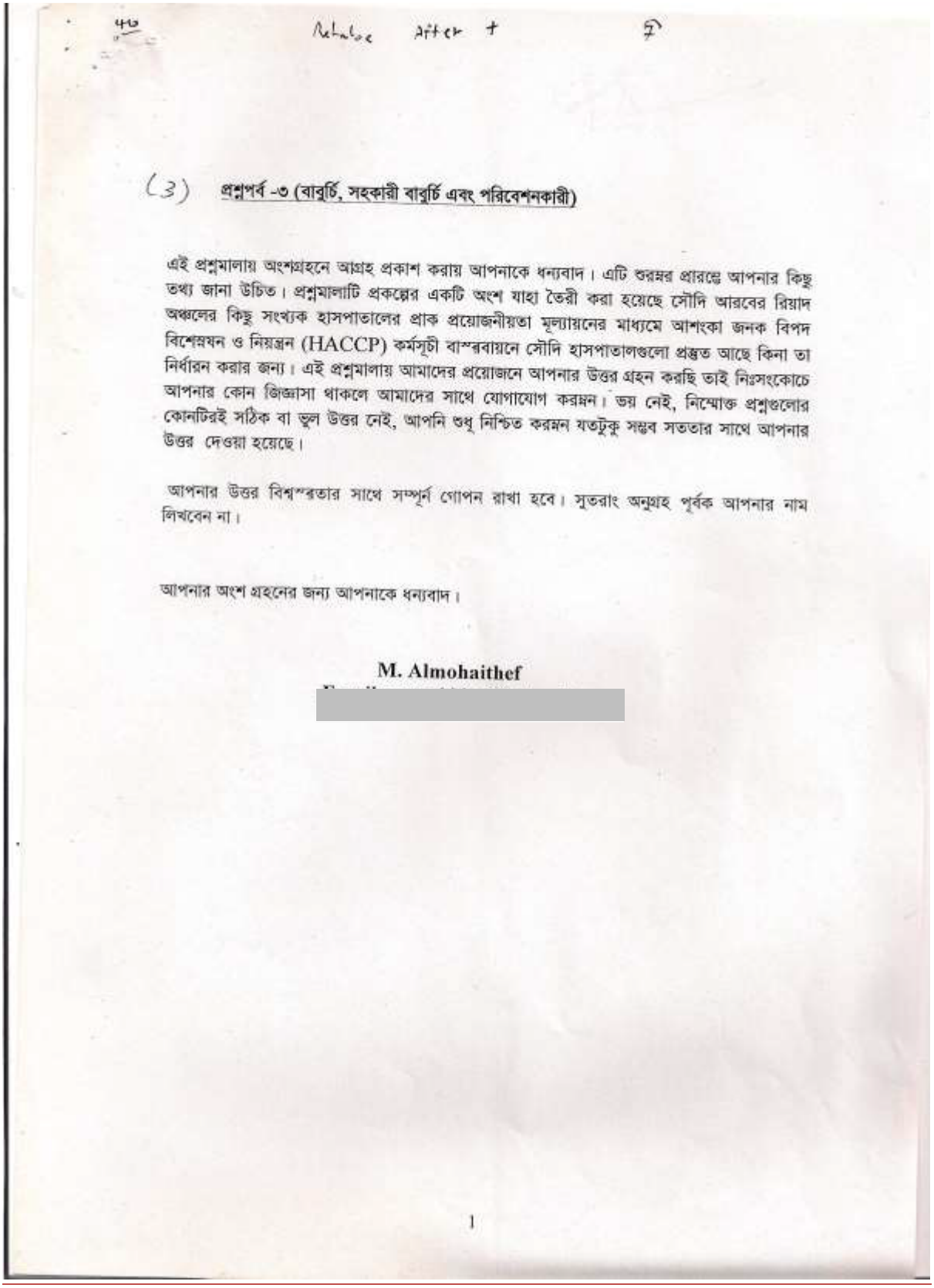
3.31- أنا اعتقد بأني أطبق الممارسات الصحية الصحيحة بشكل (اكبر) أثناء أعداد الوجبة عندما يكون المشرف متواجدا

1-أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

3.32- أنا أنوي التقيد بالممارسات الصحية الصحيحة دائما أثناء أعداد وتجهيز الوجبات

1-أوافق بشدة 2- أوافق 3- غير متأكد 4- لا أوافق 5 – لا أوافق أبدا

APPENDIX 11: QUESTIONNAIRE FOR GROUP 3, FOOD HANDLERS (BENGALI VERSION)



(3) প্রশ্নপর্ব -৩ (বাবুর্চি, সহকারী বাবুর্চি এবং পরিবেশনকারী)

এই প্রশ্নমালায় অংশগ্রহনে আগ্রহ প্রকাশ করায় আপনাকে ধন্যবাদ। এটি শুরুর প্রারম্ভে আপনার কিছু তথ্য জানা উচিত। প্রশ্নমালাটি প্রকল্পের একটি অংশ যাহা তৈরী করা হয়েছে সৌদি আরবের রিয়াদ অঞ্চলের কিছু সংখ্যক হাসপাতালের প্রাক প্রয়োজনীয়তা মূল্যায়নের মাধ্যমে আশংকা জনক বিপদ বিশ্লেষন ও নিয়ন্ত্রন (HACCP) কর্মসূচী বাস্তবায়নে সৌদি হাসপাতালগুলো প্রস্তুত আছে কিনা তা নির্ধারন করার জন্য। এই প্রশ্নমালায় আমাদের প্রয়োজনে আপনার উত্তর গ্রহন করছি তাই নিঃসংকোচে আপনার কোন জিজ্ঞাসা থাকলে আমাদের সাথে যোগাযোগ করুন। ভয় নেই, নিম্নোক্ত প্রশ্নগুলোর কোনটিরই সঠিক বা ভুল উত্তর নেই, আপনি শুধু নিশ্চিত করুন যতটুকু সম্ভব সততার সাথে আপনার উত্তর দেওয়া হয়েছে।

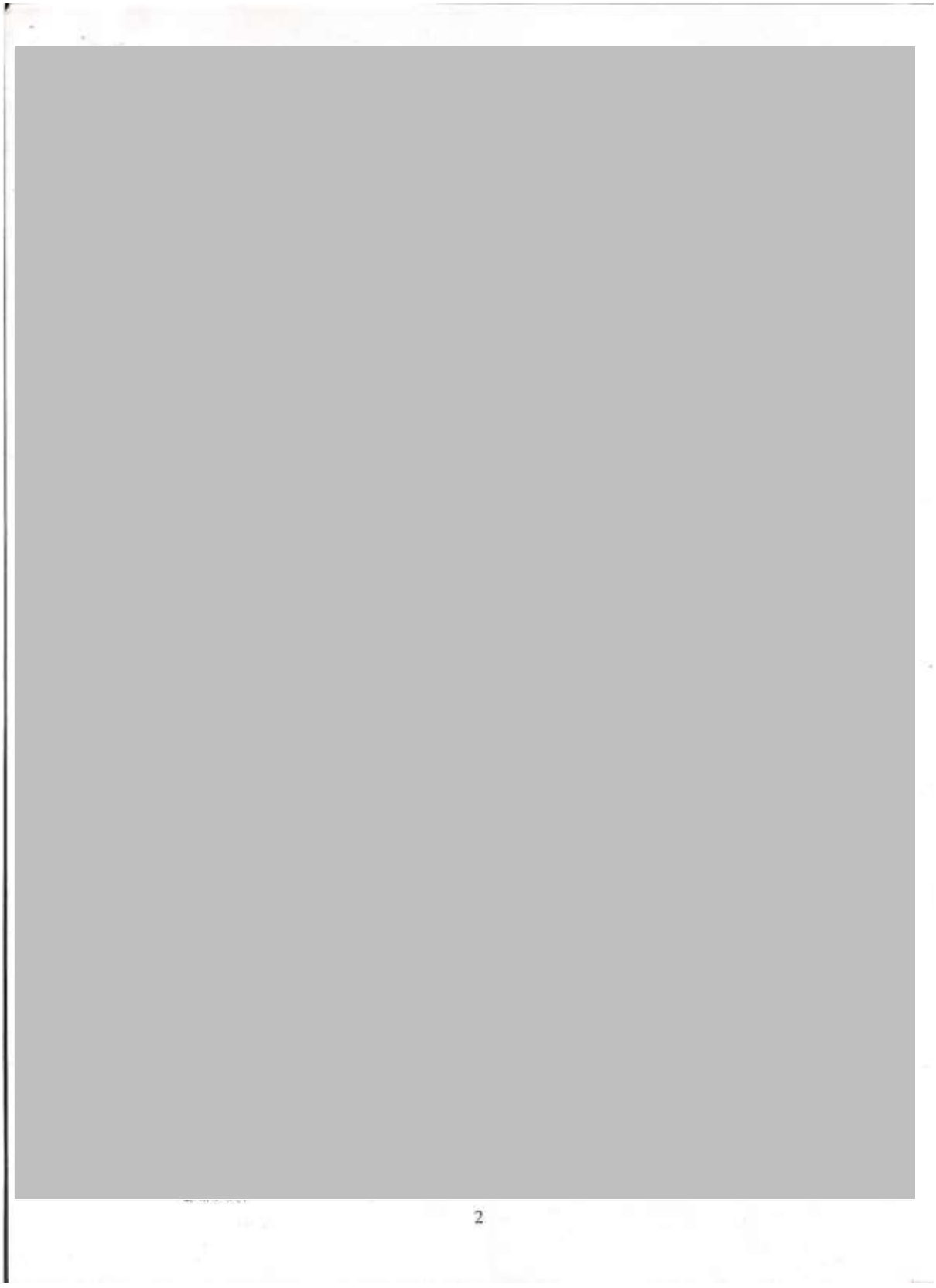
আপনার উত্তর বিশ্বস্ততার সাথে সম্পূর্ন গোপন রাখা হবে। সুতরাং অনুগ্রহ পূর্বক আপনার নাম লিখবেন না।

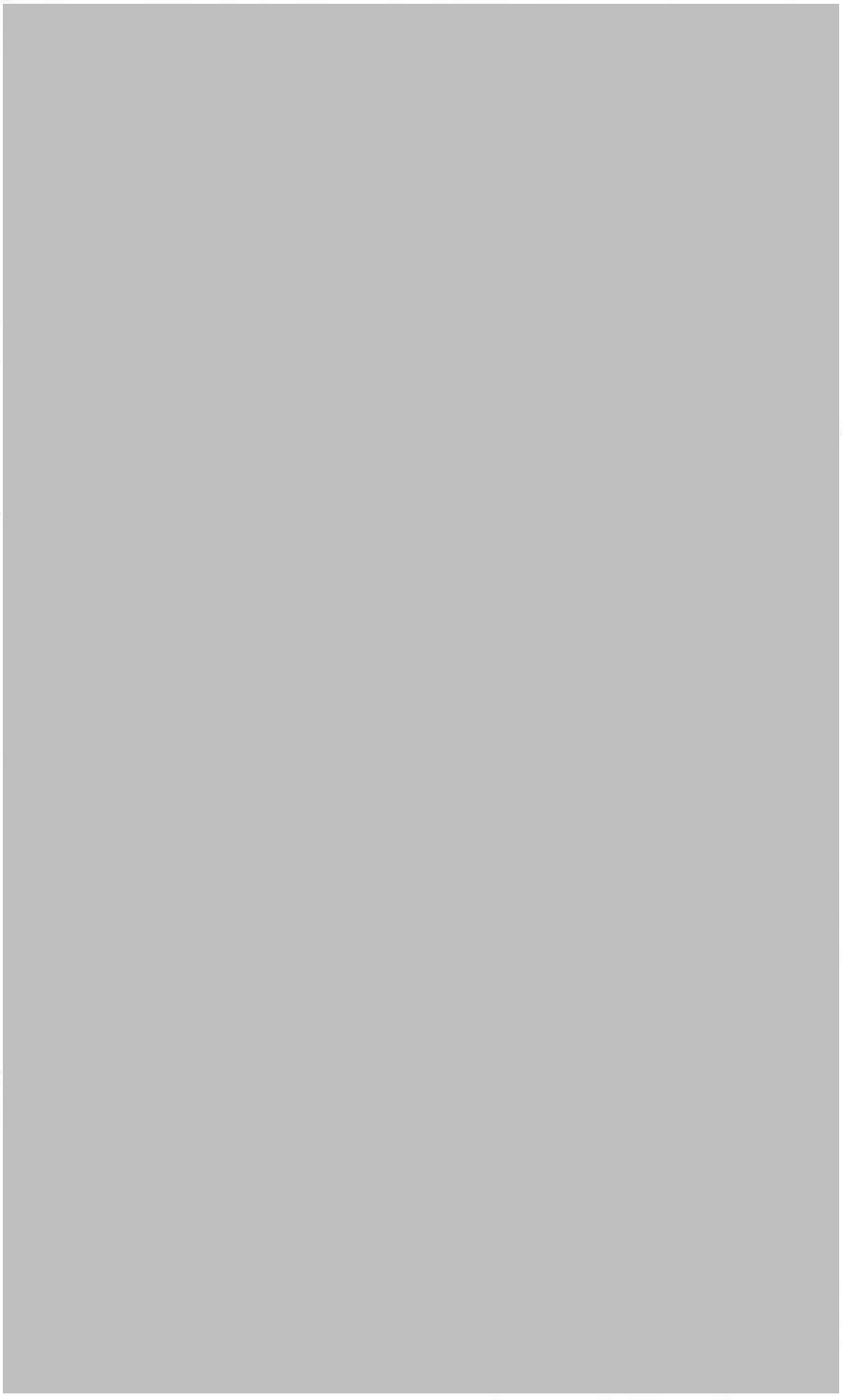
আপনার অংশ গ্রহনের জন্য আপনাকে ধন্যবাদ।

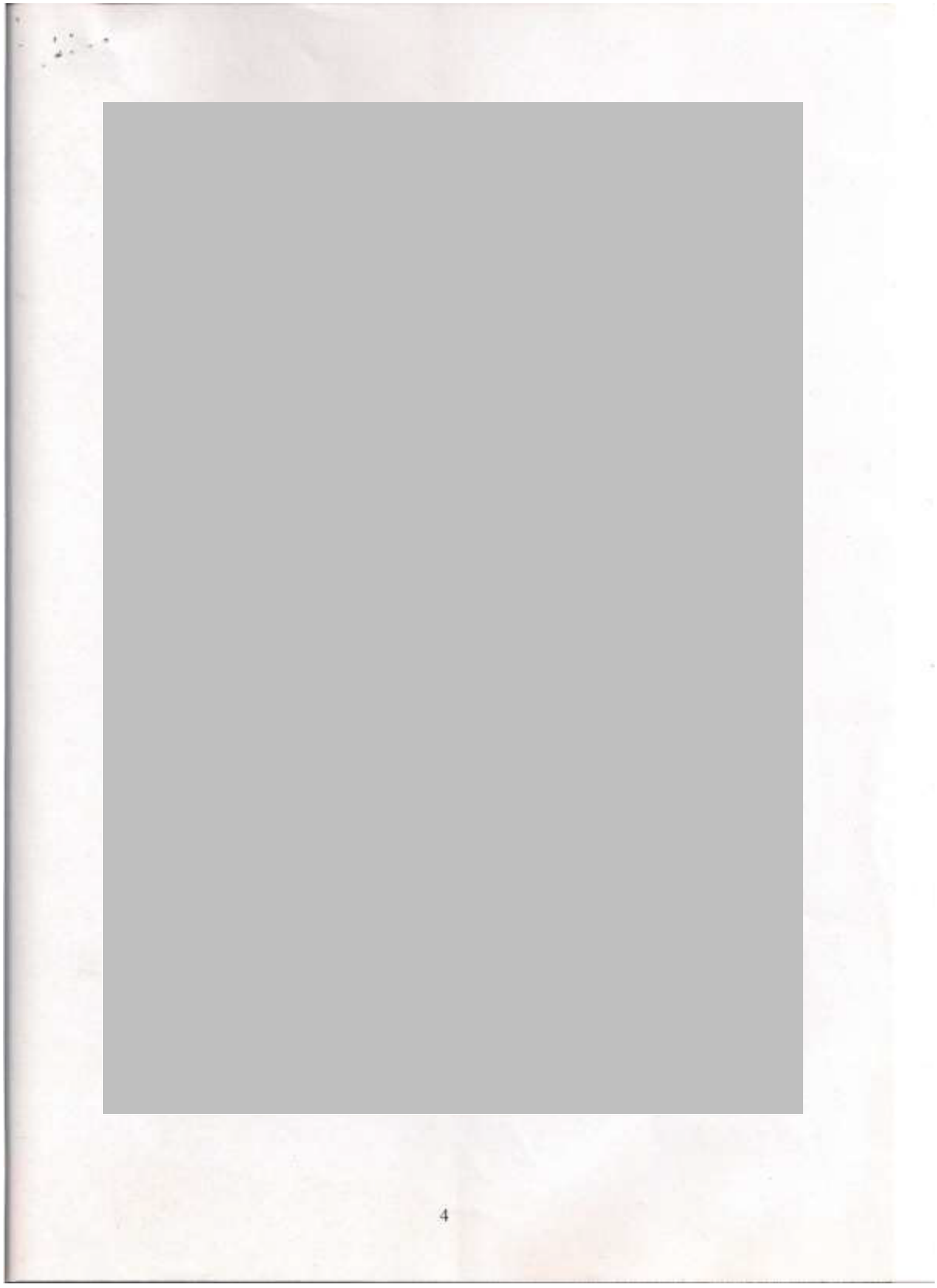
M. Almohaithef

[redacted]

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APPENDIX 12: QUESTIONNAIRE FOR GROUP 3 , FOOD HANDLERS (INDIAN VERSION)

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3

ഗ്രൂപ്പ് 3ൽ പെടുന്ന പാചകക്കാർ, സഹായികൾ, വെയിറ്റർമാർ, എന്നിവർക്കായുള്ള ചോദ്യാവലി

ഈ ചോദ്യാവലിയിൽ പങ്കെടുക്കുന്നതിനായി താങ്കൾക്കുള്ള താൽപര്യത്തിന് ആദ്യമേ തന്നെ നന്ദി പ്രകാശിപ്പിക്കട്ടെ. ഇവിടെ കൊടുത്ത ചോദ്യാവലിക്കുള്ള ഉത്തരങ്ങൾ രേഖപ്പെടുത്തുന്നതിന് മുന്നോടിയായി ചില വസ്തുതകൾ സൂചിപ്പിക്കുന്നു. സൗദി അറേബ്യയിലെ ആശുപത്രികളിൽ "അപകട സാദ്ധ്യതാ പഠനവും, നിയന്ത്രണങ്ങൾക്കും, നിവാരണങ്ങൾക്കുമുള്ള പദ്ധതികൾ" (Hazard Analysis Critical Cntrol Point – HACCP) നടപ്പിലാക്കുന്ന പ്രോജക്ടിന്റെ ഭാഗമായി, റിയാദ് പ്രവിശ്യയിലെ വിവിധ ആശുപത്രികളിലെ പദ്ധതികളെ അടിസ്ഥാനപ്പെടുത്തിക്കൊണ്ട് രൂപപ്പെടുത്തിയ ചോദ്യാവലികളാണ് ഇവിടെ കൊടുത്തിരിക്കുന്നത. താങ്കളുടെ ഉത്തരങ്ങൾ സർവ്വാത്മനാ സ്വാഗതം ചെയ്യുന്നതോടൊപ്പം, താങ്കൾക്കുണ്ടാവുന്ന സംശയങ്ങൾക്കുള്ള നിവാരണത്തിനായി ഏതു സമയത്തും താങ്കൾക്ക് ഞങ്ങളെ ബന്ധപ്പെടാവുന്നതുമാണ്. നിങ്ങൾ എഴുതുന്ന ഉത്തരങ്ങൾ ശരിയോ,തെറ്റോ ആയിക്കൊള്ളട്ടെ, മിറച്ച് നിങ്ങളുടെ ഉത്തരങ്ങളോട് പരമാവതി നിങ്ങൾക് നീതി പുലർത്തണമെന്നു മാത്രം.

നിങ്ങൾ അയക്കുന്ന ഉത്തരങ്ങൾ രഹസ്യമായി സൂക്ഷിക്കുമെന്നതിനായി താങ്കളുടെ പേര് വിവരങ്ങൾ എവിടേയും എഴുതേണ്ടതില്ലെന്ന് കൂടി ഓർമ്മിപ്പിക്കുന്നു.

താങ്കളുടെ സഹകരണത്തിന് നന്ദി

I [redacted]

1

1- പൊതു സവിശേഷതകൾ/മറ്റ് വിവരങ്ങൾ

1. ലിംഗം

a. പുരുഷൻ b- സ്ത്രീ

.....

2. വയസ്സ്

a. 24 ന് താഴെ b. 25 - 34 c. 35 - 44 d. 45 - 54 e. 55 ന് മുകളിൽ

.....

3. പദവി

a. സൗജന്യ b. മറ്റുള്ളവർ (ദയവായി രേഖപ്പെടുത്തുക)

.....

4. വിദ്യാഭ്യാസ യോഗ്യത

a. പ്രാഥമിക വിദ്യാഭ്യാസം b. ഡിപ്ലോമ

c. ബിരുദം e. മറ്റ് യോഗ്യത (രേഖപ്പെടുത്തുക)

.....

5. പ്രവർത്തി പരിചയം

a. ഒരു വർഷത്തിൽ താഴെ b. 2 - 5 c. 6 - 15 d. 16 - 25 e. 26 ന് മുകളിൽ

.....

6. ജോലിയുടെ സ്വഭാവം

a. ഫീൽഡ് ജോലി b. ഓഫീസ് ജോലി c. അഡ്മിൻ ജോലി

d. പരിപാലകൻ/പരിപാലിക e. മറ്റു തൊഴിൽ (രേഖപ്പെടുത്തുക)

.....

7. ശമ്പളം

a. 600 റിയാലിൽ താഴെ b. 600 - 1000 c. 1000 - 2000 d. 2000ന് മുകളിൽ

.....

8. ശുചിത്വ പരിപാലനത്തിനുള്ള പരിശീലനം

a. ഉണ്ട് b. ഇല്ല

.....

9. ഭക്ഷ്യ ശുചിത്വവുമായി ബന്ധപ്പെട്ട് ഏതെങ്കിലും പരിശീലനത്തിൽ പങ്കെടുക്കാനായി താങ്കളുടെ മേലധികാരി താങ്കളോട് ആവശ്യപ്പെട്ടിട്ടുണ്ടോ ?

a. ഉണ്ട് b. ഇല്ല

.....

1- പൊതു സവിശേഷതകൾ/മറ്റ് വിവരങ്ങൾ

1. ലിംഗം

a. പുരുഷൻ b- സ്ത്രീ

.....

2. വയസ്സ്

a. 24 ന് താഴെ b. 25 - 34 c. 35 - 44 d. 45 - 54 e. 55 ന് മുകളിൽ

.....

3. പദവി

a. സൗജന്യ b. മറ്റുള്ളവർ (ദയവായി രേഖപ്പെടുത്തുക)

.....

4. വിദ്യാഭ്യാസ യോഗ്യത

a. പ്രാഥമിക വിദ്യാഭ്യാസം b. ഡിപ്ലോമ

c. ബിരുദം e. മറ്റ് യോഗ്യത (രേഖപ്പെടുത്തുക)

.....

5. പ്രവർത്തി പരിചയം

a. ഒരു വർഷത്തിൽ താഴെ b. 2 - 5 c. 6 - 15 d. 16 - 25 e. 26 ന് മുകളിൽ

.....

6. ജോലിയുടെ സ്വഭാവം

a. ഫീൽഡ് ജോലി b. ഓഫീസ് ജോലി c. അഡ്മിൻ ജോലി

d. പരിപാലകൻ/പരിപാലിക e. മറ്റു തൊഴിൽ (രേഖപ്പെടുത്തുക)

.....

7. ശമ്പളം

a. 600 റിയാലിൽ താഴെ b. 600 - 1000 c. 1000 - 2000 d. 2000ന് മുകളിൽ

.....

8. ശുചിത്വ പരിപാലനത്തിനുള്ള പരിശീലനം

a. ഉണ്ട് b. ഇല്ല

.....

9. ഭക്ഷ്യ ശുചിത്വവുമായി ബന്ധപ്പെട്ട് ഏതെങ്കിലും പരിശീലനത്തിൽ പങ്കെടുക്കാനായി താങ്കളുടെ മേലധികാരി താങ്കളോട് ആവശ്യപ്പെട്ടിട്ടുണ്ടോ ?

a. ഉണ്ട് b. ഇല്ല

.....

2. വിലയിരുത്തൽ

1. മലിനീകരണം സംഭവിക്കുന്നത് അപകടകാരികളായ രോഗാണുക്കൾ പെരുകുന്നത് മൂലമാണ്
   a. ഭക്ഷണത്തിൽ നിന്ന് ഭക്ഷണത്തിലേക്ക്
   b. വ്യക്തികളിൽ നിന്ന് ഭക്ഷണത്തിലേക്ക്
   c. മറ്റു വസ്തുക്കളുമായുള്ള സമ്പർക്കങ്ങൾ മൂലം
   d. മുകളിൽ പറഞ്ഞ എല്ലാ കാരണങ്ങളാലും
   e. അറിയില്ല

2. പാകം ചെയ്യാൻ താല്പര്യങ്ങൾ കൈകാര്യം ചെയ്തതിനു ശേഷം കൈകൾ നന്നായി ശുചിയാക്കേണ്ടതിന്റെ ആവശ്യകത എന്തുകൊണ്ട്..?
   a. രോഗാണുക്കൾ പടരുന്നത് തടയുക
   b. മലിനീകരണം തടയുക
   c. ഭക്ഷ്യ വിഷ ബാധ ഒഴിവാക്കുക
   d. മുകളിൽ പറഞ്ഞ എല്ലാ കാരണങ്ങളാലും
   e. അറിയില്ല

3. ഭക്ഷണം പാകം ചെയ്യുമ്പോൾ കയ്യുറകൾ ധരിക്കുന്നത്
   a. ആഹാര പദാർത്ഥങ്ങൾ മലിനമാകാതിരിക്കാൻ
   b. മലിനീകരണത്തിൽ നിന്നും സ്വയം സംരക്ഷിക്കാൻ
   c. മുകളിൽ പറഞ്ഞ രണ്ട് കാര്യങ്ങൾക്കുമായി
   d. യാതൊരാവശ്യവുമില്ലെന്ന് മാത്രമല്ല അതൊരു അടയാളം കൂടിയാണ്
   e. അറിയില്ല

4.ഭക്ഷണം പാകം ചെയ്യുമ്പോഴും, ശീതീകരിക്കുമ്പോഴും പാകം ചെയ്തതും അല്ലാത്തതുമായ ഭക്ഷണങ്ങൾ പ്രത്യേകം പ്രത്യേകമായി വെക്കണമെന്ന് പറയുന്നത് എന്ത് കൊണ്ടാണ്..?
   a. അടുക്കള അടുക്കും ചിട്ടയുമായി സൂക്ഷിക്കാം എന്നതിനാൽ
   b. രുചി വ്യത്യാസം സംഭവിക്കാതിരിക്കാൻ
   c. മലിനീകരണം തടയാൻ
   d. മന്ത്രാലയത്തിന്റെ ആളുകൾ ആവശ്യപ്പെടുന്നു എന്നതിനാൽ
   e. അറിയില്ല

5. കോളി ബാക്ടീരിയ പകരുന്നത്
   a. ഈച്ചകൾ
   b. മനുഷ്യർ
   c. വൃത്തിക്കാത്ത ഇറച്ചിയും പച്ചക്കറികളും വഴി
   d. മേൽ പറഞ്ഞവയിലൂടെയെല്ലാം
   e. അറിയില്ല

6. ബാക്ടീരിയകൾ വഴി ഉണ്ടാകുന്ന ഭക്ഷ്യ മലിനീകരണം തിരിച്ചറിയാൻ കഴിയുന്നു
   a. കണ്ണത് നോക്കി
   b. പരിശോധിച്ചു നോക്കി
   c. അനുഭവ പരിചയത്തിലൂടെ
   d. അറിയില്ല

7. നേരത്തെ തയ്യാറാക്കി വച്ചിരിക്കുന്ന ഭക്ഷണത്തെക്കുറിച്ച് നിങ്ങൾക്ക് എന്തെങ്കിലും സംശയം തോന്നിയാൽ
   a. മന്ത്രാലയത്തിന്റെ സുപ്രീംകൌൺസിലറെ വിവരം അറിയിക്കും
   b. ചിലവു കുറക്കുന്നതിന്റെ ഭാഗമായി അതു വീണ്ടും ഉപയോഗിക്കും
   c. ചൂടാക്കി വീണ്ടും ഉപയോഗിക്കും
   d. നശിപ്പിക്കും
   e. അറിയില്ല

8. കോഴിയിറച്ചി പാകം ചെയ്യുമ്പോൾ അകത്തുള്ള ഊഷ്മാവ് ചുരുങ്ങിയത്
   a. 55C b. 65C c. 75C d. 100C e. അറിയില്ല

9. റഫ്രിജറേറ്ററിനു വേണ്ട കൃത്യമായ ഊഷ്മാവ്
   a. 10C 15C b. 5C 10C c. 3C 5Cd. 0 C ക്ക് താഴെ e. അറിയില്ല

10. കഴിക്കാൻ പാകമായ ചൂടുള്ള ഭക്ഷണം "ബൈൻ മാരി"യിൽ സൂക്ഷിക്കുന്ന ഊഷ്മാവ്

a. 25C b. 50C c. 65C d. 80C e. അറിയില്ല

11. പനിയോ, വയറിളക്കമോ, ഛർദ്ദിയോ നിങ്ങൾക്ക് അനുഭവപ്പെടുമ്പോൾ

a. സാധാരണ പോലെ ജോലി ചെയ്യും.
b. മുതലയുമായിലെ ബണ്ടപ്പെട്ട ഉദ്യോഗസ്ഥരെ വിവരമറിയിക്കും
c. ഡോക്ടറെ കണ്ടതിനു ശേഷം മാത്രം ജോലി തുടരും
d. ശരീരം നഷ്ടമാകുന്ന പേടിയിൽ റിപ്പോർട്ട് ചെയ്യില്ല
e. അറിയില്ല

12. അപകട സാദ്ധ്യതാ പഠനവും, നിയന്ത്രണങ്ങൾക്കും, നിവാരണങ്ങൾക്കുമുള്ള പദ്ധതികളും (Hazard Analysis Critical Control Points-HACCP) എന്നതിനെക്കുറിച്ച് നിങ്ങൾ എന്താണ് മനസ്സിലാക്കിയത്..?

a. കമ്പിട്ടർ മുഖേനയുള്ള ഭക്ഷ്യ സുരക്ഷ
b. നിയന്ത്രണത്തിനുള്ള ഉപാധി എന്ന നിലയിൽ
c. ഊഷ്മാവ് നിയന്ത്രണ സംവിധാനം എന്ന നിലയിൽ
d. അപകടങ്ങൾ തിരിച്ചറിഞ്ഞ്, നിയന്ത്രിക്കാനും ഭക്ഷ്യ സുരക്ഷ
e. ഉപയോഗിക്കാനും കഴിയുന്ന പദ്ധതിയെന്നതിനാൽ

13. അടുക്കളയിൽ ജോലി ചെയ്യുമ്പോൾ പുകവലി ആശാസ്യമല്ല. കാരണം

a. സിഗരറ്റിന്റെ ഗന്ധം ഭക്ഷണത്തിലേക്ക് വ്യാപിക്കുന്നതിനാൽ
b. ഉമിനീരിലുള്ള ബാക്ടീരിയ കൈവിരലിലൂടെ ഭക്ഷണത്തിലേക്ക് പകരാമെന്നതിനാൽ
c. അടുക്കളയിൽ തീപിടിച്ചേക്കാമെന്നതിനാൽ
d. മേൽ പറഞ്ഞ കാരണങ്ങൾ കൊണ്ടെല്ലാം
e. അറിയില്ല

3. ശീലങ്ങൾ

1. പൊതിഞ്ഞുവെക്കാത്ത ഭക്ഷണ പദാർത്ഥങ്ങൾ എടുക്കുന്നതിനു മുമ്പായി നിങ്ങൾ കൈകൾ വൃത്തിയായി കഴുകാറുണ്ടോ.?

a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

2. പൊതിഞ്ഞു വെ ാത്ത ഭക്ഷണ പദാർത്ഥങ്ങൾ പാകംചെയ്യുമ്പോഴോ, വിതരണം ചെയ്യുമ്പോഴോ, മുമ്പായി നിങ്ങൾ മാസ്ക് ധരിക്കാറുണ്ടോ.?

a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

3.പൊതിഞ്ഞു വെക്കാത്ത ഭക്ഷണ പദാർത്ഥങ്ങൾ കൈകാര്യം ചെയ്തതിനു ശേഷം നിങ്ങൾ വൃത്തിയായി കഴുകാറുണ്ടോ.?

a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

4. പൊതിഞ്ഞു വെ ിാത്ത ഭക്ഷണ പദാർത്ഥങ്ങൾ പാകംചെയ്യുമ്പോഴോ, വിതരണം ചെയ്യുമ്പോഴോ, നിങ്ങൾ കൂടാ അഥവാ തലയിൽ തൊപ്പി ധരിക്കാറുണ്ടോ.?

a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

5. ഭക്ഷണ സാധനങ്ങൾ ചൂടാറാതെ നിരീക്ഷിക്കുന്നതിനായി തെർമോമീറ്റർ ഉപയോഗിക്കാറുണ്ടോ..?

a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

പരിചാരകന്മാർ/പരിചാരികമാർ എന്നിവർക്ക് മാത്രമായുള്ള അധിക ചോദ്യങ്ങൾ

1. രോഗികൾക്കുള്ള ഭക്ഷണം വിതരണം ചെയ്യുന്നതിനു മുമ്പായി കൈകൾ ശുചിയാക്കാറുണ്ടോ..?
a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

2. രോഗികൾക്കുള്ള ഭക്ഷണം വിതരണം ചെയ്തതിനു ശേഷം കൈകൾ ശുചിയാക്കാറുണ്ടോ..?
a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

4. മനോഭാവം

1. ഭക്ഷണം പാകം ചെയ്യുമ്പോഴെല്ലാം ശരിയായ ശുചിത്വം പാലിക്കേണ്ടത്
a. വളരെ ആവശ്യമാണ് b. ആവശ്യമാണ് c. ആവശ്യമോ അനാവശ്യമോ അല്ല d. ആവശ്യമില്ല e.തീരെ ആവശ്യമില്ല

2. ഭക്ഷണം തയ്യാറാക്കുമ്പോൾ ശുചിത്വം പാലിക്കുന്നത് ഭക്ഷണം മൂലമുള്ള അസുഖങ്ങൾ തടയുന്നതിന് സഹായകരമാകുന്നു.
a. ശരിയായി തോന്നുന്നു b. തോന്നുന്നു c. തോന്നുകയോ വിയോജിക്കുകയോ ഇല്ല
d. വിയോജിക്കുന്നു e. കഠിനമായി വിയോജിക്കുന്നു

3. ശുചിയോടെ പാചക ചെയ്യാത്ത ഭക്ഷണം കഴിക്കുന്നത് ആശുപത്രിയിലെ രോഗികളുടെ മരണത്തിനു തന്നെ കാരണമായേക്കാം
a. കൂടുതൽ സാധ്യതയുണ്ട് b. സാധ്യതയുണ്ട് c. സാധ്യത ഉണ്ടാവാം ഇല്ലായിരിക്കാം
d. സാധ്യതയില്ല e. സാധ്യത തീരെ ഇല്ല

4.എന്റെ സുപ്രധാനസേവനമായ സാന്ത്വനത്തിൽ കൂടുതൽ ഭക്ഷണം പാചകം ചെയ്യുമ്പോൾ കൂടുതൽ ശുചിത്വം പാലിക്കാൻ ഞാൻ ശ്രമിക്കുന്നു
a. കൂടുതൽ സാധ്യതയുണ്ട് b. സാധ്യതയുണ്ട് c. സാധ്യത ഉണ്ടാവാം ഇല്ലായിരിക്കാം
d. സാധ്യതയില്ല e. സാധ്യത തീരെ ഇല്ല

5. ഭക്ഷണം പാകം ചെയ്യുന്ന സമയത്തെല്ലാം ശരിയായ ശുചിത്വം പാലിക്കാൻ ഞാൻ ശ്രമിക്കാറുണ്ട്
a. കൂടുതൽ സാധ്യതയുണ്ട് b. സാധ്യതയുണ്ട് c. സാധ്യത ഉണ്ടാവാം ഇല്ലായിരിക്കാം
d. സാധ്യതയില്ല e. സാധ്യത തീരെ ഇല്ല

Questionnaire for group 4 (cleaners and stores keepers)

Thank you for taking an interest in this questionnaire. Before you start here is some information you should know. This questionnaire is part of a project which is designed to determine the readiness of Saudi's hospitals for HACCP implementation by evaluating pre-requisites programmes in a number of hospitals in Riyadh region- Saudi Arabia. We are keen to receive your answers to this questionnaire so please feel free to contact us with any queries you may have. Don't worry; there are no right or wrong answers to any of the following questions, simply try to ensure that your answers are as honest as possible.

Your responses will remain confidential and completely anonymous, so please do not write your name.

Thank you for your participation

M. Almohaithef

Email : [redacted]

A- Demographic characteristic

4.1- Gender:

a- Male b- Female

…….

4.2- Age Group:

a- Under 24 b- 25-34 c- 35-44 d- 45-54 e- Over 55

……..

4.3- Nationality:

a- Saudi b- other (please classify) ……..

…….

4.4- Education and Qualifications:

a- Elementary b- Diploma

c- Bachelors d- Other (please classify) …….

……

4.5- Years of Work Experiences

a- < 1 b- 2 - 5 c- 6-15 d- 16-25 e- >25

…….

4.6- Work activity

b- Store Keeper b- Cleaner

d- Other.....

……..

4.7- Salary :

a- < 600 SR b- 600 – 1000 SR

c- 1000 – 2000 SR d- > 2000 SR

…….

4.8- Have you received any hygiene training?

b- Yes b- No

…….

4. 9- Have your managers required of you to attend any food hygiene training course?

b- Yes b- No

……..

B. Knowledge

4.10 Why is it important to wash your hands after handling raw meat?

a. To prevent spread of bacteria/germs
b. To avoid cross contamination
c. To avoid food poisoning
d. All above
e. Do not Know

4.11 Food poisoning bacteria can be brought into the kitchen by :

a. People
b. Insects
c. Raw meat and vegetables
d. All above
e. Do not know

4.12. The correct temperature for a refrigerator is

a. 10 C - 15 C
b. 5 C – 10 C
c. 1 C – 5 C
d. Below 0 C
e. Do not know

4.13. The correct temperature for a freezer is :

a. 0 C
b. -4 C
c. -18 C
d. 1 C
e. Do not know

4.14 . Raw meat should be stored at:

a. The top of the fridge
b. The bottom of fridge
c. The centre of fridge
d. None of those
e. Do not know

4.15. When you suffer of fever, diarrhoea, or vomiting, will you:

f. Continue working normally
g. Report Ministry's employees
h. Go to doctor then continue working
i. Afraid to report because they stop your work without salary
j. Do not know

4.16. What do you understand by "Hazard Analysis critical control Points" (HACCP)?

a. Food safety system by using computer
b. Process control
c. Temperature control
d. System to ensure safe food by identifying and controlling specific hazards
e. Don't know

4.17 . When a disinfectant is used to clean refrigerators the equipment should be turn off and brought to room temperature because:

a. It is safe
b. To reduce electric cost
c. Disinfectant work best at room temperature
d. Do not know

4.18. Why floors must be kept clean especially at the end of the day?

a. To keep the tiles in a good condition
b. Insects may transfer contamination between floor and work surface
c. To remove bad smell
d. Do not know

4.19. Washing utensils with water and soap kill all bacteria

a. Yes b. No c. Do not know

4.20. Chemicals items should be stored separately than other foodstuffs

b. Yes b. No c. Do not know

4.21. Keeping on my gloves when going to the toilet may prevent diseases

a. Yes b. No c. Do not know

.....

C. Practices

4.22. Do you wash your hands before touching unwrapped raw foods?

a. Always b. Sometimes c. Never

4.23. Do you use the same towel to clean many places in the kitchen ?

a. Always b. Sometimes c. Never

4.24. Do you wash your hands after touching unwrapped foods?

a. Always b. Sometimes c. Never

4.25. Do you check concentration of sanitizing solutions according to manufacture's instruction

a. Always b. Sometimes c. Never

D. Attitude

4.26 Carrying out good hygienic practice at all times during food preparation is

1. Very important 2. Important 3. Neither important or not 4. Unimportant 5. Very unimportant

4.27 Carrying out good hygienic behaviour at all times during food preparation can help to prevent food borne illness

1. Strongly agree 2. Agree 3. Neither agree or disagree 4. Disagree 5.strongly disagree

4.28. It is possible that hospital patients may die as a result of eating food that was not hygienically prepared

1. Highly possible 2.Possible 3.Neither possible or not 4.Impossible 5. Highly impossible

4.29. My behaviour during food preparation is more hygienic when my supervisor is present

1. Highly possible 2.Possible 3.Neither possible or not 4.Impossible 5. Highly impossible

4.30. I intend to carry out good hygienic practice at all times during food preparation

1. Extremely likely 2. Likely 3.Neither likely nor unlikely 4. Unlikely 5. Extremely unlikely

APPENDIX 14: QUESTIONNAIRE FOR GROUP 4 , CLEANERS AND STORE KEEPERS (BENGALI VERSION)

Questionnaire For Group 4(cleaners and Stores keepers)

তিন (৩) টা শ্রেনীর জন্য প্রশ্নমালা: (বাবুর্চি- সহকারী বাবুর্চি এবং পরিবেশনকারী)

এই প্রশ্নমালা গুলিতে অংশগ্রহনের আগ্রহের জন্য আপনাকে ধন্যবাদ। এখানে আরাম্ভ করার পূর্বেই আপনার অবশ্যই কিছু তথ্য জানা আছে। এই প্রশ্নগুলি প্রকল্পের একটি অংশ যাহা সৌদি আরবের রিয়াদ এলাকার একটি সৌদি হাসপাতালের প্রাক-প্রয়োজনীয়তা মূল্যায়ন করার মাধ্যমে HACCP প্রোগাম বাস্তবায়ন করার জন্য সৌদি হাসপাতলগুলো প্রস্তুত/আগ্রহ আছে কিনা তা নির্ধারন করতে পরিকল্পনা করা হয়। আমরা অতি আগ্রহের সাথে এই প্রশ্নমালাটিতে আপনার উত্তরের অপেক্ষায় আছি, সুতরাং আপনার যে কোন অনুসন্ধানের জন্য মুক্ত মনে আমাদের সাথে যোগাযোগ করুন। নির্ভয়ে নিম্নেলিখিত প্রশ্নের উত্তর দিন, তাতে ভুল অথবা সঠিক যাহাই হউক, আপনী যথাসম্ভব চেষ্টা করুন সঠিক উত্তরের জন্য।

আপনার উত্তর সম্পুর্ন গোপনীয় এবং অজ্ঞাতনামা হিসাবে থাকবে, সুতরাং দয়া করে আপনার নাম লিখবেন না।

আপনার অংশগ্রহনের জন্য ধন্যবাদ

এম. আলমোহাইতেফ

I [redacted]

I

১. জনসংখ্যাতাত্ত্বিক বৈশিষ্ট্য

১- লিঙ্গ:

ক) পুরুষ খ) মহিলা

. . . . . .

২. বয়সের শ্রেনী:

ক) ২৪ এর নীচে, খ) ২৫-৩৪ বছর গ) ৩৫-৪৪ বছর ঘ) ৪৫-৫৪ বছর ঘ) ৫৫ এর উপরে

. . . . . .

৩. জাতীয়তা:

ক) সৌদি খ) অন্যান্য (দয়া করে বর্ননা করুন)

. . . . . .

৪. শিক্ষাগত যোগ্যতা:

ক) প্রাথমিক খ) ডিপ্লোমা

গ) গ্যাজুয়েট ঘ) অন্যান (দয়া করে বর্ননা দিন)

. . . . . .

৫. কত বছরের কাজের অভিজ্ঞতা:

ক) ১ বছরের নীচে খ) ২-৫ বছর গ) ৬-১৫ বছর ঘ) ১৬-২৫ বছর ঙ) ২৫ বছরের উপরে

. . . . . .

৬. কাজের দায়িত্ব:

ক) প্রধান বাবুর্চি খ) বাবুর্চি

গ) সহকারী বাবুর্চি ঘ) পরিবেশন কারী

. . . . . .

৭. বেতন:

ক) ৬০০ রিয়ালের নীচে খ) ৬০০-১০০০ রিয়াল

গ) ১০০০-২০০০ রিয়াল ঘ) ২০০০ রিয়ালের উপরে

. . . . . .

৮. আপনার স্বাস্থ্যবিজ্ঞান সংশ্লিষ্ট কোন প্রশিক্ষন আছে কিনা?

ক) হ্যাঁ খ) না

. . . . . .

৯. আপনার ম্যানেজার আপনাকে স্বাস্থ্যবিজ্ঞান প্রশিক্ষনের জন্য কখনও মনোনীত করিয়া ছিল কিনা?

ক) হ্যাঁ খ) না

.....

২. জ্ঞান/অভিজ্ঞতা:

১. কাঁচা মাংস নাড়াচাড় বা ধরার পর আপনার হাত ধোয়া গুরুত্বপুন কেন?

ক) অতিশয় ক্ষুদ্রতম ব্যাকটেরিয়া/জীবানুর হাত থেকে রক্ষার জন্য ।
খ) যাহাতে দুষিত জীবানু পার হতেনা পারে ।
গ) খাদ্য বিষক্রিয়া থেকে রক্ষার জন্য ।
ঘ) উপরের সব থেকে ।
ঙ) জানি না

২. খাদ্যে বিষক্রিয়া বা বিষাক্তকারী জীবানু কিচেনে/ পাকঘরে আনায়ন করে

ক) জনসাধারন
খ) ক্ষুদ্র প্রাণী
গ) কাঁচা মাংস এবং সাকসবজি
ঘ) উপরের সব থেকে
ঙ) জানি না

৩. একটা ফ্রিজের সঠিক তাপমাত্রা হয়:-

ক) ১০সেন্টিগ্রেড - ১৫ সেন্টিগ্রেড
খ) ৫সেন্টিগ্রেড - ১০ সেন্টিগ্রেড
গ) ১সেন্টিগ্রেড - ৫ সেন্টিগ্রেড
ঘ) ০ সেন্টিগ্রেডের নীচে
ঙ) জানি না

৪. ফ্রিজের ভিতরের অংশে সঠিক তাপমাত্রা হয়:-

ক) ০ সেন্টিগ্রেড
খ) মাইনাস ৪ সেন্টিগ্রেড
গ) মাইনাস ১৮ সেন্টিগ্রেড
ঘ) ১ সেন্টিগ্রেড
ঙ) জানি না

৫. কাঁচা মাংস সংরক্ষন করা হয়:-

ক)ফ্রিজের ভিতরে উপরের অংশে
খ) ফ্রিজের ভিতরে নীচের অংশে
গ) ফ্রিজের ভিতরে মধ্যম অংশে
ঘ) কোনটার ভিতর না
ঙ) জানি না

৬. কখনও আপনী জ্বরে, ডাইরিয়া আক্রান্ত হলে বা বমি হলে কি করবেনঃ-

ক) সাধারন ভাবে আপনার কাজ চালিয়ে যাবে

খ) মন্ত্রনালয়ের কর্মচারীর নিকট রির্পোট করবেন

গ) ডাক্তারের নিকট যাবে এবং কাজ চালিয়ে যাবে

ঘ) ভয়/ শঙ্কিত মনে রির্পোট করবেন কারন তারা যদি বিনা বেতনে আপনার ডিউটি বন্ধ করে দেয়

ঙ) জানি না

৭. "Hazard Analysis Critical Control Points" (HACCP) বলতে আপনী কি বুঝেন

ক) কম্পিউটার ব্যবহারের মাধ্যমে খাবার নিরাপত্তা পদ্ধতি।

খ) পদ্ধতি নিয়ন্ত্রন।

গ) তাপমাত্রা নিয়ন্ত্রন।

ঘ) নিদ্দিষ্ট ঝুকি বা বিপদ সনাক্ত করার তাহা নিয়ন্ত্রনের মাধ্যমে নিরাপদ খাবার নিশ্চিত করার পদ্ধতি

ঙ) জানি না।

৮. ফ্রিজ বন্ধকরে যন্ত্রাংশ খুলে যখন রোগ জীবাণুনাশক দিয়ে পরিষ্কার করা হয় তখন যন্ত্রাংশ গুলো রুমের তাপমাত্রায় নিয়ে আসা হয় কারনঃ-

ক) এইটি নিরাপদ।

খ) বিদ্যুৎ বিল কমানোর জন্য।

গ) রুমের তাপমাত্রায় রোগ জীবাণুনাশকের কার্য্যকারীতা বেশী।

ঘ) জানি না

৯. বিশেষ করে দিনের শেষে ফ্লোর বা মেঝ কেন পরিস্কার করা হয়?

ক) মেঝের বা ফ্লোরের টাইলস গুলো ভাল আবস্থায় রাখতে।

খ) ছোট কীট পতঙ্গ যেন ফ্লোর থেকে কাজের স্থানে দুষিত কিছু স্থানান্তর করতে না পারে।

গ) খারাপ গন্ধ বাহির করে দেয়ার জন্য।

ঘ) জানি না

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১১. পানি ও সাবন দিয়ে গৃহস্থলীর কাজে ব্যবহৃত জিনিস পত্র ধুয়ো নিলে জীবাণূ মরে যায়

ক) হ্যাঁ খ) না গ) জানি না

১২. রসায়নিক দ্রব্যাদি খাদ্য দ্রব্য থেকে আবশ্যই আলাদা রাখতে হয়

ক) হ্যাঁ খ) না গ) জানি না

১৩. টয়লেটে যাওয়ার আগে আমার গ্লোবস সযত্নে রাখি, কারন তাহা রোগ প্রতিরোধে সহায়ক

ক) হ্যাঁ খ) না গ) জানি না

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৩. অভ্যাসঃ

১. খোলা ডাকনা বিহীন খাদ্য ধরার আগে কি আপানার হাত ধুয়ে নেন ?

ক) সবসময় খ) মাঝে মাঝে গ) কখনও না

২. যে তোয়ালে দিয়ে রান্নাঘরের বিভিন্ন জায়গা পরিস্কার করা হয় আপনী কি সেটি ব্যবহার করেন?

ক) সবসময় খ) মাঝে মাঝে গ) কখনও না

৩. ডাকনা বিহীন খাদ্য ধরার পর কি আপনার হাত ধুয়ে নেন?

ক) সবসময় খ) মাঝে মাঝে গ) কখনও না

৪. আপনী কি প্রস্তুতকারকের নির্দেশ পুর্ন মনোযোগ সহকারে সেনিটাইজিং পরীক্ষা করেন

ক) সবসময় খ) মাঝে মাঝে গ) কখনও না

৪. মনোভাবঃ

১. খাবার তৈরী সময় এবং অন্য সবসময় ভাল স্বাস্থ্যবিধি অনুশীলন করা

ক) খুব গুরুত্বপূর্ন ক) গুরুত্বপূর্ন গ) কোন গুরুত্বপুর্না না অথবা না

ঘ) গুরুত্বপূর্ন না ঙ) একবারে গুরুত্বপূর্ন না

২. খাবারের দুষিত প্রতিরোধ করতে, খাবার তৈরীর সময় বা সবসময় ভাল স্বাস্থ্যবিধি সাহায্য করতে পারে

ক) দৃঢ়ভাবে সম্মত খ) সম্মত গ) কখনও সম্মত নয়, অথবা সম্মত না

ঘ) সম্মত না ঙ) দৃঢ় ভাবে সম্মত না

৩. স্বাস্থ্যবিধি মোতাবেক খাদ্য তৈয়ার না করিলে ঐ খাদ্য খাওয়ার ফলে হাসপাতালে রোগী মারা যাওয়া সম্ভব

ক) অবশ্যই সম্ভব খ) সম্ভব গ) কোন সম্ভব নাই অথবা না

ঘ) সম্ভব না ঙ) একবারেই অসম্ভব

৪. খাবার তৈরীর সময় আমার আচরন আরো বেশী স্বাস্থ্যবিধি সম্মত হয় যখন আমার সুপারভাইজার উপস্থিত থাকে।

ক) অবশ্যই সম্ভব খ) সম্ভব গ) কোন সম্ভব নাই অথবা না

ঘ) সম্ভব না ঙ) একবারেই অসম্ভব

৫. আমি খাবার তৈরী কালীন পূর্ন সময়, বা সব সময় মান সম্মত স্বাস্থ্যবিধি মানিয়ে চলতে উদ্যোগী হই

ক) প্রচন্ডভাবে সম্ভব খ) সম্ভব গ) অসম্ভব অথবা না

ঘ) অসম্ভব ঙ) একবারে সম্ভব নয়

APPENDIX 15: QUESTIONNAIRE FOR GROUP 4 , CLEANERS AND STORE KEEPERS (INDIAN VERSION)

ഗ്രൂപ്പ് 4ൽ പെടുന്ന പാചകക്കാർ, സഹായികൾ, വെയിറ്റർമാർ, എന്നിവർക്കായുള്ള ചോദ്യാവലി

ഈ ചോദ്യാവലിയിൽ പങ്കെടുക്കുന്നതിനായി താങ്കൾക്കുള്ള താല്പര്യത്തിന് ആദ്യമേ തന്നെ നന്ദി പ്രകാശിപ്പിക്കട്ടെ. ഇവിടെ കൊടുത്ത ചോദ്യാവലിക്കുള്ള ഉത്തരങ്ങൾ രൂപപ്പെടുത്തുന്നതിന് മുന്നോടിയായി ചില വസ്തുതകൾ സൂചിപ്പിക്കുന്നു. സമീപ ഭാവിയിലെ ആശുപത്രികളിൽ "അപകട സാദ്ധ്യതാ പഠനവും, നിയന്ത്രണങ്ങൾക്കും, നിവാരണങ്ങൾക്കുമുള്ള പദ്ധതികൾ" (Hazard Analysis Critical Control Point – HACCP) നടപ്പിലാക്കുന്ന പ്രോജക്ടിന്റെ ഭാഗമായി, റിയാദ് പ്രവിശ്യയിലെ വിവിധ ആശുപത്രികളിലെ പദ്ധതികളെ അടിസ്ഥാനപ്പെടുത്തിക്കൊണ്ട് " രൂപപ്പെടുത്തിയ ചോദ്യാവലികളാണ് ഇവിടെ കൊടുത്തിരിക്കുന്നത്. താങ്കളുടെ ഉത്തരങ്ങൾ സർവ്വാത്മനാ സ്വാഗതം ചെയ്യുന്നതോടൊപ്പം, താങ്കൾക്കു ാവുന്ന സംശയങ്ങൾക്കുള്ള നിവാരണത്തിനായി ഏതു സമയത്തും താങ്കൾക്ക് ഞങ്ങളെ ബന്ധപ്പെടാവുന്നതുമാണ്. നിങ്ങൾ എഴുതുന്ന ഉത്തരങ്ങൾ ശരിയോ,തെറ്റോ ആയിക്കൊള്ളട്ടെ, മിറച്ച് നിങ്ങളുടെ ഉത്തരങ്ങളോട് പരമാവധി നിങ്ങൾ നീതി പുലർത്തണമെന്നു മാത്രം.

നിങ്ങൾ തരുന്ന ഉത്തരങ്ങൾ രഹസ്യമായി സൂക്ഷിക്കുമെന്നതിനായി താങ്കളുടെ പേര് വിവരങ്ങൾ എവിടെയും എഴുതേ തിരിച്ചറിഞ്ഞ കൂടി ഓർമ്മിപ്പിക്കുന്നു.

താങ്കളുടെ സഹകരണത്തിന് നന്ദി

M. Almohaithef
Email [redacted]

1 - പൊതു സവിശേഷതകൾ/മറ്റ് വിവരങ്ങൾ

1. ലിംഗം
   a. പുരുഷൻ b- സ്ത്രീ

.....

2. വയസ്സ്
   a. 24 ന് താഴെ b. 25 - 34 C. 35 - 44 d. 45 - 54 e. 55 നു മുകളിൽ

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3. പൗരത്വം
   a. സൗദി b. മറ്റുള്ളവർ (ദയവായി രേഖപ്പെടുത്തുക)

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4. വിദ്യാഭ്യാസ യോഗ്യത
   a. പ്രാഥമിക വിദ്യാഭ്യാസം b. ഡിപ്ലോമ
   C. ബിരുദം e. മറ്റ് യോഗ്യത (രേഖപ്പെടുത്തുക)

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5. പ്രവർത്തന പരിചയം
   a. ഒരു വർഷത്തിൽ താഴെ b. 1 - 5 C. 6 - 15 d. 16 - 25 e. 26 നു മുകളിൽ

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6. ജോലിയുടെ സ്വഭാവം
   a. ചീഫ് കുക്ക് b. കുക്ക് C. അസി. കുക്ക്
   d. പരിചാരകൻ/പരിചാരിക e. മറ്റു തൊഴിൽ (രേഖപ്പെടുത്തുക)

.....

7. ശമ്പളം
   a. 600 റിയാലിൽ താഴെ b. 600 - 1000 C. 1000 - 2000 d. 2000ന് മുകളിൽ

.....

8. ശുചിത്വ പരിപാലനത്തിനുള്ള പരിശീലനം
   a. ഉ ˇ b. ഇല്ല

.....

9. കഴിഞ്ഞ ശുചിത്വവുമായി ബന്ധപ്പെട്ട് ഏതെങ്കിലും പരിശീലനത്തിൽ പങ്കെടുക്കാനായി താങ്കളുടെ മേലധികാരി താങ്കളോട് ആവശ്യപ്പെട്ടിട്ടുണ്ട ാ ?
   a. ഉ ˇ b. ഇല്ല

.....

2. വിജ്ഞാപനം

1. പാകം ചെയ്യാൻ മാംസങ്ങൾ കൈകാര്യം ചെയ്തതിനു ശേഷം കൈകൾ നന്നായി ശുചിയാക്കേ തിന്റെ ആവശ്യകത എന്തുകൊ "..?

a. രോഗാണുക്കൾ പടരുന്നത് തടയുക

b. മലിനീകരണം തടയുക

c. ഭക്ഷ്യ വിഷ ബാധ ഒഴിവാക്കുക

d. മുകളിൽ പറഞ്ഞ എല്ലാ കാരണങ്ങളാലും

e. അറിയില്ല

2. ഭക്ഷ്യ വിഷബാധക്ക കാരണമാകുന്ന ബാക്ടീരിയ അടുക്കളയിലെത്തുന്നത്

a. ആളുകളിലൂടെ

b. പ്രാണികളിലൂടെ

c. വെയ്ക്കാത്ത ഇറച്ചിയും പച്ചക്കറികളും വഴി

d. മേൽ പറഞ്ഞവയിലൂടെയെല്ലാം

e. അറിയില്ല

3. റഫ്രിജറേറ്ററിനു വേ കുതുമായ ഊഷ്മാവ്

a. 10C 15C b. 5C 10C c. 1C 5C d. 0C ക്ക് താഴെ e. അറിയില്ല

4. ഫ്രീസറിനു വേ ുന്ന കുതുമായ ഊഷ്മാവ്

a. 0C b. 4C c. -18C d. 0C ക്ക് താഴെ e. അറിയില്ല

5. വെയ്ക്കാത്ത മാംസങ്ങൾ സൂക്ഷിക്കുന്നത്

a. ഫ്രിഡ്ജിന്റെ മുകൾ ാഗത്തായി b. ഫ്രിഡ്ജിന്റെ അടിാഗത്തായി

c. ഫ്രിഡ്ജിന്റെ നടുവിലായി d. ഇതിലൊന്നുമല്ല e. അറിയില്ല

6. പന്നിയോ, വയറിളക്കമോ, ചർദ്ദിയോ നിങ്ങൾക്ക് അനുഭവപ്പെടുമ്പോൾ

a. സാധാരണ പോലെ ജോലി ചെയ്യും.

b. ന്ത്രാലയത്തിലെ ബന്ധപ്പെട്ട ഉദ്യോഗസ്ഥനെ വിവരമറിയിക്കും

c. ഡോക്ടറെ ക തിനു ശേഷം രാത്രം ജോലി തുടരും

d. ശമ്പളം നഷ്ടമാകുന്ന പേടിയിൽ റിപ്പോർട്ട് ചെയ്യില്ല

e. അറിയില്ല

7. അപകട സാദ്ധ്യതാ പഠനവും, നിയന്ത്രണങ്ങൾക്കും, നിവാരണങ്ങൾക്കുമുള പദ്ധതികൾ (Hazard Analysis Critical Cntrol Point – HACCP) എന്നതിനെക്കുറിച്ച് നിങ്ങൾ എന്താണ് മനസ്സിലാക്കിയിട്ടുള്ളത്..?

a. കമ്പ്യൂട്ടർ മുഖേനയുള്ള ഭക്ഷ്യസുരക്ഷ

b. നിയന്ത്രണത്തിനുള്ള ഉപാതി എന്ന നിലയിൽ

c. ഊഷ്മാവ് നിയന്ത്രണ സംവിധാനം എന്ന നിലയിൽ

d. അപകടങ്ങൾ തിരിച്ചറിഞ്ഞ് പ്രവർത്തിക്കാനും ഭക്ഷ്യ സുരക്ഷ ഉറപ്പാക്കാനും കഴിയുന്ന പദ്ധതി എന്ന നിലയിൽ.

e. അറിയില്ല

8. അണുനാശിനികൾ ഉപയോഗിച്ച് റഫ്രിജറേറ്റർ വൃത്തിയാക്കുമ്പോൾ, അത് ഓഫാക്കി അന്തരീക്ഷ ഊഷ്മാവിലേക്കെത്തി എന്ന് ഉറപ്പ് വരുത്തേ തു ".. കാരണം..?

a. അങ്ങിനെ ചെയ്യുന്നത് സുരക്ഷിതമാണ്.

b. ഇലക്ട്രിസിറ്റി ചാർജ്ജ് ലാഭിക്കാം എന്നതിനാൽ

c. അന്തരീക്ഷ ഊഷ്മാവിൽ അണുനാശിനി ഫലപ്രദമായി പ്രവർത്തിക്കുമെന്നതിനാൽ

d. അറിയില്ല

9. ദിവസത്തിനൊടുവിൽ തറ വൃത്തിയായി സൂക്ഷിക്കേ ത് എന്തുകൊ ്..?

a. ടൈൽസ് നല്ല വൃത്തിയായി സൂക്ഷിക്കാൻ

b. വൃത്തിഹീനമായ തറയിൽ നിന്നും അണുക്കൾ അന്തരീക്ഷത്തിലേക്ക് പടരാൻ സാധ്യതയുള്ളതിനാൽ.

c. ദുർഗന്ധം തടയാൻ

d. അറിയില്ല

10. സോപ്പും വെള്ളവും ഉപയോഗിച്ച് പാത്രങ്ങൾ വൃത്തിയാക്കുന്നത് അണുക്കളെ നശിപ്പിക്കാൻ സഹായിക്കുന്നു.

a. അതെ b. ഇല്ല c. അറിയില്ല

11. രാസ പദാർത്ഥങ്ങൾ ഭക്ഷണസാധനങ്ങളിൽ നിന്നും പ്രത്യേകമായി സൂക്ഷിക്കണം

a. അതെ b. ഇല്ല c. അറിയില്ല

12. ടോയ്ലെറ്റുകളിൽ പൊകുന്ന നേരത്തും കയ്യുറകൾ ഊരാതെ വെക്കുന്നത് രോഗം വരുന്നത് തടയാൻ സഹായിക്കും

a. അതെ b. ഇല്ല c. അറിയില്ല

3. ശീലങ്ങൾ

1. പൊതിഞ്ഞുവെക്കാത്ത ഭക്ഷണ പദാർത്ഥങ്ങൾ എടുക്കുന്നതിനു മുമ്പായി നിങ്ങൾ കൈകൾ വൃത്തിയായി കഴുകാറുണ്ട ാ.?

a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

2. അടുക്കളയിലെ വിവിധ ജോലികൾ വൃത്തിയാക്കുന്നതിന് ഒരേ തുണി തന്നെ നിങ്ങൾ ഉപയോഗിക്കുമോ..?

a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

3. പൊതിഞ്ഞു വെക്കാത്ത ഭക്ഷണ പദാർത്ഥങ്ങൾ കൈകാര്യം ചെയ്തതിനു ശേഷം നിങ്ങൾ വൃത്തിയായി കഴുകാറുണ്ട ാ.?

a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

4. അണുനാശിനികളും, മറ്റു ക്ലീനിങ്ങ്ലായനികളും നിർമ്മാതാവിന്റെ നിബന്ധനകൾക്കനുസരിച്ച് ഉപയോഗിക്കുമോ..?

a. എല്ലായിപ്പോഴും b. ചിലപ്പോൾ മാത്രം c. ഒരിക്കലുമില്ല

4. മനോഭാവം

1. ഭക്ഷണം പാകം ചെയ്യുമ്പോഴെല്ലാം ശരിയായ ശുചിത്വം പാലിക്കേ ത്

a. വളരെ ആവശ്യമാണ് b. ആവശ്യമാണ് c. ആവശ്യമോ അനാവശ്യമോ അല്ല

d. ആവശ്യമില്ല e. തീരെ ആവശ്യമില്ല

2. ഭക്ഷണം തയ്യാറാക്കുമ്പോൾ ശുചിത്വം പാലിക്കുന്നത് ഭക്ഷണം മൂലമുള്ള അസുഖങ്ങൾ തടയുന്നതിന് സഹായകരമാകുന്നു.

a. ശക്തിയായി യോജിക്കുന്നു b. യോജിക്കുന്നു c. യോജിക്കുന്നോ വിയോജിക്കുന്നോ ഇല്ല

d. വിയോജിക്കുന്നു e. കഠിനമായി വിയോജിക്കുന്നു

3. ശുചിയോടെ പാചം ചെയ്യാത്ത ഭക്ഷണം കഴിക്കുന്നത് ആശുപത്രിയിലെ രോഗികളുടെ മരണത്തിനു തന്നെ കാരണമായേക്കാം

a. കൂടുതൽ സാധ്യതയു ˇ b. സാധ്യതയു ˇ c. സാധ്യത ഉ ാവാം ഇല്ലായിരിക്കാം

d. സാധ്യതയില്ല e. സാധ്യത തീരെ ഇല്ല

4.എന്റെ സുപ്രധാനവ്യക്തികളുടെ സാന്നിധ്യത്തിൽ കൂടുതൽ ഭക്ഷണം പാചകം ചെയ്യുമ്പോൾ കൂടുതൽ ശുചിത്വം പാലിക്കാൻ ഞാൻ ശ്രമിക്കുന്നു

a. കൂടുതൽ സാധ്യതയു ˇ b. സാധ്യതയു ˇ c. സാധ്യത ഉ ാവാം ഇല്ലായിരിക്കാം

d. സാധ്യതയില്ല e. സാധ്യത തീരെ ഇല്ല

5. ഭക്ഷണം പാകം ചെയ്യുന്ന സമയത്തെല്ലാം ശരിയായ ശുചിത്വം പാലിക്കാൻ ഞാൻ ശ്രമിക്കാറു ˇ

a. കൂടുതൽ സാധ്യതയു ˇ b. സാധ്യതയു ˇ c. സാധ്യത ഉ ാവാം ഇല്ലായിരിക്കാം

d. സാധ്യതയില്ല e. സാധ്യത തീരെ ഇല്ല

APPENDIX 16: CHECKLIST USED IN HOSPITALS INSPECTION

Audit/ inspection form

Name of hospital: ---------- Date: ----------

Name of contractor ----------

Number of Meals: ----------

Number of beds:

a- >100 c- 100 -200

b- 200- 500 d- < 500

Number of food inspectors:

a- 0 c- 5-10

b- 1- 5 d- 10>

Number of employees (under contractor)

a- > 10 c- 50 - 100

b- 10 -50 d- <100

Has the HACCP system been implemented?

a- Yes b- No

Has the food-hygiene–practices manual been adopted?

a-Yes b- No

Structure and equipment				
Area	**Conditions**	**Y**	**N**	**Comments**
Entrances	Air Curtain			
	Automatic doors			
	Windows prevents accumulation of dirt			
Receiving area	Available and clean			
Floor	Clean			
	Easy to clean , smooth and non-absorbent			
	Nonslip			
Walls	Clean			
	Easy to clean, smooth and non-absorbent			
	No flaking paint work			
Ceiling	Clean			
	No flaking paint work			
	Structurally sound			
Ventilation	Suitably and sufficiently ventilated , maintains kitchen temperature			
Light	Adequate light in receiving area			
	Adequate light in preparation area			
	Adequate light in stores and cooling area			
Electric fly killing units and pest control	Enough and provided at strategic locations			
	Not placed over food preparation areas or equipment			
	Not placed at direct sunlight			
	There is a formal contract with one of pest control companies?			
	No evidence of pest / evidence of pest control			
Equipment	Clean			
	No debris under it			
	Easy to move/ movable			

Sink	Available in all operation areas			
	Hot			
	Cold			
	separated sink for washing equipment , salad and ready to eat food			
Dishwasher Machine	Structurally sound			
	Soap			
	Hot water			
	Sterilizer liquid			
Toilets	Clean			
	far away from operation area			
	double doors			
	adequately ventilation			
	hand wash basin			
	Hot water			
	Cold water			
	Liquid soap			
	Antibacterial gel			
	Hygienic hand drying / paper towels			
	No outdoor clothes stored in WC			
Wash hand basin	Available in all kitchen area			
	Clean			
	Hot water			
	Cold water			
	Liquid soap			
	Antibacterial gel			
	Hygienic hand drying / paper towels			
Food contact surfaces	Cutting tables are cleaned Constantly			
	Smooth/ made from stillness steal or plastic			

	Washable			
	separate work surfaces for high risk food, ready to eat food and raw meat			
Drain	Sufficient fall from clean areas to dirty areas			
	Flow via a separate system from the foul sewage			
Waste and bins	have lids			(except preparation areas)
	Enough number			
	Cleaning and disinfecting periodically			
	Waste daily dispose in black bag to the main container			
	Waste disposal is in main container so far from kitchen			
Dry storage area	Clean / dry			
	Enough light			
	Electronic fly killing units			
	All Foodstuff are stored on shelves			
	Thermometer and temperature record (<25C)			
Refrigerators	Clean			
	Thermometer and temperature record (4C-8C)			
	Food Covered and labelled			
	Raw food , meat and cooked food are separately			
Freezers	Clean			
	Thermometer and temperature record (-15C -18C-)			
	Food Covered and labelled			
Food cart	Clean and disinfected daily			
	Heater and cooling worked			
Staff				
General appearance and clothing	Have a work uniform			
	Clean clothing			
	Head dressing			
Hygiene status	Good hygiene practices during preparation and handling			

	No boils, burn or cuts on the hands			
	No jewelleries			
	Nails are cut			
	Dispersible gloves			
	Heath certificate is available			
	Masks			
Training	Providing the new staff with food hygiene courses			
	All staff trained on hygiene and safety practices			
Smoking	No evidence in operation rooms			
Foodstuff and General Procedures				
Food sampling	Available for 48 hr.			
Foodstuff dates	So far to expiry (at least 33%)			
Cooked food	Covered and ladled			
Thawing food	In refrigerators			
Salad washing	Washing well with warm water and recommended chemicals			Sodium, calcium hypochlorite , chlorine dioxide
Temperature control	Calibrated thermometers are used to check temperatures			
	Cooking temperature 75°C			
	Reheating temperature 75°C			
	Holding temperature of hot food >63°C			
	Holding temperature of cold food <8°C			
Cleaning	Cleaning/ toxic materials stored separate from food			
	Cleaning schedule			
	Detergent available			
	Disinfectant available			

APPENDIX 17: TRAINING SESSION (POWERPOINT)

Slide 1

Food Contamination



Presented by

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Slide 2

Course Aim

- To provide an understanding of the principles of food contamination sources, and how to apply the basic knowledge to control hazards and prevent food poisoning.



Slide 3

At the end of this lecture, learner will be able to :

- List the main types of contamination in food .
- Know the general feature and characteristic of bacteria and its effect on food.
- Recognize the factors effecting growth of bacteria.
- List of the sources of microbial contamination in food and the causes of cross-contamination .
- Apply the appropriate methods to prevent contamination and stop bacterial growth .



Slide 4

Introduction & Definition

- '**food hygiene** 'all measures necessary to ensure the safety and cleanliness of foodstuffs from farm to fork

(Article 2 of the horizontal 'General Food Hygiene Directive' (93/43/EEC)

- **Food contamination** : substances that make food unfit for human consumption.

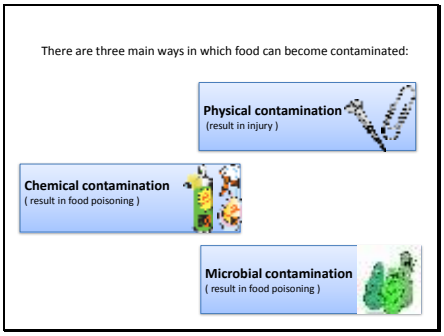
(Medical Dictionary)

- **Safe food:** is that food free from microbial, chemical and physical contaminations

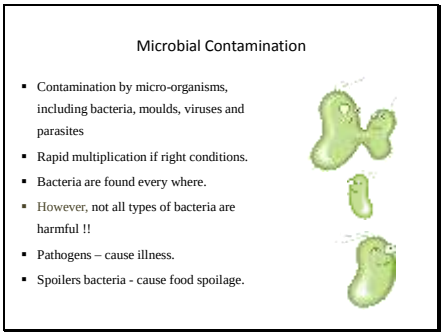




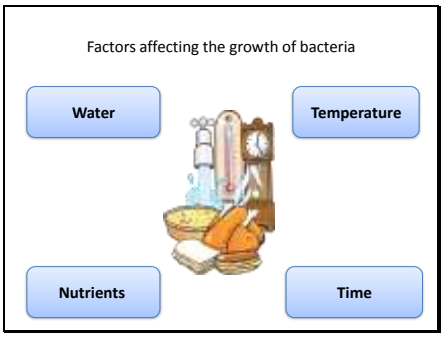
Slide 5



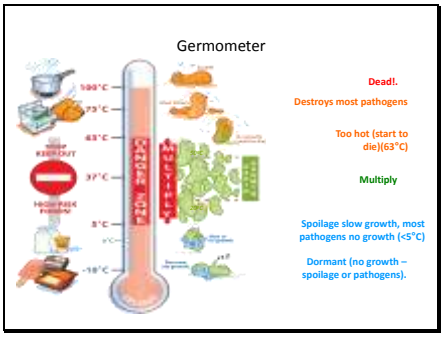
Slide 6



Slide 7



Slide 8



Slide 9

Sources of Bacteria

- **Can be transfer via :**

➢ Direct ; (cross-contamination)
✓ raw food .



- **OR**

➢ Indirect; (need a vehicles)
✓ People , sewage ,
✓ Insects ,soil, dust ,
✓ refuse, animals



Slide 10

An example !

- Even though this tea towel has only been used a few times, it is very likely to be teeming with millions of bacteria including *Staphylococcus.* These bacteria will be spread to every surface this tea towel comes into contact with.



Slide 11

How can you prevent bacterial growth in food ?

- Preventing the cross-contamination and stopping the vehicles .
- Don't forget Personal Hygiene
- Controlling one of the main requirements .

✓ Cold temperatures
✓ Hot temperatures
✓ Short time in danger zone



Slide 12

Thank you



Slide 1

Foodborne diseases



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Slide 2

By the end of this lecture, learner will be able to :

- Recognize the characteristics of foodborne diseases & the symptoms of food poisoning.
- Know the main causes of food poisoning and how pathogens can transfer .
- Define the risk groups .
- Apply the suitable prevention methods.



Slide 3

Definition

- **Foodborne diseases**: is a general term referring to an illness caused and transferred by eating food that has been contaminated by microorganisms or chemical toxins.
- **Food poisoning** (intoxication) : A result of actions of microbial or chemical toxins .
- **Food infection** : A result of ingesting pathogen – contaminated food.



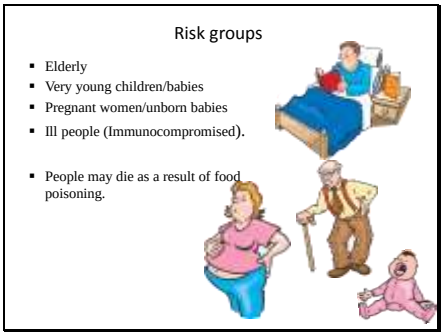
Slide 4

Characteristics & Symptoms

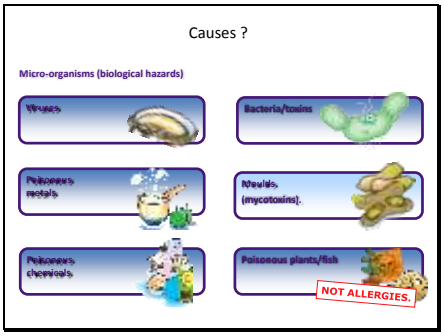
- **Incubation period**
  1 to 36 hours
- **Duration**
  1 to 7 days
- **Symptoms :**
  - Abdominal pain/stomach cramps
  - Diarrhoea
  - Vomiting
  - Nausea (feeling sick)
  - Fever
  - Dehydration



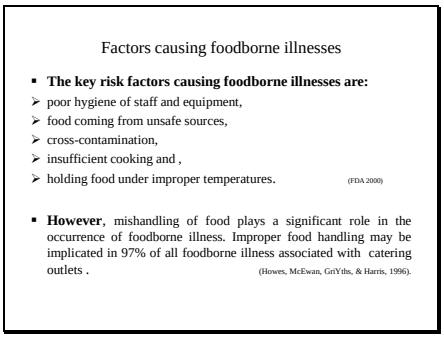
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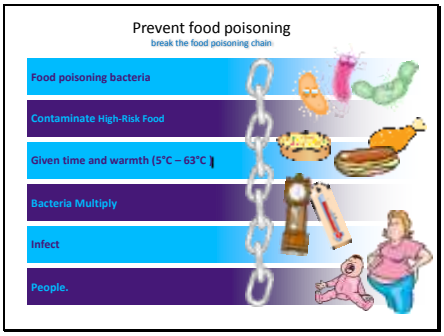
Slide 6



Slide 7



Slide 8



Slide 9

Five Keys to prevent food poisoning

1- Keep clean :

- ✓ Wash your hands before handling food and often during food preparation.
- ✓ Wash your hands after going to the toilet.
- ✓ Wash and sanitize all surfaces and equipment used for food preparation.
- ✓ Protect kitchen areas and food from insects, pests and other animals.

(WHO)



Slide 10

Five Keys to prevent food poisoning

2- Separate raw and cooked :

- ✓ separate raw meat , , poultry and seafood from other food .
- ✓ Use separate equipment and utilises for handling and preparing food .
- ✓ Store food in containers to avoid contact between raw and prepared food . (WHO)



Slide 11

Five Keys to prevent food poisoning

3- Cook thoroughly :

- Cook food thoroughly , especially meat , poultry , eggs and seafood up to (70 C).
- Reheat cooked food thoroughly . (WHO)
- Remember to use the thermometer !



Slide 12

Five Keys to prevent food poisoning

4- Keep food at safe temperature :

- ✓ Don't leave cooked food at room temperature for more than 2 hs.
- ✓ Refrigerate cooked and perishable food below 5 C.
- ✓ Keep hot food at 60 C.
- ✓ Do not thaw frozen food at room temperature .
- ✓ (WHO)



Slide 13

Five Keys to prevent food poisoning

5- Use safe water and raw material :

- ✓ Select fresh and wholesome foods .
- ✓ Choose food come from safe sources
- ✓
- ✓ Don't use food beyond its expiry date.

(WHO)



Slide 14

Thank you



Slide 1

Food storage

Presented by
Mohammed Almohaithef

MSc Food Safety and Hygiene
Ph D student
University of Birmingham



Slide 2

By the end of this lecture, learner will be able to :

- Define low & high risk food .
- Recognize the sings & causes of food spoilage .
- Apply the correct way to store food .
- Know the appropriate temperature for cooking and storing.
- Know the right way to use thermometers.



Slide 3

Definition

- **Food spoilage :** the original nutritional value, texture, and flavor of the food are damaged, the food become harmful to people and unsuitable to eat.



- **Food can spoil** as a result of two main factors:
  - 1) growth of micro-organisms
  - 2) action of enzymes

Slide 4

Favoured Food For Bacteria

- **High-risk food** is ready-to-eat, usually protein, which supports the growth of bacteria. Usually requires refrigeration/frozen storage.
- Milk , eggs , meat .. Also fresh fruit .
- **Low-risk food** can usually be stored at ambient temperatures.
- Dry food , low pH food , salted food .



Slide 5

What are the signs of food spoilage?

- **Signs of spoilage :**
  - Off-odours
  - Discolouration
  - Slime/stickiness
  - Mould
  - Texture change
  - Unusual taste
  - The production of gas
  - Blown cans or packs

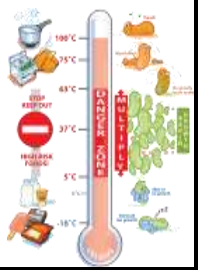


- **Are those signs enough ???**

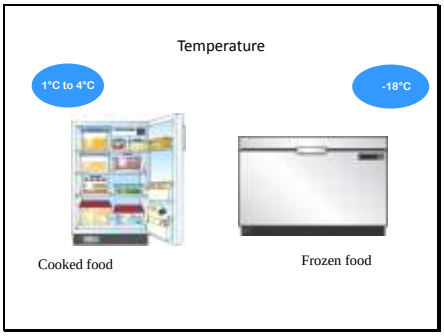
Slide 6

How do you can avoid food spoilage ?

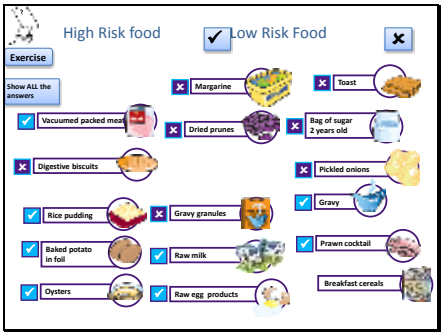
- **Remember** :
- (dangerous zone)
- Control the temperature



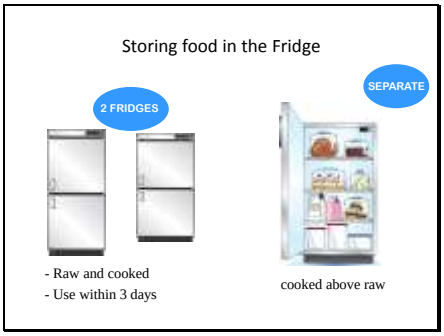
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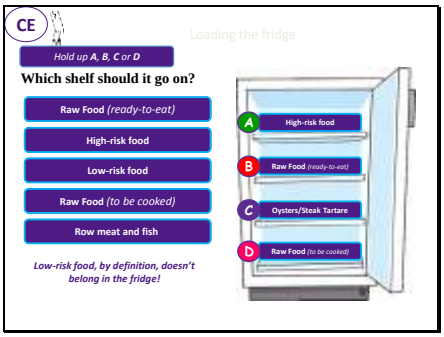
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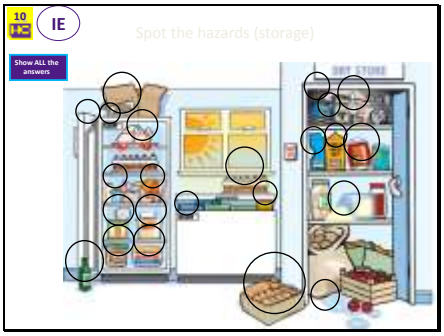
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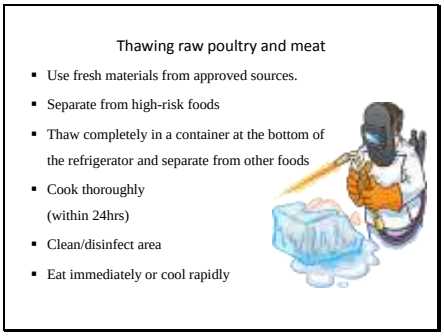
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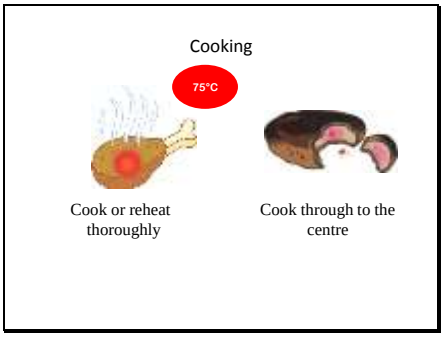
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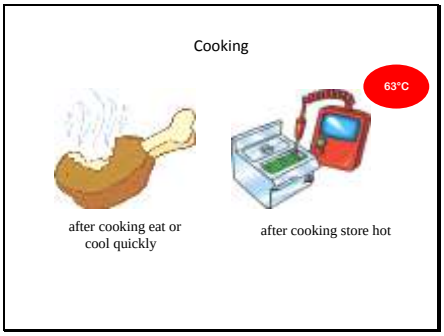
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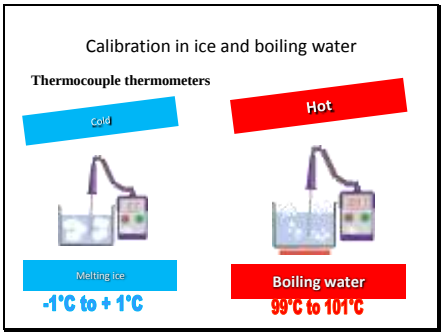
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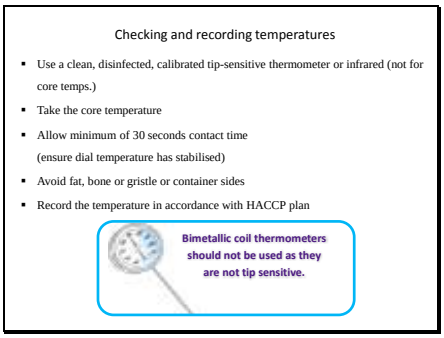
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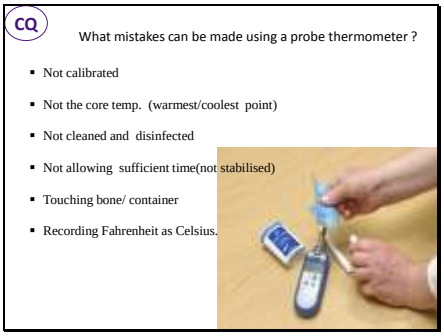
Slide 16



Slide 17



Slide 18



Slide 19

Thank you



Slide 1

Personal hygiene

Presented by
Mohammed AlMohaithef

MSc Food Safety and Hygiene
Ph D Student
University of Birmingham



Slide 2

By the end of this lecture, learner will be able to :

- Understand the relationship between general hygiene & food infection.
- Know the main rules of personal hygiene.
- Apply the correct way to wash hands.
- Know the cleaning & disinfection methods.



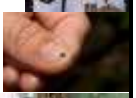
Slide 3

Some facts !

- **Foodservices staff may** represent a major source of food-borne outbreaks, as they introduce pathogens into foods during every phase from purchase to distribution !!

(Angelillo, Viggiani, Greco, & Rito, 2001; Lust al., 1994).





- **Food hygiene in the hospital can acquire peculiar features**:
  - patients could be less immune to microbiological and nutritional risks; and
  - large numbers of persons can be exposed to infections and possible complications .

(Buccheri et al., 2007)



Slide 4

Some facts

- **As a food handler , you have a full responsibility to handle food safely. So**:
  - *protect other people from getting sick*
  - *protect your reputation in the food industry*
  - *protect your business, and*
  - *protect your job.*
- To reduce risk of outbreaks , it is essential that foodservices staff have high standards of personal hygiene.
- Remember !! even healthy people may carry food poisoning bacteria on their bodies.

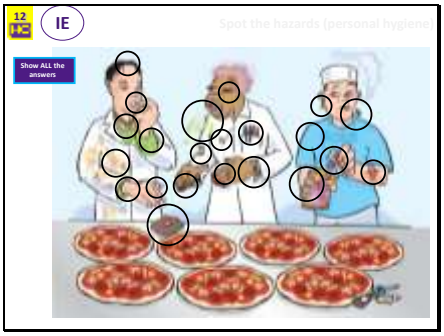


Slide 5

➢Put yourself in other place and watch how your workmates handle food. Would you like to eat food prepared by you ?



Slide 6



Slide 7

High standards of personal hygiene are necessary to stop food contamination

- Hands/nails
- Skin/boil/septic cuts
- First aid dressings
- Mouth/nose/ears – coughing/sneezing
- Hair
- Jewellery
- Smoking.

- **When you suffer from any disease you must inform your supervisor**



Slide 8

CQ

When is it most important to wash hands?

- After:
- Entering food room
- Using toilet
- Handling raw food
- Changing a dressing
- Dealing with an ill customer/colleague
- Touching hair, nose or face
- Smoking, eating, coughing, sneezing and blowing the nose
- Cleaning
- Handling waste
- Handling money



CQ **Why is it important to wash hands?**

To prevent microbiological contamination of ready-to-eat foods.

Slide 9

Hazards from cleaning

- Cross-contamination especially from cloths – disposable preferred also colour-coded.
- Chemical contamination (tainting)
- Physical contamination
- (e.g. from brush bristles).
- Failure to destroy pathogens.
- Dirty cleaning equipment.



Slide 10

Thank you



Slide 1



Slide 2



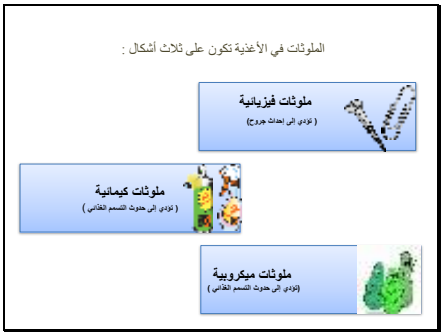
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Slide 4



Slide 5



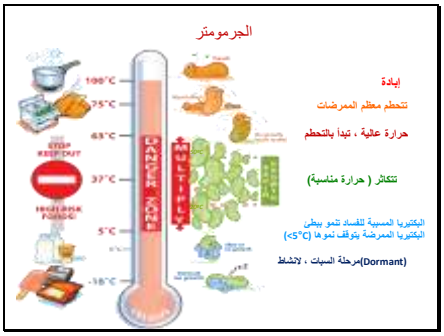
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Slide 7



Slide 8



Slide 9

مصادر وطرق انتقال البكتيريا

- **ممكن أن تنتقل بطريقتين :**

➢ مباشرة (التلوث الخلطي)
- ✓ اتصال الأغذية النيئة بالمطبوخة .

- **أو**

- غير مباشرة (تحتاج ناقل)
  - ✓ الإنسان
  - ✓ الحشرات
  - ✓ التربة
  - ✓ الغبار
  - ✓ الحيوانات
  - ✓ مياه الري الملوثة





Slide 10

مثـــــال

- على الرغم من أن هذه المنشفة تم استخدامها لدقائق معدودة ، لكن من المؤكد احتوائها على ملايين البكتيريا خاصة بكتيريا (*ستافيليوكوكيس*) ، هذه البكتيريا سوف تنتشر على أي سطح يتم ملامسته !!



Slide 11

كيف يمكن منع الملوثات البكتيرية ونموها في الغذاء ؟

- منع نواقل البكتيريا والحد من التلوث الخلطي .
  لا ننسى النظافة الشخصية ✓

- التحكم في احد العوامل المؤثرة على نمو البكتيريا .

  - ✓ خفض درجة الحرارة
  - ✓ زيادة درجة الحرارة
  - ✓ عدم ترك الغذاء فترة طويلة تحت نقطة الخطر.
  - ✓ عوامل أخرى : التمليح ، التخليل ، التجفيف .



Slide 12

Thank you



Slide 1



Slide 2



Slide 3



Slide 4



Slide 5



Slide 6



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Slide 8



Slide 9

خمس قواعد أساسية لمنع التسمم الغذائي

(منظمة الصحة العالمية)

1- حافظ على النظافة بشكل عام !

- ✓ اغسل يديك قبل لمس الطعام ، واثناء اعداد الطعام ، وبعد الانتهاء .
- ✓ اغسل يديك بعد استخدام الحمام .
- ✓ نظف وطهر جميع المعدات والأسطح المستخدمة والملامسة للغذاء .
- ✓ حافظ على منطقة إعداد الغذاء والمستودعات خالية من الحشرات والقوارض وأيضا الحيوانات .



Slide 10

خمس قواعد أساسية لمنع التسمم الغذائي

2- افصل المواد النيئة عن المطبوخة :

- ✓ افصل اللحوم والأسماك والدواجن النيئة عن المواد الغذائية الأخرى .
- ✓ استخدم معدات وأدوات منفصلة ذات ألوان مختلفة إثناء إعداد الغذاء .
- ✓ احفظ المواد الغذائية داخل حاويات مغلقة في الثلاجة لتجنب أي اتصال أو تلوث بين النيئ والمطبوخ .



Slide 11

خمس قواعد أساسية لمنع التسمم الغذائي

3- أطهو جيدا حتى النضج :

- ✓ أطهو الطعام جيدا ، خصوصا اللحوم والدواجن والبيض والمأكولات البحرية حتى (70 درجة مئوية) .
- ✓ اعد تسخين الطعام المطبوخ جيدا عند الرغبة في استهلاكه .
- ✓ لا تنسى !! استخدم ميزان درجة الحرارة دائما .



Slide 12

خمس قواعد أساسية لمنع التسمم الغذائي

4- حافظ على الغذاء في درجة حرارة آمنه :

- لا تترك الطعام المطبوخ أو السريع التلف لأكثر من ساعتين في درجة حرارة الغرفة .
- احفظ الطعام المطبوخ والسريع التلف تحت درجة حرارة (5 درجة مئوية) .
- احفظ الطعام الساخن في مسخنات على درجة حرارة اعلى من (60 درجة مئوية) .
- تجنب إذابة الطعام المجمد في درجة حرارة الغرفة .



Slide 13



Slide 14



Slide 1



Slide 2



Slide 3



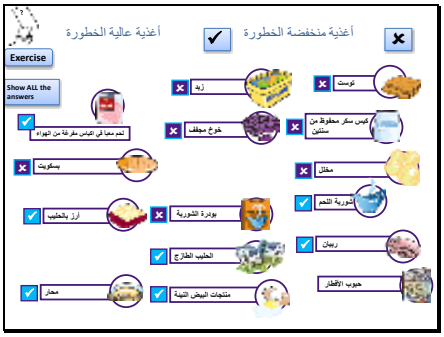
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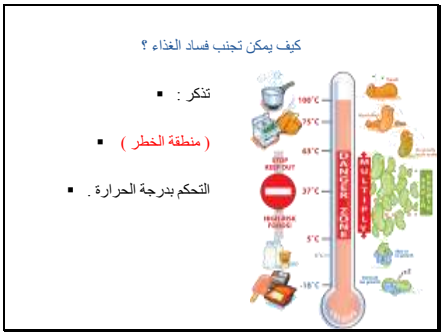
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Slide 8



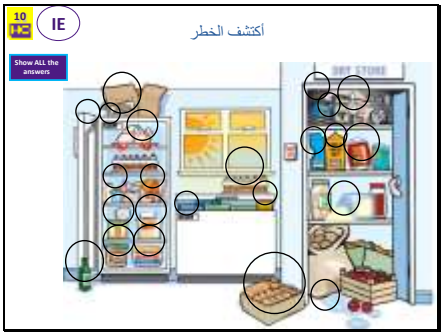
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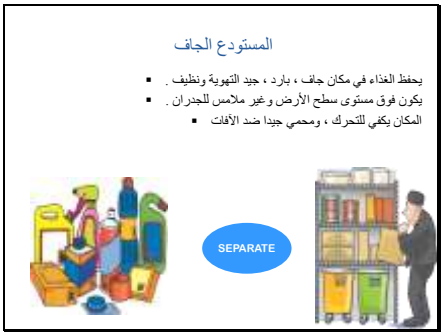
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Slide 11



Slide 12



Slide 13



Slide 14



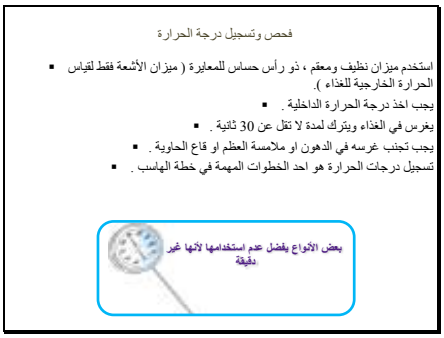
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Slide 17



Slide 18



Slide 19

Thank you



Slide 1

الصحة والنظافة العامة



محمد المحيذيف

ماجستير العلوم / الصحة والسلامة الغذائية
جامعة برمنجهام – انجلترا

Slide 2

في نهاية هذه المحاضرة ، سيتمكن المتعلم من التعرف على :

- العلاقة بين النظافة العامة والعدوى الغذائية .
- القواعد الأساسية للنظافة الشخصية أثناء إعداد الغذاء .
- الطريقة الصحيحة لغسل اليدين .
- طريقة تنظيف الأسطح والمعدات الملامسة للغذاء .



Slide 3

بعض الحقائق !

- **موظفي الخدمات الغذائية** بشكل عام يمثلون المصدر الأساسي للانتشار الأمراض الغذائية ، حيث انهم قد يجلبون البكتيريا الممرضه (بدون قصد) الى الغذاء في كل مراحل السلسلة الغذائية من الشراء وحتى التوزيع !!

(Angelillo, Viggiani, Greco, & Rito, 2001; Lust al., 1994).

- **صحة وسلامة الغذاء في المستشفيات يمكن أن تكون مختلفة عنها في القطاعات الأخرى (مطاعم ، فنادق ..) لسببين :**
  - التعامل هنا يكون مع مرضى ذو مناعة منخفضة للمخاطر الميكروبية والتغذوية .
  - عند وجود خطأ ، أعداد كبيرة معرضة للأصابة والعدوى والمضاعفات الأخرى المعقدة !!

(Bucchieri et al., 2007)







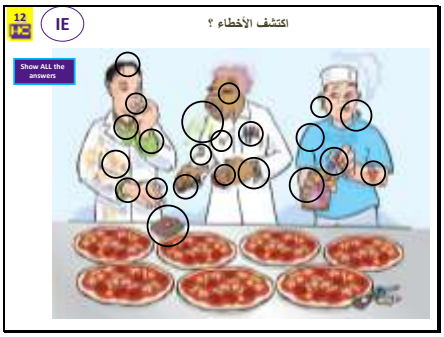
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Slide 9



APPENDIX 18: STAFF FEEDBACK FORM (FOR TRAINING)

Thank you so much for your attendance

1- please give me two new things you have learnt ?

a- .....

b- .....

2- Please write your comments and feedback :

.....

.....

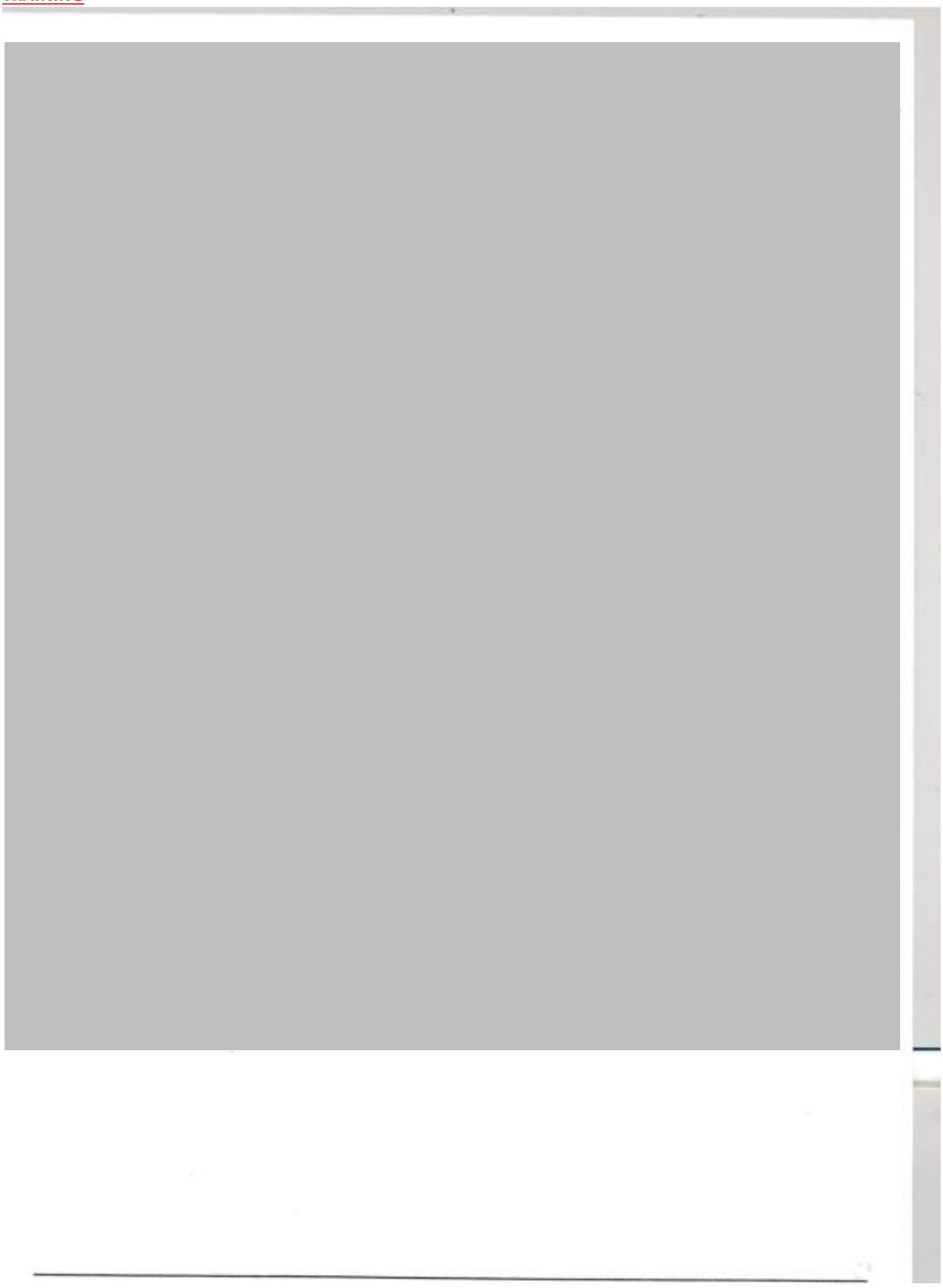
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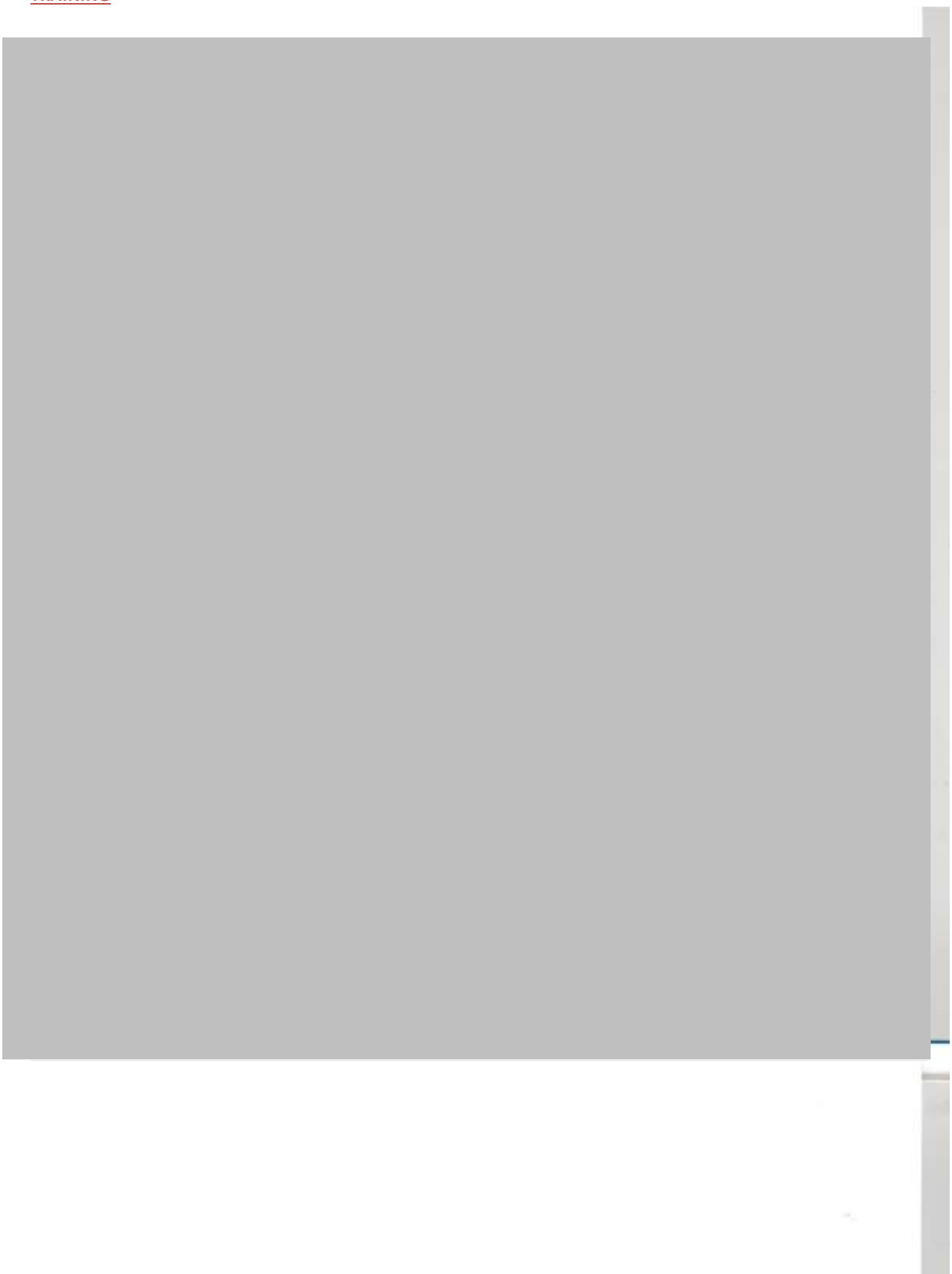
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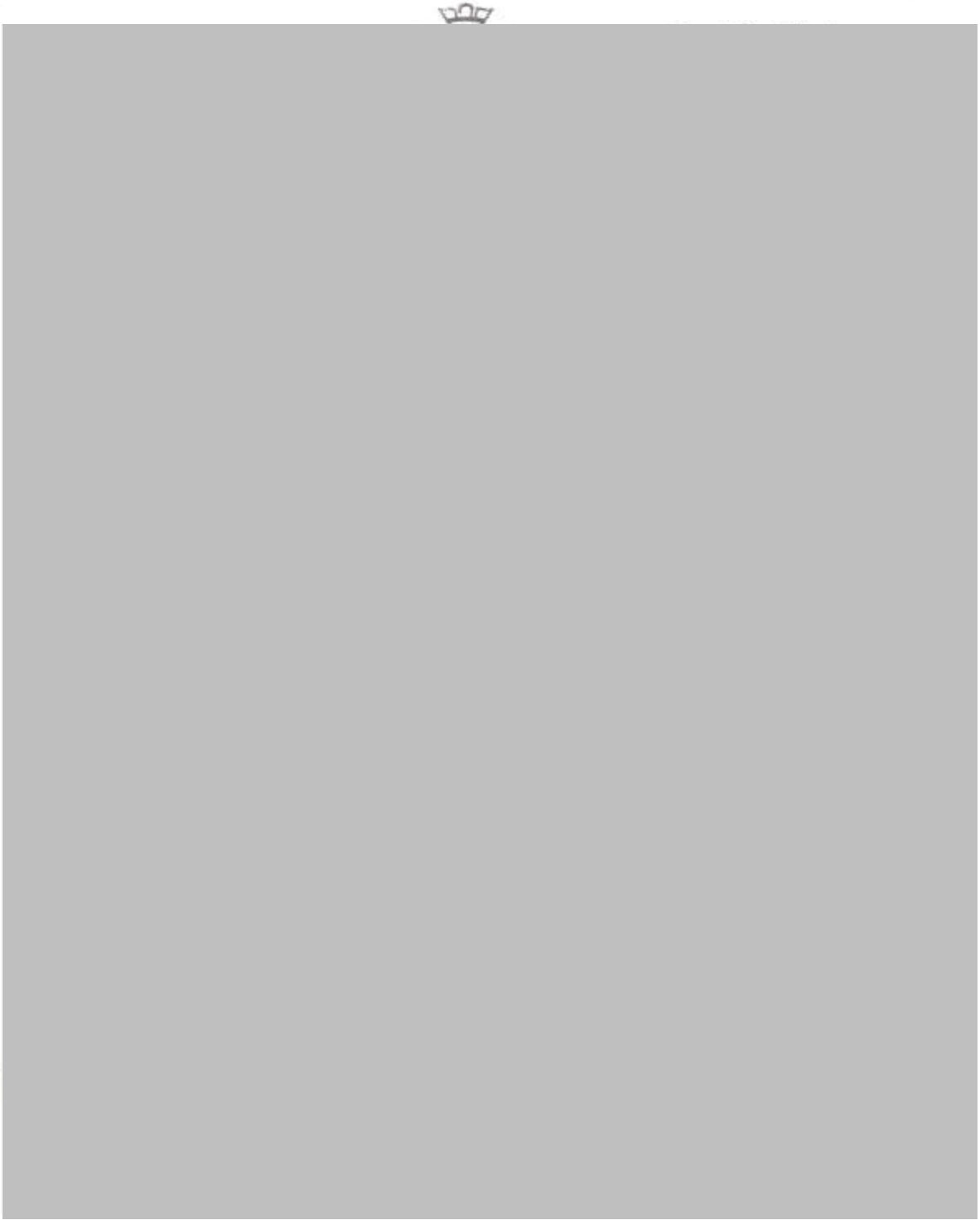
APPENDIX 19: CERTIFICATE FROM KING SAUD MEDICAL CITY (RCH) CONFIRMED DATA COLLECTION AND STAFF TRAINING



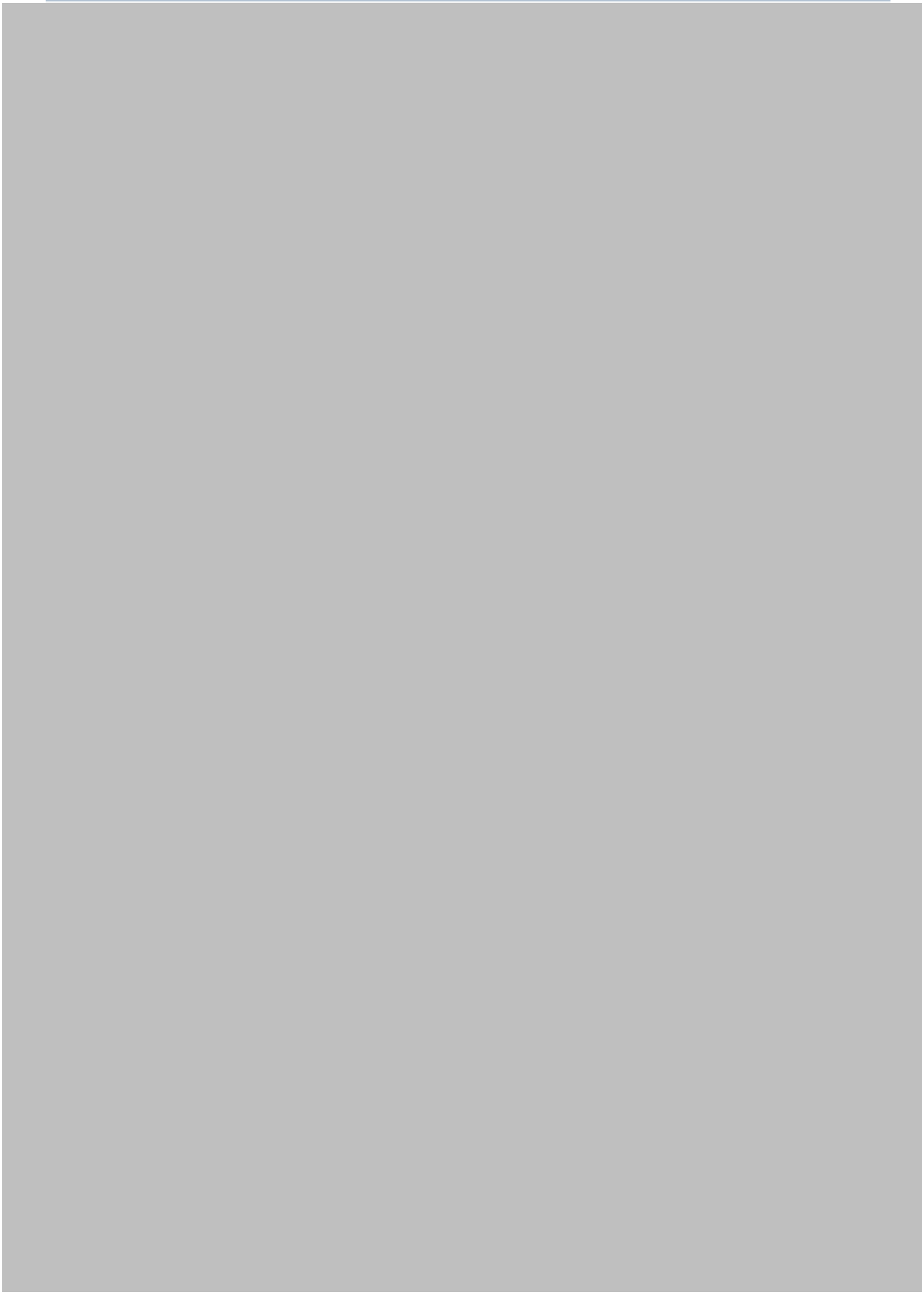
APPENDIX 20: CERTIFICATE FROM REHABILITATION HOSPITAL CONFIRMED DATA COLLECTION AND STAFF TRAINING



APPENDIX 21: CERTIFICATE FROM CHEST HOSPITAL CONFIRMED DATA COLLECTION AND STAFF TRAINING



APPENDIX 21: CERTIFICATE FROM CHEST HOSPITAL CONFIRMED DATA COLLECTION AND STAFF TRAINING



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