Sudan University of Sciences
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Collage of graduate studies

Assessment of Knowledge Attitudes and Practices among the Workers of Atbara and Aldamer Slaughter House in River Nile State - Sudan

تقييم معرفة وسلوك وممارسات سلامة الأغذية وسط العاملين بسلخانتي عطبرة والدامر بولاية نهر النيل - السودان

Fulfillment of the Requirements for the Award of the Degree of Master of Science in Preventive medicine (Food safety)

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استهلال

قال تعالي :

(لَن يَنَالَ اللَّهَ لُحُومُهَا وَلَا دِمَاؤُهَا وَلَكِن يَنَالُهُ التَّقْوَى مِنكُمْ كَذَلِكَ سَخَّرَهَا لَكُمْ لِتُكَبِّرُوا اللَّهَ عَلَى مَا هَدَاكُمْ وَبَشِّرِ الْمُحْسِنِينَ)[1]

صدق الله العظيم

[1] . سورة الحج ، الآية (37) .

Dedication

To my father's soul of whom I had good role models and a good help, who taught me how the knowledge can make me distinctive, and had been a father, teacher, brother and a friend. I request anyone who reads this manuscript to pray for mercy on his soul.

My mother:

To the warm heart, the angle that took care of me and without her caring and support, it would not have been possible to conduct this work. To the mother I only wished.

My husband (Hisam musa):

To the part of my heart and soul, always hoped, and giving the support and warm encouragement for my career development. To my sons whom I have tasted with them what it means to be a mother. To those whom I grew with and among them I spent the most beautiful days of my life.

My brothers and sisters:

To the my brothers and sisters, leaving behind a beautiful memory, I ask Allah to happy life,

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Many thanks to my Mother and my sister Armani with all the support and help in order to be successful in my career .

Last but not least, I would like to thank my colleagues who shared me those moments.

Abstract

The Dim of This research to study The ineae processing houses and how they follow the approved premises which registered by the controlling authority for hygiene management of meat products for human being consumption .

The hare chosen 150of the slaughters workers Atbara and Aldamer Localities River Nile State to evaluate The levee of knowledge, attitude and practice of hygiene in slaughter houses workers .

The methodology of semi - structured questionnaire is taker to assess the knowledge, attitude and practice The period of July to August 2018.

Descriptive statistics and multivariate analysis were used to analyze the level knowledge attitude and practice with association with other factors.

The came to the following facts .

There is a connection between knowledge, attitude and practice with regard to hygiene practice.

practice and attitude goes together older aged workers have a good practice. And better knowledge and good practice.

There is an increase knowledge, attitude and practice of hygiene among abattoir workers .

The is wore need to increase The heed of hygiene in abattoir premises

Recommendations :

Anew slaughterhouse should be established to fulfilling The hygiene requirements according to The region and international standards .

To increase The level of knowledge on hygiene practice among abattoir workers in order to reduce to reduce and end The incidence of diseases and sickness in Atbara and Aldamer Localities.

ملخص البحث

تهدف هذه الدراسة لمعرفة الاجراءات الصحية والبيطرية التي تتبع المعرفة بها من السلطات الصحية والبيطرية في سبيل انتاج ذبيح صحي صالح لاستعمال واستهلاك الادمي

أجريت هذه الدراسة في محليتي عطبرة والدامر بولاية نهر النيل حيث أختار عدد 150 من العاملين المسالخ بمحلية عطبرة والدامر وذلك بهدف تقييم مستوي المعرفة الممارسات الصحية بالمصالح .

أختيرت منهج المقابلة المباشرة لمل الاستبيان لقييم المعرفة والممارسات التي تتبع في المسالخ في المحليتين في الفترة من يوليو الي اغسطس 2018م

في جانب التحليل الاحصائي استخدم برنامج SPSS لتحليل المتغيرات المتعددة لمعرفة مستوي المعرفة والممارسات المرتبطة بعوامل اخري

وصل الباحث الي الحقائق التالية :

- هناك ارتباط وثيق بين المعرفة والممارسات المرتبطة بمستوي الممارسة الصحية والبيطرية توصل الباحث ان هناك ارتباط لمفهوم الممارسة والعمر ان العاملين الذين مارسوا المهنة وهم الأن في سن متقدمة في هذه المسالخ أقل معرفة وممارسة من الذين مارسوا هذه المهنة وهم في سن صغيرة .

- ان هنالك معرفة متزايدة وممارسة جيدة بين العامين في هذا المجال

التوصيات :

ضرورة تشييد مسالخ حديثة لتطبيق اجراءات سلامة الغذاء التي تناسب المستويات الاقليمية العالمية مزيداً من الجهود لارتفاع مستوي العاملين في هذه المسالخ زيادة المعرفة بالجوانب الصحية والبيطرية بين العاملين في المسالخ ذلك وصولاً الي تقليل ومن ثم انهاء الامراض المرتبطة بصحة الانسان والحيوان بمحليتي عطبرة والدامر .

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Introduction

Fresh meat and poultry are easily contaminated with a variety of micro-organisms and if not properly handled and preserved they support growth of spoilage and pathogenic species leading to loss of quality and potential public health problems. Microorganisms are introduced through a variety of sources when the sterile muscles of healthy animals and birds are exposed to environment during slaughter, cutting and further handling. These sources include air, water, soil, feces, feed, hides, hair, feather, wool, intestines, lymph nodes, processing equipment, utensils, and humans. The multiplicity of contamination sources and the variability in faculties and practices of slaughtering and processing operation may lead variation in types of microorganisms and , especially, extent of contamination introduced in meat and poultry, which may also vary with individual herds of flocks, animal or birds, geographical location and season of year. Cleanliness of animals and birds is an important factor affecting the contamination of meat and poultry and is influenced by climate, location, method of transportation and holding condition.

Since early in the twentieth century, regulatory inspection activities have been applied to ensure the hygienic status of meat and poultry supply. These traditional regulatory requirements include

1veterinary inspection of live animals and birds, their carcass and organ tissues following slaughter .

Supervision of procedure involved in meat and poultry handling and processing. These activities should prevent meat and poultry from overtly diseased animals or birds and visibly contaminated, not properly processed, or abused, products from reaching the consumer.

Regulatory requirements, proper facility design and good manufacturing practice, as well as other industry initiatives based on competition product quality,

long distance shipment, distribution requirements and economics of operation, have extended product shelf life and improved quality, but have not prevented microbiological contamination of raw products or eliminated food bone disease.(John N. Sofas and Gary Smith- 2006)

One of the main principles of slaughter hygiene is to avoid contact between a carcass and the floor. The carcass needs to be off the ground as soon as possible during the first steps of the slaughtering process. This requirement is best fulfilled if carcasses are already off the ground at the point of bleeding. In the absence of supporting technical devices to hoist up carcasses for bleeding, that step can be done on the ground because the carcass is still fully covered by the skin. Once the protective cover of the animal skin is cut open or removed, it is absolutely necessary to prevent any contact with the floor.

Objective:

_To assess knowledge, attitudes and practices among workers in slaughter house in Atbara and Aldamer slaughter house inRiver Nile state in Sudan.

Chapter One

LITERATURE REVIE

1-1Attitude knowledge and practice study:

A KAP study measures the level of knowledge, attitudes and practices in a community. It can also determine the level of education of a community (Kaliyaperumal, 2004).

1-2 Key Components in Knowledge, Attitudes and Practices (KAP):

A KAP study can identify knowledge gaps, cultural beliefs, or behavioral patterns that may facilitate understanding and action, as well as those that pose problems or create barriers in program delivery. As with any study in general, a KAP study begins with developing the conceptual framework. The conceptual framework specifies the meaning of key components and identifies how variables are to be measured or operationalized. It also explains the rationale for the importance of particular concepts that are under study and why particular variables and their measurements are chosen (Nestor and Schutt, 2012). Key components in the KAP study are described as follows:

1.2.1 .Knowledge:

According to the Merriam-Webster Dictionary, knowledge is defined as the fact or condition of knowing something with familiarity gained through experience or association. In Plato's Theaetetus, Socrates and Theaetetus discuss three definitions of knowledge: knowledge as nothing but perception, knowledge as true judgment, and, finally, knowledge as a true judgment with an account. Each of these definitions has been shown to be unsatisfactory (Audi, 2011).

Knowledge in the field of public health can be profitable, but it will not necessarily be able to increase positive behavior's. Measuring the level of knowledge using the KAP survey can help identify areas where

the process of information dissemination and public education should continue to be implemented (WHO, 2008).

(Azeri2010) explains that in the KAP survey the level of public knowledge is assessed regarding concepts related to public health in programs at the national and international levels. Without knowledge one would not have a basis for making decisions and taking decisive action against the problem. In general, knowledge is divided into six levels which are:

1. Know: This is simply recall of information that has been studied previously. Included in this is the ability to recall anything specific from all the materials studied or from stimuli that have been received.
2. Comprehension: This is defined as the ability to correctly describe and interpret objects of a known material. People that have been aware of the object or material must be able to explain it, cite examples, infer and predict the object being studied.
3. Application: A person's ability to use the material learned in actual circumstances.
4. Analysis: The ability to describe the material or an object in its various components but where the components still relate to each other within an organizational structure. This ability can be revealed by the use of verbs such as describe, distinguish and classify.
5. Synthesis: This refers to the ability to place or connect multiple parts into a whole new form. In other words it’s the ability to combine several existing formulations and establish a new formulation.

Based on the above definitions it can be concluded that knowledge is to know a new object, and this becomes an attitude towards the object

only if the knowledge is accompanied by a readiness to act accordingly. When a person has a certain attitude towards an object then that person has to know about the object. Knowledge is also a collection of information that has been conceived, acquired during the learning process in life, and can be used at any time to adjust themselves and their environment An individual's knowledge can grow and develop in accordance with his capabilities, needs, experiences and the intensity of information materials exchange in the environment. Individual sources of knowledge can be derived from a variety of learning experiences both formal and informal

1-2-2Attitudes:

(Early and Chai ken 2007) defined an attitude as a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor. Attitude is translated from response towards a particular object and may be accompanied by a tendency to act in accordance with the perception to the object. In this context objects are not only physical objects or individuals, but can also be events, norms, values and so forth (Pratkanis et al, 1989).

In social psychology each attitude a person holds can be expected to help that person meet his seeds in some way or other. According to Katz (1960) in(Petty and Fazio 2008), the needs fulfilled by attitudes, The functions of attitudes, fall into four broad categories:

The first one in the adaptive (or instrumental) function: Some attitudes serve to enable people to attain particular desired goals or avoid undesirable circumstances. The second

The knowledge function: which help people . They help people ascribe causes to events and direct attention towards features of people or situations that are likely to be useful in making sense of them .The third

The value-expressive (or ego-expressive) function they are important because they express values that are integral to that person's self-concept (i.e. their ideas about who they are), and the expression of that attitude communicates important things about that person to others.

Finally t he ego-defiance function serve to protect the person that holds them from psychologically damaging events or information by allowing them to be recast in less damaging or threatening ways.

Some social psychologists claim that attitude can be understood better by considering its components. There are three main components of attitude: cognition, affection and co-native (behaviour). Cognition is the component of attitude associated with individual beliefs about the object; affection includes the direction and intensity of individual assessments or the experience towards the object; while the co-native component is the tendency to act in a certain way towards the object (Pratkanis et al, 1989). These three components are usually interrelated and consistent with each other.

Attitude can also be described as the reaction an individual has to what he likes or dislikes about something which ultimately determines the behavior of the individual. A person with an attitude of preference towards something tends to approach, to find out and to join, while a negative attitude towards something tends to make the person avoid it (Rahay uningsih, 2008). Attitude was also defined based on orientation as also Response oriented: Attitude is a form of feeling, that feeling of support (favorable) or a lack of support (unfavorable) towards an object.

1. Response preparedness oriented: Attitude is a readiness to react to an object in a certain way when confronted with a stimulus that requires a response. Or it is a conditioned pattern of behavior, tendency or anticipatory readiness to adapt to the social situation.

2. Triadic schemes oriented: Attitude is a constellation of cognitive, affective, and co-native components interacting to understand, to feel, and to behave towards an object in the surrounding environment.(Rahayuningsih2008)

In addition to the attitude definitions outlined above, there are many more other definitions provided by experts. The discrepancies between these definitions seem more likely caused by a difference in emphasis, but in general attitude can be defined as the positive (favorable) or negative (unfavorable) beliefs, feelings and assessment of individuals, and these provide direction or tendencies for individuals to behave in certain ways.

1-2-3Practices

Repeated s or systematic exercise for the purpose of acquiring skills or proficiency.

1-3Food safety:

Food safety is an assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use (FAO/WHO, 2003).

Food safety describes the practice of managing food in such a way that the food is highly unlikely cause any harmful effects, whether in the short term or long term to anyone who consumes products that have been processed, stored or sold by the business FAO/WHO, 2003).

1-4Frozen food

Product maintained at a temperature equal to or below -18 ºC in any part of the product (Codex, 1997).

1-5Food-borne diseases and zoonosis

About 75% of the new communicable diseases that have affected humans over the last 10 years were caused by pathogens originating from animals or animal products (WHO, 2007). Zoonotic pathogens are a major contributor to human food-borne diseases in both developed and developing countries (Schlundt, 2002). They are transmitted during handling of infected livestock at the farm, markets, slaughterhouse, processing and transportation, at the butchery or during preparation of food (Hubbert, 1996). In many countries and especially in developing ones, millions of people are affected by preventable zoonoses such as Rabies, Rift Valley Fever, Brucellosis, Leishmaniasis, Echinococosis Tularemia, amongst others (WHO, 2002).

1-5-1Campylobacter

Since first being recognised as a significant human pathogen in the early 1970s, Campylobacter species have become the most frequently identified cause of gastroenteritis in many countries (Bean and Griffin 1990; Lane and Baker 1993; O'Brien et al 1993; Crerar et al 1996). Most of these infections are thought to be foodborne in origin (Richmond Report 1990) and most cases appear sporadically, with relatively few point-source outbreaks reported (Sockett et al 1993); (Adak et al 1995; Crerar et al 1996). However, the ability to identify outbreaks is limited by the absence of effective subtyping techniques. Poultry meat, other meat products, untreated milk and shellfish have all been implicated as food vehicles, although very seldom confirmed bacteriologically (Lane and Baker 1993; Adak et al 1995). Cross contamination from raw meats has been recognised as a mode of transmission for campylobacteriosis (Adak et al 1995).

1-5-2Salmonella

Throughout the 1980s and early 1990s the United Kingdom and Northern America recorded a sudden increase in laboratory reported Salmonella infections. Much of the increase was attributed to S. Enteritidis, differing from the situation before the 1980s, in which S.

Typhimurium was considered the main cause of foodborne infections throughout the developed world (Rodrigue et al 1990). In the north-eastern USA, there was a seven-fold increase in the rate of S. Enteritidis infections between 1976 and 1986 (Bean and Griffin 1990).

By the end of the 1980s the incidence of S. Enteritidis in the United Kingdom had doubled, most cases being caused by phage type 4 (Sockett et al 1993). Similar increases were reported from many other European countries (Rodrigue et al 1990). During the late 1980s increasing evidence identified hens eggs as the main source of S. Enteritidis infections. Phage type 4 predominated in Europe and the United Kingdom q@ whereas phage types 8 and 13 were most frequently associated with egg-related outbreaks in the USA (St Louis et al 1988; Mishu et al 1994). In contrast, poultry meat and other meat products are the main sources for S. Typhimurium and other salmonella species (Sockett et al 1993; Sharp and Reilly 1994).

1-5-3Enterohaemorrhagic Escherichia coli (EHEC)

EHECs are recently described foodborne pathogens with major public health significance.

Infection with these agents has been shown to cause haemorrhagic colitis (HC), haemolytic

uraemic syndrome (HUS) and thrombotic thrombocytopaenic purpura (Griffin and Tauxe 1991). The predominant EHEC serotype responsible for cases of HUS both in the USA and the United Kingdom is E. coli O157:H7 (Griffin and Tauxe 1991; Wall et al 1996). In the United States,

E. coli O157:H7 is estimated to cause more than 20,000 infections and as many as 500 deaths each year and is now the most common cause of acquired renal failure in the USA (Boyce et al 1995). Initially, outbreaks of HC and HUS were shown to be associated with the consumption of inadequately cooked ground beef (Bell et al 1994). However, other vehicles such as untreated milk (MacDonald et al 1988), unpasteurised apple cider (MMWR 1997a) and alfalfa sprouts (MMWR 1997b) have been identified. Other modes of transmission have also been documented, including transmission from drinking water (Swerdlow et al 1992), transmission to persons swimming in a faecally contaminated lake (Keene et al 1994), and secondary transmission from person to person (Belongia et al 1993). The ease with which E. coli O157:H7 is spread from person to person suggests that the infectious dose is low. This has been supported by quantification of contamination levels in outbreaks ranging from four to 930 organisms/gram (Belongia et al 1993). Listeria monocytogenes .

1-5-4Listeria monocytogenes

Is a bacterium found widely in the environment. It causes listeriosis, a relatively uncommon disease compared with most other foodborne infections, but one that can be particularly severe in immunocompromised persons and pregnant women. Infection in pregnant women can lead to abortion and still birth.

For many years before the early 1980s, fewer than 100 cases of listeriosis were recorded annually throughout the UK (Sharp and Reilly 1994). A marked increase was observed in reports of listeriosis in several countries during the mid-1980s, reaching epidemic proportions in the UK by 1988 when over 300 cases were recorded. The incidence of listeriosis returned to pre-epidemic levels when education strategies to decrease the

risk of infection were implemented (McLauchlin et al 1991; Tappero et al 1995).

1-6Viral food borne infections:

In the 1980 outbreaks of viral gastroenteritis due to small round structured viruses (SRSV) including Norwalk virus increased in England and Wales, with many of these out break attributed to sewage-contaminated shellfish (O'Hara et al 1983). The increase in SRSV gastroenteritis reports probably reflected improved identification, diagnosis and reporting of these infections (Sockets et al 1993).

Outbreaks of hepatitis A have been linked to many foods and are usually a result of direct spread from an infected food handler or the consumption of contaminated seafood (Latham sprea and Schable 1982; Sockett et al 1993; Cowden et al 1995). The potential for explosive and extensive outbreaks of viral foodborne disease was demonstrated in early1997 when over 600. **Zoonosis Disease:** a diseases and infections that are naturally transmitted between vertebrate animals and humans. (The Control of Neglected **Zoonotic Disease Ref**: WHO/SDE/FOS, 2006.1).

1-7Zoonotic Pathogens: A zoonotic agent may be a bacterium, a virus, a fungus or other communicable disease agent. (The Control Of Neglected Zoonotic Disease, WHO/SDE/FOS, 2006.1)

1-7-1Tuberculosis (TB): Tuberculosis, commonly known as TB, is a contagious and an often severe airborne disease caused by a bacterial infection (Mycobacterium). TB typically affects the lungs, but it also may affect any other organ of the body. It is usually treated with a regimen of drugs taken for 6 months to 2 years, depending on the type of infection. (Definition of Tuberculosis, National Institute of Allergy and Infectious Disease, April 03, 2012.

1-7-2Brucellosis: is a bacterial disease caused by members of the Brucella genus that can infect humans but primarily infects livestock. Symptoms of the disease include Intermittent fever, sweating, chills, aches, and mental depression. The disease can become chronic and recurrent, particularly if untreated. (Definition of Brucellosis, Gale Encyclopedias of Medicine, 2008 “The Gale Group, Inc.” All rights reserved)

1-7-3Viral Hemorrhagic Fevers (VHFs): refer to a group of illnesses that are caused by several distinct families of viruses. In general, the term "viral hemorrhagic fever" is used to describe a severe multisystem syndrome (multisystem in that multiple organ systems in the body are affected). Characteristically, the overall vascular system is damaged, and the body's ability to regulate itself is impaired.

These symptoms are often accompanied by hemorrhage (bleeding); however, the bleeding is rarely life- threatening. While some types of hemorrhagic fever viruses can cause relatively mild illnesses, many of these viruses cause severe, life-threatening disease. (Definition of Viral Hemorrhagic Fevers, Communicable Disease Centre, June 19, 2013).

Animal welfare: ‘means how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behavior, and if it is not suffering from unpleasant states such as pain, fear, and distress. Good animal welfare requires disease prevention and veterinary treatment, appropriate shelter, management, nutrition, humane handling and humane slaughter/killing. Animal welfare refers to the state of the animal; the treatment that an animal receives is covered by other terms such as animal care, animal husbandry, and humane treatment (Terrestrial Animal Health Code: ‘animal welfare’ OIE-may, 2008).

1-8Food handling

Any operation in the preparation, processing, cooking, packaging, storage, transport, distribution and service of food (Codex, 2004).

1-**9 Food hygiene**

All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain. (FAO/WHO, 2003).

Food hygiene is much more than cleanliness, it involves all measures necessary to ensure the safety and wholesomeness of food during preparation, processing, manufacturing, packaging, storage, distribution, handling and offering for sale or supply to the consumer (Richard, 2002).

1-9Good Hygienic Practices (GHP) All practices regarding the condition and measures necessary to ensure the safety and suitability of food at all stages of the food chain (WHO Teachers Handbook, 1999).

1-**10 Hazard**

A biological, chemical or physical agent in food with condition of the potential to cause an adverse health effect (Codex, 2004).

1-**11 High risk foods**

Food is allowed growth and reproduction of bacteria, which are eaten without cooking or any other transactions to exterminate the bacteria, such as milk and milk products, eggs, meat, fish and vegetables. Does not include acidic foods (with a pH less than 4.6) but also includes any food stored or prepared or handled at improper temperature (Alhmzawy, 2004).

1-12Contamination:

The introduction or occurrence of a contaminant in food or food environment (Codex, 2004).

1-**13Cross contamination**:

Cross contamination is transfer of bacteria from one object to another. This contamination can be direct from food to food or indirect via hand and surfaces.

Direct contamination requires the source of bacteria to be in direct contact with the food, for example, if raw poultry touches or drips on to high risk food. Indirect contamination relies on vehicle to transport the bacteria. For example, if raw poultry is prepared on a chopping board with utensils that are then used for high risk food (Taylor, 2010).

1-**14Pests:**

Insects, birds, rodents and any other animal capable of directly or indirectly contaminating food (Codex, 1997) .

1-15Microbiological contamination:

Occasionally, the term "microbe" or "microbial" is used instead of the term "microorganism." Microbiological contamination means occurrence of a microorganism that has the potential to cause illness or injury. Microorganisms include yeasts, molds, bacteria, protozoa, helminthes (worms), and viruses (FDA, 1998)

1-16Chemical contamination :

Occurs with the contact of chemicals or chemical compounds to the food such as from Pesticides on the farm or in the food premises . And / or from industrial chemicals, Environmental contamination freezer breakdown (ammonia), mercury, fertilizers (nitrates), veterinary drugs. And/or through cleaning activities such as storage in food containers, spraying near food, Storage with food . And or Leaching during Packaging.

1-17-3Physical contamination :

Present of foreign bodies from raw materials Such as pebbles, snails, stalks, leaves, wood, glass, insects and rodents. And/or Packaging

materials Such as staples, cardboard, string, fibers, cloth, rubber, plastic, wood and polythene. And/or Structure, equipment, notices, cleaning Such as wood, nuts and bolts, plaster, paint flakes, grease/oil, glass, drawing pins, cloths and bristles. And/or from Personnel/visitors, jewellery, finger nails, buttons, combs, pen tops, sweet papers, cigarette ends and hair. And/or from pests or rodents Such as droppings, hair, bait, insects, eggs, larvae and molts. In the food (Advanced Food Safety, 2003**).**

1-18 General hygiene during preparation:

Bacterial contamination in the kitchen often occurs during processing of raw foods. Raw meat and poultry products may be contaminated with pathogens. During food preparation pathogenic organisms may be transmitted to food items by the handler both directly or by cross contamination through hands, surfaces, utensils and equipment that have been inadequately cleaned and disinfected between the preparation of different types of food (Linda and Irma, 2005).

Date on risk factors for food borne diseases imply that most out breaks result from faulty food handling practices (Aimmees and Pragk, 2004).

1-19Food handler responsibility:

Separating raw foods and ready to eat foods is vital to stop harmful bacteria from spreading. Deliveries received in a clean, separate area. Remove the secondary packaging if possible. Defrosting must be carried in a separate safe place. Keep raw food away from ready to eat foods.

Prepare different food in different area, if not possible use different timing. Use different color coding boards (Advanced Food Safety, 2007).

1-20Food storage:

On reaching the kitchen food items should be stored and handled correctly to decrease the growth of the microorganisms already present and to minimize the risk of contamination. For bacterial food borne diseases prevention guidelines in clued that-Keeping high risk foods

products at or below 4° C, separating raw and ready-to-eat food products during storage and applying the correct procedures when thawing frozen food items (Linda and Irma, 2005).

In order to prevent the growth of pathogens, a refrigerator must be operated correctly to maintain a temperature of below 5° C (Taylor, 2011). Cross contamination of pathogens from raw commodities to frequently occurs in the refrigerator. Therefore, raw foods, particularly meat, poultry, liquid egg products, fish and shellfish, must be strictly separated from prepared foods, preferably by the use of different refrigerators (FAO/WHO, 1993).

Storing raw meat, poultry or fish on the top shelf in the refrigerator increase the risk of cross contamination due to the potential dripping of raw juices on to other foods stored beneath.

The risk is especially high if the foods stored below are ready to eat items that will not be heated to enough high temperatures to destroy pathogenic bacteria. Frozen meat and poultry should be thawed by putting in refrigerator, placing in a sealed package in cold water or in microwave oven. Destroying frozen food items at room temperature or in warm water is hazardous practice as temperature 5° C and 60° C can lead to growth of food borne pathogens (Linda and Irma, 2005).

1-21Cleaning and disinfecting:

Cleaning well maintained premises promotes good food hygiense practices, inhibits pests and also results in a safe working environment where damaged equipment and slips, trips and falls are controlled through good housekeeping (FAO/WHO, 1993).

. Notes wash with detergent, then add chemical disinfectant, then dry. Use an all-in-one cleaning product that washes and disinfects (e.g. sanitizer). Wash with detergent in a hot dishwasher (very hot water acts as a disinfectant) (Taylor, 2010).

1-22Personal hygiene of the food handler :

The human body is a source of many pathogens. The nose, throat, hands and faeces are the most important sources. Therefore, personal hygiene, protecting clothing and hand washing play an important role in preventing disease. Table below summarizes food handling practices essential to produce safe food Source: Taylor (2011).

Thorough hand washing will take approximately 20 seconds. It must include the following steps:

1. Wet, warm water should be applied to both hands
2. Lather, soap should be applied and hands should be rubbed together to make a lather. All surfaces of both hands should be covered.
3. Rinse, all soap should be rinsed away with fresh clean water.
4. Dry, hands should be dried thoroughly, ideally with a clean paper towel.

Habits, not allowing during food handling , such as smoking , tasting food using fingers or other activities which bring hands and mouth directly in contact with food , because these habits can cause contamination of food, equipment and surfaces with pathogens from body (Taylor, 2011).

1-23The use of gloves:

The use of disposable viny1, latex and neclatet gloves has not been proved o be a safer method of handling food compared to food handlers who use effective hand washing techniques (Richard, 2002).

Tests have indicated that the use of rubber gloves is not necessary an important bacteriological over the use of bare hands unless the gloves retain smooth, unbroken surface and are washed frequently.

They should be washed inside as well as outside to prevent soiling the hands by wearing gloves after continual use (Richard, 2002).

The use of gloves is recommended, however for procedures involving frozen foods and also when prolonged impression of the hands in hot water containing detergents, in such cases protection of skin is advisable.

Proponents of gloves claimed that provided hands are washed before putting on the gloves, and they are disposed of frequently, they minimize the risk of contamination of high risk foods especially hand washing is not being achieved. It is also claimed that food handlers with gloves are more aware that they are handling high-risk food and are less likely to scratch their head, pick their nose or carry out other bad hygiene practices (Richard, 2002).

All stages of slaughter can result in carcass contamination. The central aim ofslaughter is to efficiently remove the skin/hide and viscera in a manner that will

prevent contamination of the carcass with the hide or gastrointestinal contents the hygiene of the operatives and implements used are crucial to attainment of process hygiene. An important concept for understanding the steps in the slaughtering process where contamination is likely to occur is that of Hazard Analysis critical control point

1-24Critical Control Points (HACCPs) :

HACCP is a risk-based food safety assurance system which focuses on prevention strategies on known hazards. Proponents of HACCP have argued that, the system can focus on the critical stages from producer to consumer in a cost-effective manner. HACCP identifies potential hazards and faulty practices at an early stage rather than reacting to deficiencies in end-product testing. It focuses on raw material and process control rather than structure and layout of food premises (Ehiri, etal., 1996).

Although Implementation of HACCP requires additional resources like training, structure, technical support, but investment in long term by the reduction of contaminated food, improvements of quality and safety

of the food, increased reliability and fewer complaints by consumers (Motarjemi and Kaferstein, 1999).

A few studies have also been carried out to explore managers' attitude and Understanding in food safety, HACCP and food hygiene training (Mortlock et al., 1999; Worsfold and Griffith, 2003;) (Taylor, 2004,). The postal Survey by(Mortlock et al. 1999) in the UK showed that, most managers perceived their businesses to be low risk regardless of the foods they handle. Half of the managers interviewed in a survey on attitudes and perceptions towards hygiene training in South Wales were not skilled to train and often were not trained in basic hygiene themselves (Worsfold, etal., 1997). Additionally, (Taylor, 2007) interviewed four small and medium enterprise owners, who were implementing HACCP, using a qualitative, in-depth, discovery-based methodology. It was found that, the main barriers that hindered HACCP implementation were due to HACCP being considered as difficult, burdensome and unnecessary and because of staff and external problems. The authors explained that the interplay of barriers at knowledge, attitude and behavioral levels could account for these problems.

Last few years there has been a wide spread agreement that, the way forward in food safety is the application of HAACP. In regional Arabic countries the classical HACCP seems to be difficult to follow due to many factors and the governments are seriously discussing about an alternative food safety management system to propose and recommend business to be followed. The outcome was evolving a "risk management system based on HACCP principles" In 2002 a wide reaching international survey conducted that, there had been no systematic, effective implementation of HACCP in the hospitality industry anywhere in the world (Taylor 2008).

1-25Meat hygiene: expert supervision of all meat products to provide wholesome meat for human consumption and preventing danger to public health (veterinary journal, 1999)

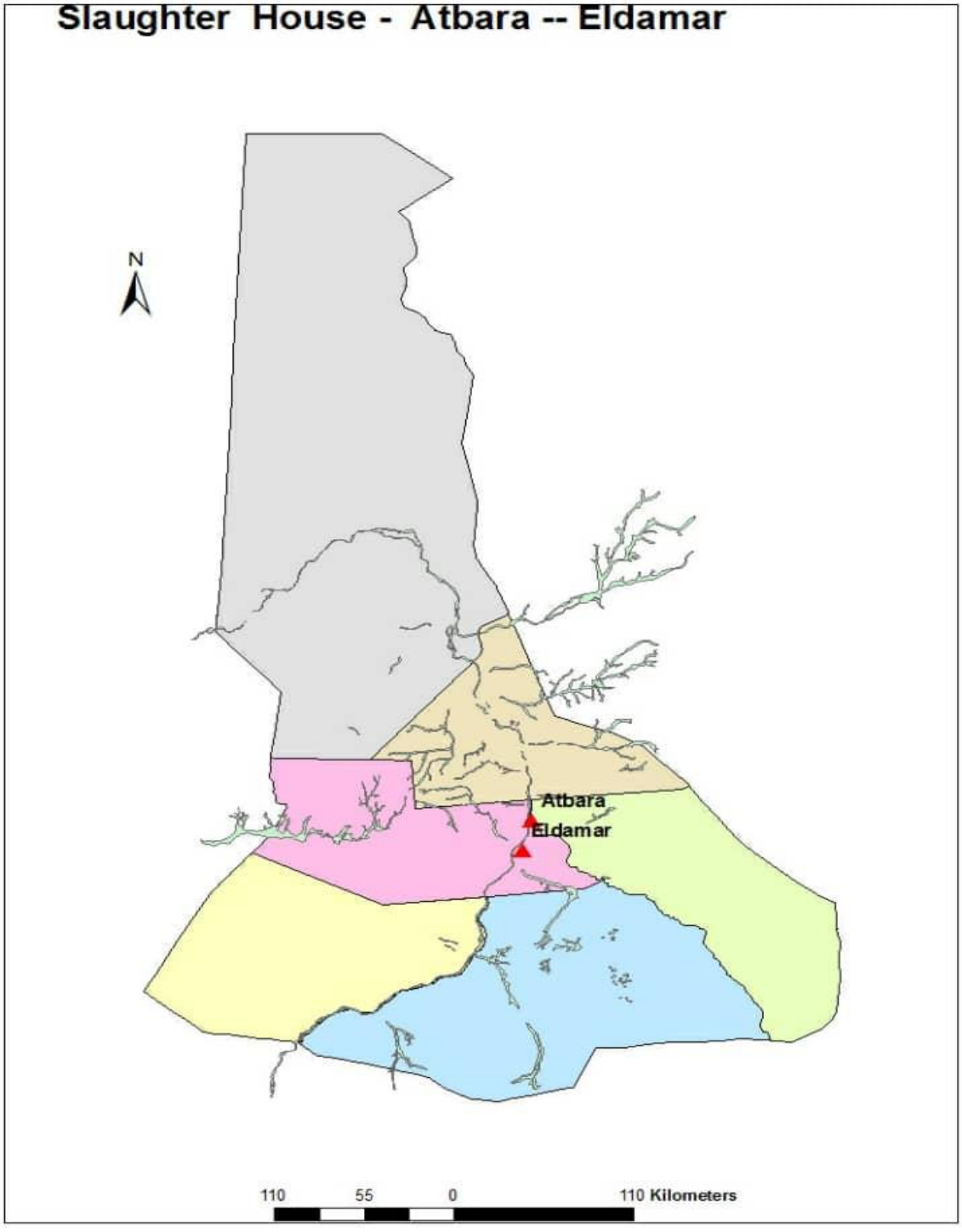
Halal slaughtering: is defined in Quran, the Islamic form of slaughtering animals ,poultries or dahlia involves killing through a cut to the jugular vein, carotid artery and wind pipe (Holly Quran may 12. 2014).

CHAPTER TOW

MATERIALS AND METHODS

2-1 STUDY Area (see the map):

the study was carried(out in RIVER NILE State in tow localities Atbara and A ldamer localities in order to evaluate food Hygiene Knowledge, Attitudes, and Practices of slaughter workers.See Fig -1



Mab Solughter house Atbra an Aldamer

2-2 Geographic situation of study area:

Atbara locality is one of River Nile State localities located 17°42'N &

Atbara locality is one of River Nile State localities located 17°42'N & 33°59'E Atbara is located between the longitude33.99886 and latitude17.71988and a Aldamer is located between longitude 33.94501 and lattitude17.53418(Atabara locality record 2009) and in northeastern of Sudan. Total size area estimates about 3510 Square kilometers. It is located at the junction of the River Nile and Atbara River. Atbara locality is divided into four administrative unit (North, Middle , South and Sola administrative unit). Atbara locality is an important railway junction and railroad manufacturing center. It is known as the "Railway City' and The National Railway Company's headquarters are actually located there in Atbara.

2-3Cenus of Populations :

Atbara is a locality of census of population about139.264 people .and The population census of Aldamer is about122.944 people(census in River nile state2009) Most of populations in Atbara are workers in the railway lines.

2-4tudy population

The slaughter house workers (100 workers in Atabara and 50 workers in Aldamer

2-5 Sampling method: the population of the study had treated as a sample.

2-6 Sample Size: The study covered all workers in Atbara and Aldamer slaughterhouses, a total number of 150 workers were considered in this study.

2-7Study design:

The study was designed as descriptive study utilizing different dependent and independent variables. This was a cross-sectional

descriptive study mainly based on quantitative questionnaires to answer questions on knowledge, attitude and practice with regard to hygiene among abattoir workers. Knowledge, attitude and practice were determined by the use of structured interview and through direct observations of the hygienic status and practices by abattoir workers. The target population constituted all the people working in abattoir. The abattoir involved were three metropolitan abattoirs

2-8 Data collection :

The data were collection by Questionnaire consist four the part as the following

1. **Socio- demographic characteristics:** of slaughterhouse worker consist of to collect information about the socio demographic characteristics of the respondents such as AGE (years)- Nationality –Educational level-duration of work(years)- Monthly salary-
2. **Working Duration (hours)- place of residence**.
3. **Knowledge of slaughterhouse workers :**

consists of question covering the aspects of Knowledge which include;

Do you have basic food hygiene & safety training Is There any relationship between the works in slaughter houses and Zoonotic diseases If yes what are the most common Zoonotic diseases in slaughterhouses due to your own knowledge Is There any relationship between the works in slaughter houses and Food poisoning :

Do you know cross-contamination.

Do you know how meat becomes contaminated.

Do you know the optimum temperature for bacteria growth .

Is it necessary to separate people who work outside the hall from people working inside the hall .

Do you know the optimum temperature of Meat storage.

Do you know the signs of Meat spoilages .

Attitude of slaughterhouse workers :

covered the aspect of knowledge that involves; training and frequency of the training and the last part consists of attitude of the respondents toward hygiene that include; Meat hygiene is an important part of your job responsibilities Sterilizing thequipment's used for operations after use

Cooling the meat reduces bacterial growth. Pest and pets play strong role on meat contamination. .Training and learning about meat hygiene is important to me.Using hairnet, masks , protective gloves and adequate clothing reduce the risk of meat contamination .

Washing and disinfecting hands prevents Meat contamination Carcasses should be separated Improper storage of Meat can be ahazard to health butcher with abrasion or cuts should not touch carcass .

4.Practice of slaughterhouse workers :

Consist of Where do you change your dress. What do you do when you wash your hands . Name the occasion when you wash your hands

Do you smoke: Do you use snuff : Do you use the same knife for removing skin and evisceration

Do you use the same cleaning equipments for outdoor and indoor (Hall) cleaning If you got injured, what do you do.

CHAPTER THREE

RESULT

TABLE (1)Demographic Characteristics of slaughterhouse in Atbara locality

Characteristic	Demogsraphic characteristics	Number (%) n=100
Age	Less than 20	12`(12)
	20-25	15(15)
	26-30	27(27)
	31-35	20(20)
	36-40	21(21)
	More-40	5(5)
Nationality	Sudanase	98(98)
	Not sudanase	2(2)
Educational	Primary	68(68)
	Secondary	24(24)
	Higher	8(8)
	Littracy	
Monthiy salary	Less than 2	4(4)
	2-2.5	32(32)
	2.5-3	25(25)
	3-3.5	29(29)
	More than 3.5	10(10)
Work duration	8 hours'	8(8)
	9 hours'10 hours 37	28(28)
	11 hours	19(19)
	More than 11	8(8)
Place of residence	Out side	93(93)
	In side	7(7)

The age of most workers ranging between(25-30)years(27%). The most workers are sudanase\only tow workers are asubean .and high percentage of workers (68%) have received primary education foll0wed by secondary education (24%) and high education (8%) A small poration of workers recived higher education (8%) There were no illiterate workers among . about 32 workers earn 2-2.5 SDG pound per month 29(3-3.5). 25recive(2.5-3)10more than 3-5 only 4

earn less than 2. 37%of workers working every day for 10 hours . The majority of workers line out the slaughter house (93%).

Correlate between age and month salary sig .07 that indacate incarase in age related increase month salary and no correlate between age . salary and work duration sign .012(no sig nificant) there is an association between the level of education and frequency cleanliness of protective cloth ($p<0.05$), the proportion of the respondents that completed the secondary school and tertiary institution goes with workers that washes their cloth on daily basis, however, workers that completed only the primary school are those that wash their cloth twice a week, hence as the level of education increased the frequency of cleanliness of protective cloth decrease and the hygiene practice also decrease in Atabara locality .

Knowledge regarding training and frequency of training in the slaughter: demonstrates the level and frequency of training by the public health personnel in the abattoir,97% of the respondents received training regarding hygiene in abattoir by the public health personnel, in which 75% of the workers said the training is done when the need arise 97 3 Receive trainin**g .**

Attitude of workers toards hygiene in slaughter house , (Table2)

		Agree	Uncertain	Disagree	NO answer
1	Meat hygiene is an important part of your job responsibilities	51%	39%	10%	
2	Sterilizing the equipments used for operations after use	30%	38%	32%	
3	Cooling the meat reduces bacterial growth	22%	59%	17%	2%
4	Pest and pets play strong role on meat contamination	20%	20%	60%	
5	Training and learning about meat hygiene is important to me	44%	6%	46%	4%
6	Using hairnet, masks , protective gloves and adequate clothing reduce the risk of meat contamination	43%	16%	39%	2%
7	Washing and disinfecting hands prevents Meat contamination	31%	5%	60%	4%
8	Carcasses should be separated	48%	10%	42%	
9	Improper storage of Meat can be a hazard to health	72%	7%	21%	
10	butcher with abrasion or cuts should not touch carcass	38%	7%	47%	7%

shows the attitude of the workers toward hygiene practice in slaughter house , majority of the respondents reported negative attitudes regarding hygiene in abattoir. stated that, hygiene was an important part of their job responsibilities, most of them 51% agree that, wearing of protective clothing can reduce the risk of diseases, 43% agree that frequent training by public health personnel can improve hygiene in abattoir and almost all the respondents agree that improper storage of meat might be harmful to demonstrates the level and frequency of training by the public health personnel in the abattoir(,44%) of the

respondents received training regarding hygiene in abattoirand improper of meat can be ahazard (72%) and the workers washing your hands(31%). Practices regarding hand hygiene pest control, methods of meat preservation and storage of the workers in the slaughter house (Table 3)

Characteristics		**Number (%)n=100**
Do you use to wear protective clothing?	All time	0
	Some time	0
	Never	50
Do you wash your hand	All time	0
	Some time	0
	Nener	50
	All time	
Do you wash your hand when you enter the hall	Some time	0
	Never	0
	ALLtime	35
Do you use snuff inside the hall	Some time	0
	Never	15
Do you smoke inside the hall	ALLtime	45
	Some time	0
S	Never	5
Do you sterilize the knife between tasks	ALLtime	0
	Some time	0
	Never	50
Do you use the same cleaning equipments for outdoor and indoor (Hall) cleaning	ALLtime	31
	Some time	5
	Never	14
do you used to cover cuts when you cut your hand	ALLtime	0
	Some time	45
	Never	5

TABLE (1)Demographic Characteristics of slaughterhouse in Aldamer locality

Characteristic	Demographic characteristics	Number (%) n=50
Age	**Less than 20**	**10`(20)**
	20-25	**8 (16)**
	26-30	**11(22)**
	31-35	**14(28)**
	36-40	**5(10)**
	More-40	**2(4)**
Nationality	**Sudanase**	**45(90)**
	Not sudanase	**5(10)**
Educational	**Primary**	**12(24)**
	Secondary	**14(28)**
	Higher	**2(4)**
	Littracy	**22(44)**
Monthiy salary	**Less than 2**	**1(4)**
	2-2.5	**21(42)**
	2.5-3	**3(6)**
	3-3.5	**17(34)**
	More than 3.5	**8(16)**
Work duration	**8 hours'**	**7(14)**
	9 hours' **10 hours**	**9(18)** **15(30)**
	11 hours	**15(30)**
	More than 11	**4(8)**
Place of residence	**Out side**	**50(100)**
	In side	**0(0)**

The age of most workers ranging between(31-35)years(28%). Theall most workers are sudanase\.and high percentage of workers (24%) have received primary education foll0wed by secondary education (28%) and high education (4%) A all workers i litteracy (44%) workers among . about 42% workers earn 2-2.5 SDG pound per month 34%(3-3.5). 6%recive(2.5-3)0more than 3.5 only 16% . 30% of workers working every day for 10 hours.

The all workers of the slaughter house stay out side (100%).

Correlate between age and month salary sig .07 that indacate incarase in age related increase month salary and no correlate between age . salary and work duration sign .012(no sig nificant)

there is an association between the level of education and frequency cleanliness of protective cloth ($p<0.05$), the proportion of the respondents that completed the secondary school and tertiary institution goes with workers that washes their cloth on daily basis, however, workers that completed only the primary school are those that wash their cloth twice a week, hence as the level of education increased the frequency of cleanliness of protective cloth incr ease and the hygiene practice also increase in Aldamer locality .see appendex.

Knowledge regarding training and frequency of training in the slaughter(figure1):

demonstrates the level and frequency of training by the public health personnel in the slaughter house,35% of the respondents received training regarding hygiene in abattoir by the public health personnel, in which 35% of the workers said the training is done when the need arise Receive any training **.**

Attitude of workers towards hygiene in slaughter house in aldamer locality (Table5)

		Agree	Uncertain	Disagree	NO answer
1.	Meat hygiene is an important part of your job responsibilities	22%		70%	8%
2	Sterilizing the equipments used for operations after use	16%	4%	80%	
3	Cooling the meat reduces bacterial growth	64%	16%		20%
4	Pest and pets play strong role on meat contamination	4%	4%	88%	4%
5	Training and learning about meat hygiene is important to me	70%	4%	26%	
6	Using hairnet, masks , protective gloves and adequate clothing reduce the risk of meat contamination	20%		80%	
7	Washing and disinfecting hands prevents Meat contamination	44%		56%	
8	Carcasses should be separated	24%	2%	74%	
9	Improper storage of Meat can be a hazard to health	48%		16%	
10	butcher with abrasion or cuts should not touch carcass	16%	6%	76%	2%

shows the attitude of the workers toward hygiene practice in slaughter house majority of the respondents reported negative attitudes regarding hygiene in slaughter house. stated that, hygiene was an important part of their job responsibilities, most of them(70%) disagree that, wearing of protective clothing can reduce the risk of diseases,(20%) agree that frequent training by public health personnel can improve hygiene in slaughter house and almost all the respondents(48%) agree that improper storage of meat might be harmful to demonstrates the level and frequency of training by the public health personnel in the slaughter

house(70%) of the respondents received training regarding hygiene in slaughter house and improper of meat can be hazard (48%) and the all most workers (56%) disagree towashing your hands.

Practices regarding hand hygiene pest control, methods of meat preservation and storage of the workers in the slaughter house in aldamer locality (Table 6)

Characteristics		Number (%)n=100
Do you use to wear protective clothing?	All time	0
	Some time	0
	Never	50
Do you wash your hand	All time	0
	Some time	0
	Nener	50
	All time	
Do you wash your hand when you enter the hall	Some time	0
	Never	0
	ALLtime	50
Do you use snuff inside the hall	Some time	35
	Never	0
Do you smoke inside the hall	ALLtime	15
	Some time	45
S	Never	0
Do you sterilize the knife between tasks	ALLtime	5
	Some time	0
	Never	50
Do you use the same cleaning equipments for outdoor and indoor (Hall) cleaning	ALLtime	31
	Some time	5
	Never	14
do you used to cover cuts when you cut your hand	ALLtime	0
	Some time	45
	Never	5

Worker without (PPE) Personal Protective Equipment (slaughtering hall) Picture (1-2)

Picture (1)

Picture (3)

Cross contamination

CHAPTER FOUR

DISCUSSION

This study had attempted to evaluate food hygiene knowledge, attitudes, and practices of slaughters workers in, Atbara and Aldamer localities ,in River Nile State. Sudan, July 2017. Socio economic conditions of the food handlelso considered because of their vital importance for food hygiene practices.

During the research period, 150 slaughter workers in Atabara and Aldamer slaughter houses have been investigated , to reveal the picture of the current situation. Demographic characteristic revealed that the age of Aldamer of slaughter houses were as follows less than were 10(20%) 20-25 8 (16%) 26-30 11 (22?%)-31-35 14(28%) -36-40 5(10%) more than 2(40%) compared to Atbara slaughter workers were Age in and less than 20 12 (12?%) 20-25 15(15%) 26-30 27(27%) 31-35 20(20%) 36-40 21 (21%) more than 40 5(5%) .

As reflected by the study it was clear that, the educational level of the slaughter workers was good (0.0%) was illiteracy and (68%) had primary education, 24%. had secondary education and 8% had graduate educational level. In Atbarawhich the educational level of the slaughter workers in Aldamer was poor as (44%) was illiteracy and(24%) had primary education, (28%). had secondary education and(4%) had graduate educational level. For better food hygiene a good educational level is required to enable the slaughter workers to understand the concept of food hygiene.

The current study reveled that, (18%) of slaughter workers in slaughter housesin Atbara locality had good food hygiene training , while (79%) had no good food hygiene training. in Aldamer locality were not trained in food hygiene while (1%) of slaughter workers in slaughter houses had good food hygiene training , while (44%) had no good food

hygiene training This is an indication that, food hygiene training program were not organized for the slaughter workers This study .dis agree with the previous study in kano state metropolitan .Nigeria (2015 About 97% of the workers they received training when the need arises. But according to Soultos N et al regular training of meat handlers regarding the basic concepts and requirements of personal hygiene plays an integral part in ensuring safe products to the consumer.

The study revealed many critical features about the knowledge of the slaughter workers, almost (11%) of workers in slaughter houses in Atabara have well knowledge about cross contamination, while (87%) did not , , in Aldamer of workers in slaughter house well knowledge and this effects in food born diseases, and cross contamination .

the majority of slaughter workers did not understand that food can be contaminated by pathogenic bacteria, comparing with Previous study found that 60% of slaughter workers did not know that food poisoning (Elizabeth et al., 2003)

the present study showed a general positive attitude among slaughter workers towards separation of raw food in storage (65.0%) slaughter workers in slaughter house were having a good attitude to wards separation Carcasses while (48%). didn't have, it is an important part of their responsibilities, because improper storage of foods may be hazardous to health, and slaughter house workers with abrasion or cuts in finger or hands should not touch unwrapped foods.

Regarding the practices of using PPE (Personal Protective Equipments) to reduce risk of contamination, (16%) of workers were uncertain, (39%) disagree and (43%) agree and (2) not answered ..and in Aldamer practices for using PPE (Personal Protective Equipments) to reduce risk of contamination,(0 %) uncertain, (80%) disagree and (20%)

agree The importance of using, masks, protective gloves and adequate clothing in reducing food contamination is necessary.

Practice is partly a function of attitude. The word ‘partly’ here suggests that in addition to attitude factors there are also other factors that influence individual practice. The strength of the relationship between attitudes and practice is determined by the consistency between the attitude components and the other components. It is well defined that although two individuals may have similar cognitive components, if the level of the affection components is different the behavioural tendencies of each individual will be different. Since the aims of wearing protective clothes are to protect both the food products and the meat handler from cross contamination, protective clothes should be suitable to wear over other normal dress. However, this study showed that 100% of the slaughterhouse workers do not wear protective clothes.

This study expland that 100% of the respondents wash their hands with water only from a water pipe laid on the ground. According to WHO the effective requirement of hand washing includes washing of hands in hot soapy water before preparing food and after using the bathroom, changing diapers and handling pets. This study agree with perivious study in(Alkariba slaughter by Zohal ..A 2015)showed that 100 % of the respondents did not wash their clothes every day after the work and they are using the same uniform in the next day work activities. If food handlers take serious note on the cleanliness of their hands, body, and clothing, this will help in preventing the incidence of cross-contamination. 100% of the respondents don’t know the optimum temperature for bacterial growth used as a means of meat storage temperature.

, This study found that, 100% of the respondents in Aldamer and Atbara don’t wash their hands with warm water and soap. According to

WHO the effective requirement of hand washing includes washing of hands in hot soapy water before preparing food and after using the bathroom, changing diapers and handling pets

World Health Organisation, author. Informal meeting on strategies for control of amoebiasis. WHO

This study finding shows that 43% in Atabara and in Aldamer 35% of the respondents wash theirr clothes every day after the work. Sneed et al showed that if food handles take serious note on the cleanliness of their hand, body, and clothing, this will help in preventing incidence of cross-contamination from occurring.

Sneed, J., Strohbehn, C., Gilmore, S.A. & Mendonca, A. 2004. Microbiological Evaluation of foodservice contact surfaces in Iowa assisted-living facilities

used refrigerator as means of meat storage. Only 22% in Atbara and in Aldamer 32% of the respondents

CHAPTER FIVE

CONC LUSION AND RECOMMENDATIONS

Conclusion:

There is increase in knowledge, attitude and practice of hygiene among abattoir workers, but there is need to increase the level of hygiene in the abattoir premises. It also shows that workers with good attitude have a better practice but such an association with knowledge is not necessary. However there is need to increase the level of knowledge on hygiene practices among abattoir workers in order to reduce the incidencof diseases and sickness in the state.

Recommendations :

the following recommendations:-

- Anew slaughterhouse should be established in a site fulfilling the hygienic requirements as per the regional or international standards.
- The layout of the slaughterhouse should be designed according to sanitation standard operating procedures
- The slaughterhouse should be designed according to Halal slaughtering and animal welfare requirements.
- The slaughterhouse should be completely controlled by the authority.
- The slaughterhouse should be provided with a laboratory (validation program).
- Slaughterhouse workers should be provided with protective measures to avoid the occupational hazards.

The main emphasis for training should cover the followings:-

1. Basic food hygiene training.
2. Basic personal hygiene practices.

3. HACCP principal.
4. Food contaminant.
5. Bacteriology of food.
6. Food born disease outbreaks investigation.
7. Risk based inspection for food establishments.

- All slaughters need to be trained on essential food hygiene.
- All veterinarians and assistants need to be provided with special trainings on food safety programs.
- aspects of food safety as recommended by the World Health Organization.

Health authorities at the State and locality levels must implement all concerns food laws and regulations by the professionals and their way of implementing them

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APPENDIX

1. **Questionnaires to determine the knowledge, attitudes and practices of Slaughters workers towards Food Hygiene and Safety 2017 .**

Appendex(1)

PART (A) **DEMOGRAPHIC CHARACTERISTICS** :-				
1	**AGE (years**)	Less than 20 20-25 30-35 35-40 More than 40		
2	**NATIONALITY**	Sudanese) Not Sudanese		
3	**EDUCATIONAL LEVEL**	Illiteracy Primary Secondary Higher		
4	**Duration of Work (year)**:	less than one) 1-3) +3- 5 +5-10 More than10		
5	**Monthly Salary (SDG/Hundred**):	Less than 2 2-2.5) 2.5.- 3) 3- 3.5 More than 3.5		
6	**Working Duration (hours)**	8 9 10 11 More than		
7	**Place of residence**	Inside Premise Outside Premise)		
* Please indicate your opinions for the following statements about food safety:				
PART (B)				
KNOWLEDGE :-		**YES**	**NO**	**DON'T KNOW**
1	**Do you have basic food hygiene & safety training**			
2	**Is There any relationship between the works in slaughter houses and Zoonotic diseases**			
3/ A	**If yes what are the most common Zoonotic diseases in slaughterhouses due to your own knowledge**	Brucellosis ( ) Hemorrhagic fever () anthrax( ) Others ( )		
3/ B	**Is There any relationship between the works in slaughter houses and Food poisoning**	Cholera ( ) Typhoid ( ) Food poisoning ( ) Worm ( ) Dysentery ( ) Others		

4	**Do you know cross-contamination**			
5	**Do you know how meat becomes contaminated**			
6	**Do you know the optimum temperature for bacteria growth**			
7	**Is it necessary to separate people who work outside the hall from people working inside the hall**			
8	**Do you know the optimum temperature of Meat storage**			
9	**Do you know the signs of Meat spoilages**			

PART (C)

ATTITUDES		**Agree**	**Uncertain**	**Dis agree**	**No**
10	**Meat hygiene is an important part of your job responsibilities**				
11	**Sterilizing the equipment's used for operations after use**				
12	**Cooling the meat reduces bacterial growth**				
13	**Pest and pets play strong role on meat contamination**				
14	**Training and learning about meat hygiene is important to me**				
15	**Using hairnet, masks , protective gloves and adequate clothing reduce the risk of meat contamination**				
16	**Washing and disinfecting hands prevents Meat contamination**				
17	**Carcasses should be separated**				
18	**Improper storage of Meat can be a hazard to health**				
19	**butcher with abrasion or cuts should not touch carcass**				

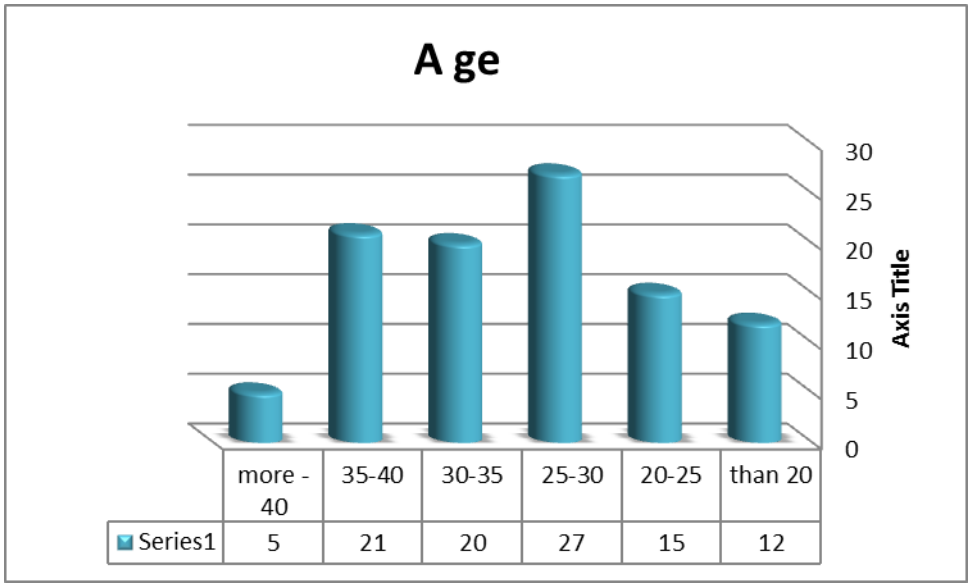
PART (D)
PRACTICES

20	**Where do you change your dress?** (a) in my residence (b) inside slaughter house (c) Locker rooms

	(d) don't change
21	**What do you do when you wash your hands?** (a) wash my hands with soap and wate) (b) wash my hands with water only (c) don't remember((d) don't know
22	**Name the occasion when you wash your hands** (a) before starting my job (b) after using the toilet) (c) before and after equipment's and body (d) don't remember)
23	**Do you smoke:** YES NO **Do you use snuff** : YES) NO)
24	**If yes where** (a) in my residence only (b) after i finish my duty) (c) on my break between duty (d) during my duty
25	**Do you use the same knife for removing skin and evisceration** (a) Usually (b) Sometimes (c) Never (d) Don't use
26	**Do you use the same cleaning equipment's for outdoor and indoor (Hall) cleaning** (a) Usually (b) Sometimes (c) Never (d) Don't use
27	**Do you touch the carcass together during washing** (a) Usually((b) Sometimes (c) Never (d) Don't use
28	**If you got injured, what do you do** (a) See a doctor (b) Dressing (c) Ignore and continue my work) (d) Don't care

DemographicCharacteristics in Atbara

Appendix(2)



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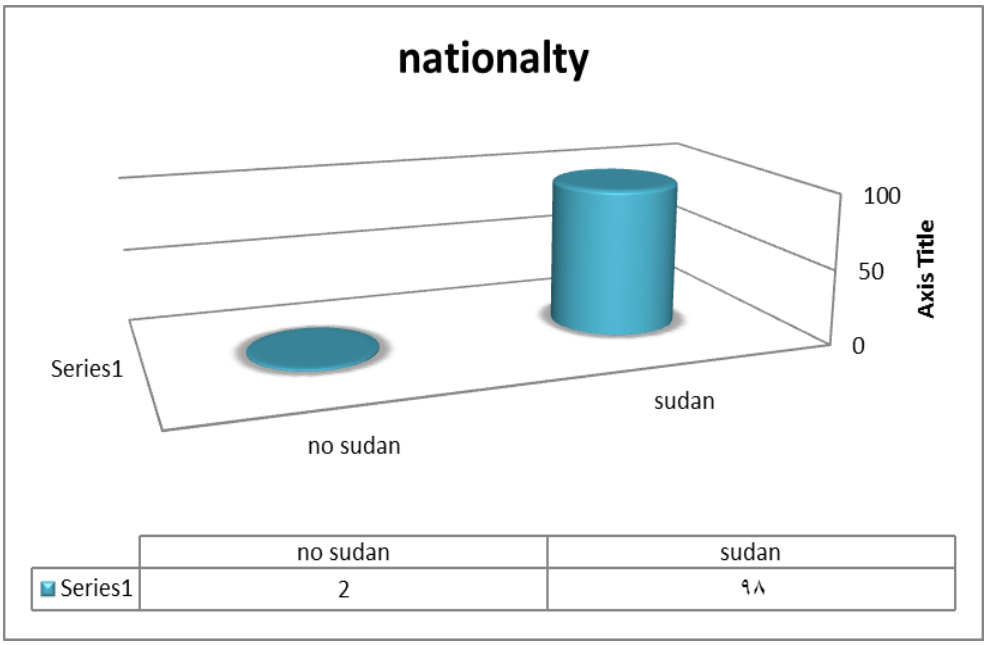
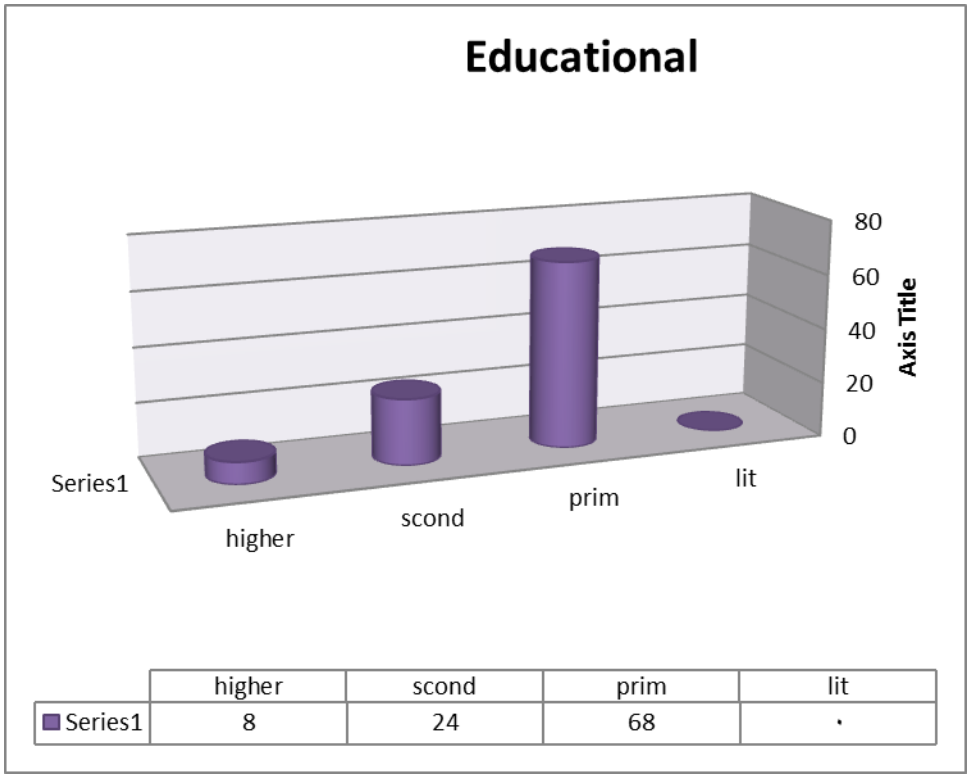
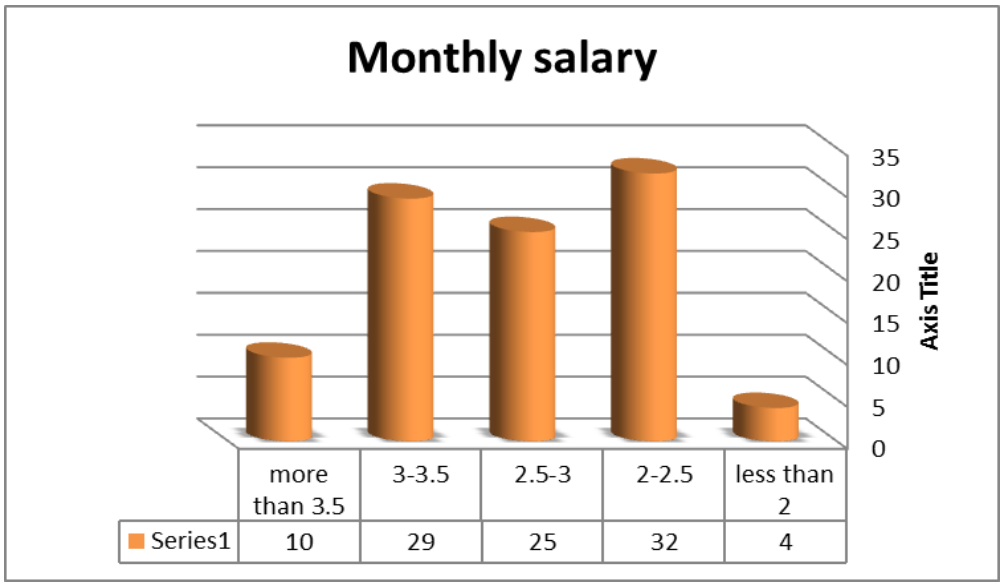


Appendix(4)



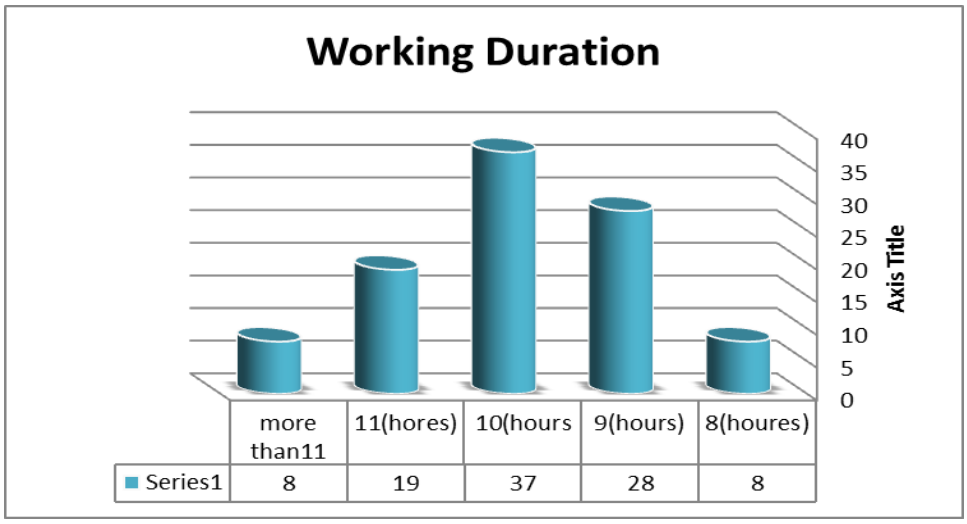
	higher	scond	prim	lit
Series1	8	24	68	·

Appendix(5)



	more than 3.5	3-3.5	2.5-3	2-2.5	less than 2
Series1	10	29	25	32	4

Appendix(6)



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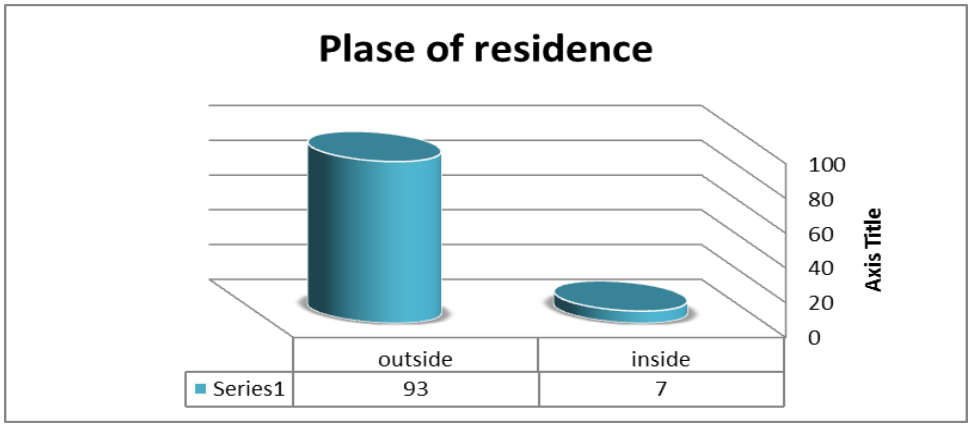
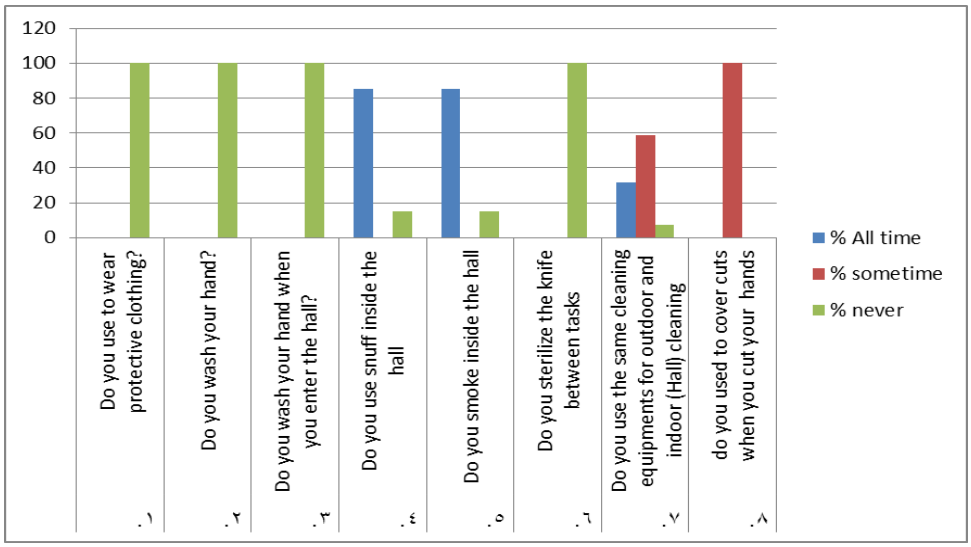
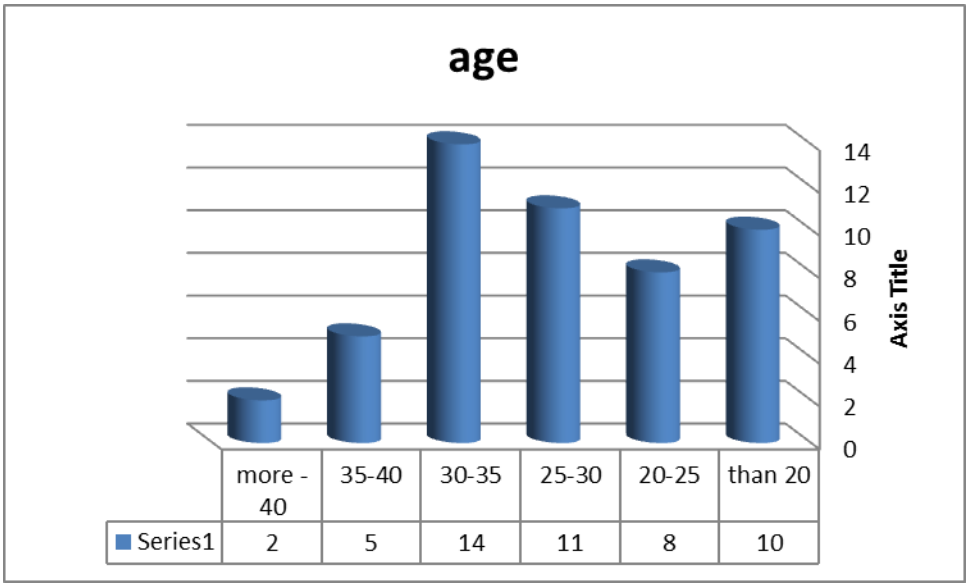




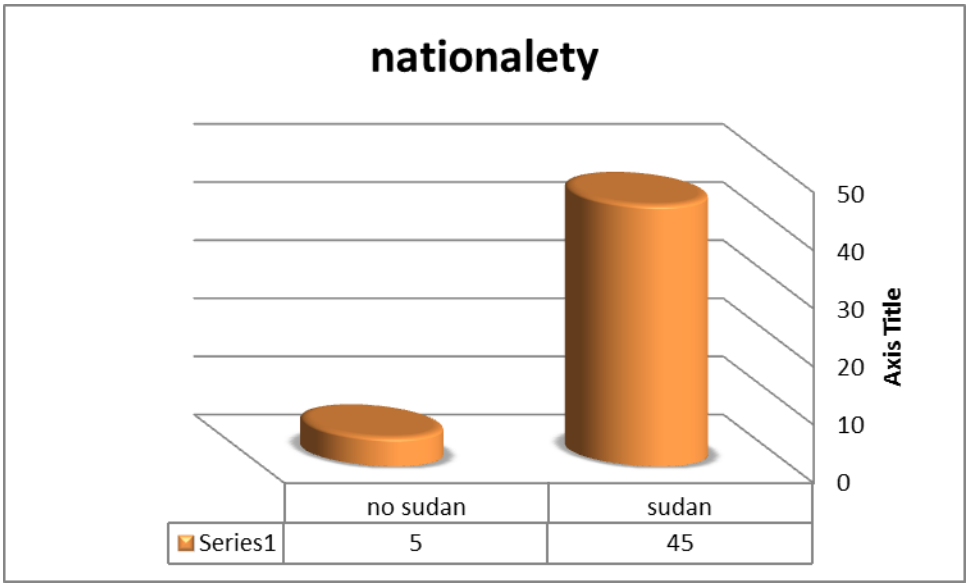
Appendix(8)

Demographic Characteristics in Aldamer

Appendix(9)



Appendix(10)



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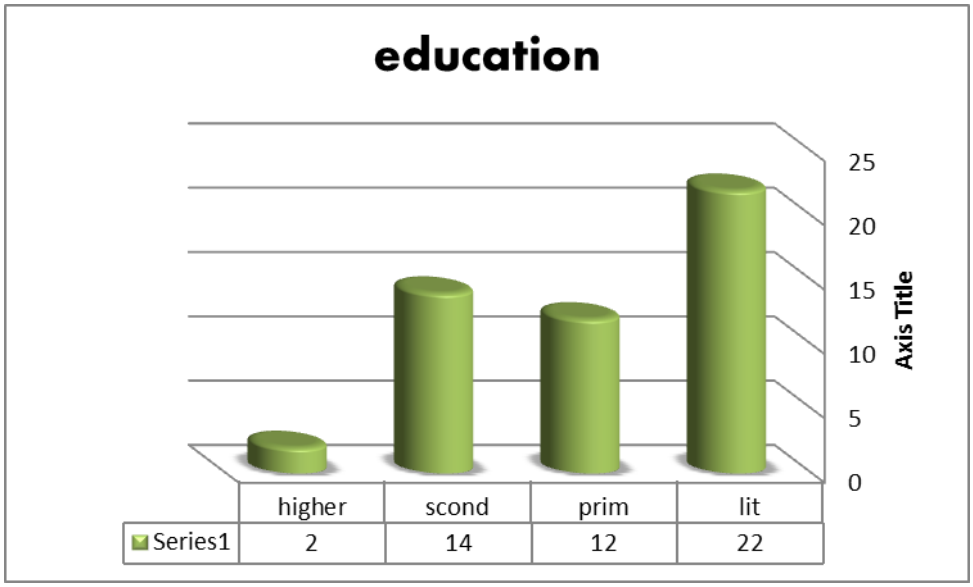
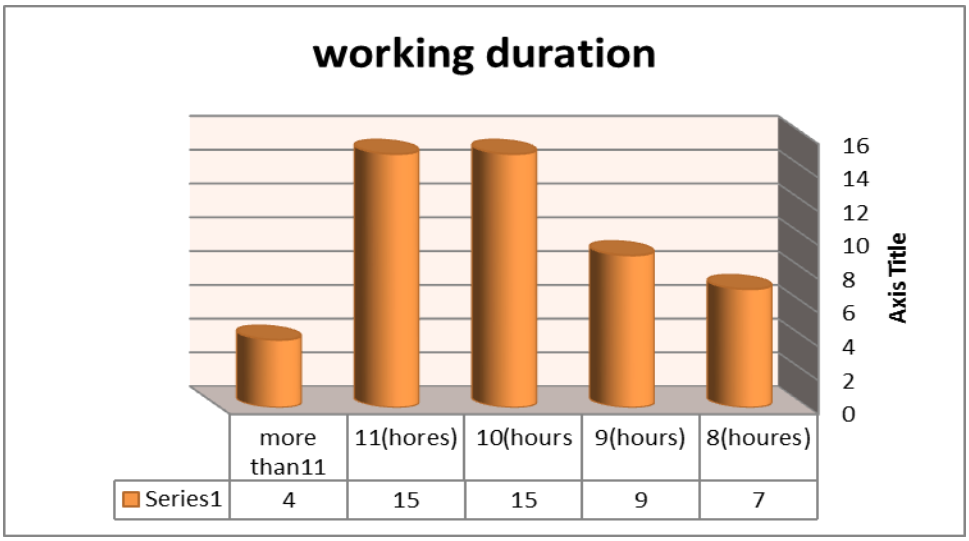


Appendix(12)

Appendix(13)



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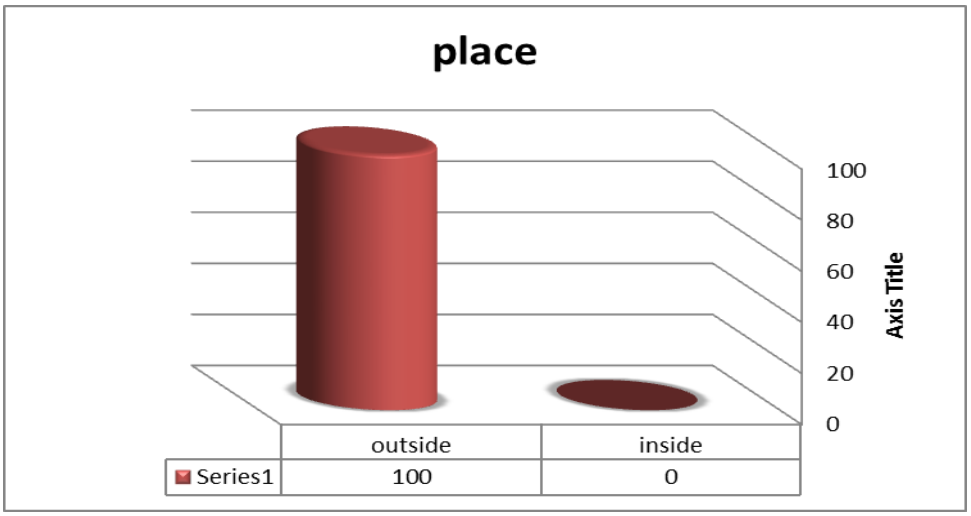

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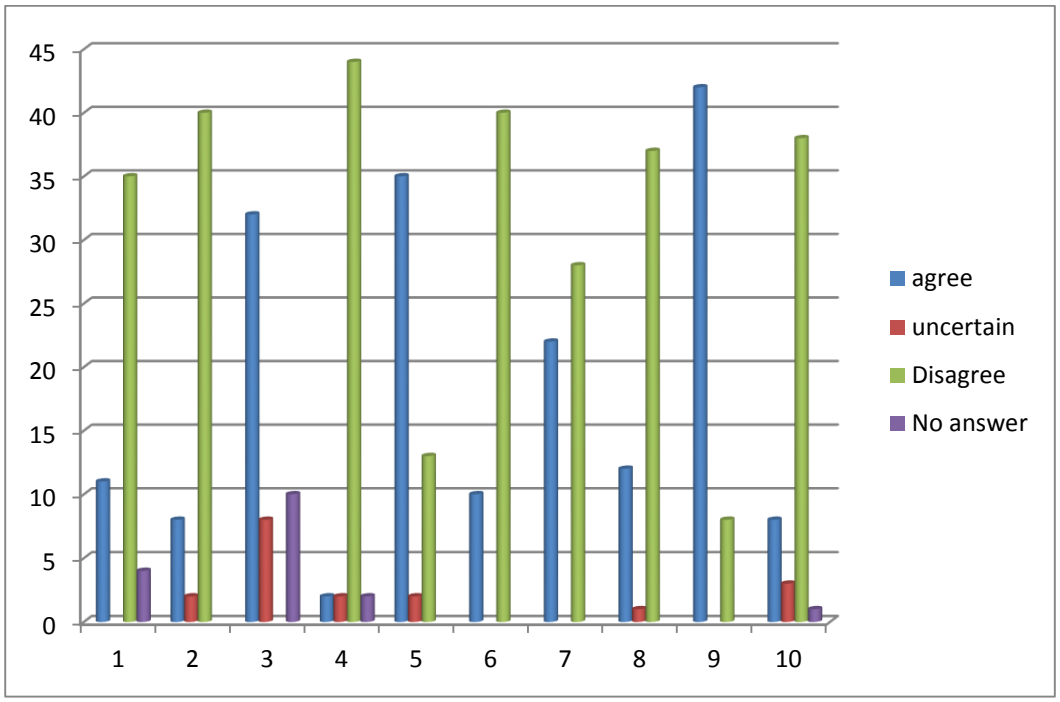

Attitude of workers towards hygiene in slaughter house in A ldamer locality(Appendex .