



بسم الله الرحمن الرحيم  
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## Assessment of Meat Safety Knowledge, Attitudes and Practices Among the Slaughterhouse Workers in ED Dueim City\_ White Nile State

تقدير المعرفة بسلامة اللحوم والسلوك والممارسات الصحية من بين عمال  
المسلخ في مدينة الدويم – ولاية النيل الأبيض

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(MVPM)

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## *Dedication*

*This work is dedicated to:*

*To*

*The spirit of my Father,*

*, My mother,*

*Brothers and sisters,*

*Wife,*

*Who gave*

*Continuous*

*Support and*

*Encouragement*

*To continue my studies.*

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## Abstract

This cross sectional study was carried out in December 2018 in White Nile state- ED dueim city. The objective of this study was to assess of the meat safety knowledge, attitudes and practices and awareness of slaughter house workers by assessing of their educational level and professionally training and experience and personal hygiene of slaughter personnel. Good slaughter hygiene practices are mandatory to minimize chances of microbiological contamination during meat processing.

Data were collected using structured questionnaire with questions on some important meat safety cues. The numbers of the respondents interviewed were 100 workers. The results showed that strong adherence between good education and training and good hygienic practices and attitudes. The percentage of none educated workers 31% its greater than workers percentages have tertiary (diploma, university), secondary and primary level. Overall the percentage of workers was attended professional training 52% it's larger than the percentage of none trained workers 48 %, but this don't reflex on their attitudes and practices. Beside that I found the most workers have experience over five years in the field.

Generally In topic of the monitoring worker health 70% of workers have valid health certificates. But that workers don't followed by routine medical checking, also 69% of respondents don't reported illness. The workers don't wearing gloves was 72% for example to not applying basic of good manufacturing practices.

## ملخص الدراسة

هذه دراسة مقطعية (مقطع زمانى ومكانى محدد) أجريت في ديسمبر 2018 فى ولاية النيل الأبيض فى مدينة الدويم، وذلك بهدف تقدير مدى الوعى و المعرفة بسلامة اللحوم والسلوك والممارسات الصحية لدى عمال المسلخ وذلك بمعرفة المستوى التعليمى لهم وخبرتهم العملية فى مجال الذبيح والسلوك الشخصى الصحى فى المسلخ. الممارسات الصحية تعتبر إلزامية لتقليل فرصة التلوث بالاحياء الدقيقة أثناء معالجة اللحوم .

البيانات جمعت بإستخدام إستبيان فيه أسئلة مهمة حول سلامة اللحوم. وقد كان عدد العمال الذين أجريت معهم المقابلات مائة عامل . عامة نتيجة الدراسة أظهرت وجود علاقة قوية حول أثر التعليم والخبرات والتدريب المهنى الجيد علي الممارسات والسلوك الصحى فى المسلخ . وكانت نسبة العمال الأميين تقدر بـ 31% وهى أكثر من نسبة العمال الذين لديهم شهادات عليا (دبلوم او جامعى) و ثانوية و ابتدائية . وبصورة عامه علي نطاق التدريب نسبة العمال الذين تدربوا تدريب مهني فى مجال المسالخ تقدر بـ 52% وهى أكثر من نسبة العمال الذين لم يتدربوا وهى 48% ، لكن هذه النسبة من التدريب لم تنعكس علي سلوكهم وممارساتهم فى المسلخ . وايضا أظهرت الدراسة أن معظم العمال لديهم خبرة فى الحقل أكثر من خمس سنوات .

فى موضوع متابعة صحة العمال وجدنا 70% من العمال لديهم شهادات صحية ولكن هؤلاء العمال لا يجرى لهم فحص صحي دوري ولذلك نجد أن 69% من العمال لا يأخذون تقارير صحية من مكان العمل . والعمال الذين لا يلبسون قفازات واقية تبلغ نسبتهم 72% وذلك مثال لعدم تطبيق الممارسات الصحية فى صناعة اللحوم .

## Introduction

Food safety is a significant public health concern in the world. Food borne diseases due to microbiological agents, including pathogens and biotoxins , and chemical contaminants in food represent serious threats to the health of thousands of millions of people (FAO and WHO, 2003). According to WHO, contaminated food contributed to 1.5 billion cases of diarrhea in children each year, resulting in more than 3 million premature deaths (DeWaal and Robert, 2005). The foods most frequently involved in disease outbreaks are those of animal origin especially beef, poultry, pork, milk, fish and eggs.

Strict maintenance of good practices of slaughterhouse hygiene in meat production is an important role for the prevention of microbial carcass contamination (Zweifel *et al.*, 2005).

Considering the food chain from farm to fork, food borne illness is caused by many factors. The most common reported contributing factors are insanitary food handling procedures and contamination of potentially hazardous foods with pathogens, foods from unsafe sources, leaving food at room temperatures for an extended period of time and insufficient time and/or temperature during initial cooking or reheating and contaminated equipment (Kassa *et al.*, 2010).

They must take significant steps to minimize the pathogen contamination to the minimum level in food (Medeiros *et al.*, 2004). The hands of food handlers can be vectors for the spread of food borne diseases because of poor personal hygiene or cross-contamination (Baş *et al.*, 2006). Food handlers should have excellent hygiene practice to ensure cross- contamination is reduced, thus protecting the consumers from food borne diseases (Abdul-Mutalib *et al.*, 2012). To ensure that food handlers in the slaughterhouse have the



awareness, knowledge and practice related to the correct way of handling food, training and education are essential parts of their job (Martins *et al.*, 2012). Food handlers participate in the final stage of the prevention of food borne diseases (Abdullah Sani and Siow, 2014).

Numerous studies indicated that training may increase knowledge but does not always result in behavior change (Powell *et al.*, 1997). Incentive factors and hindering factors should be considered for change practice. In contrast to food hygiene training, meat handler training represents one of the most effective strategies to maintain and mitigate food safety risks (Jianu and Goleț, 2014). Effective food safety training from authorities as well as adequate resources will strengthen food handling and abattoir safety practices.

Knowledge, Attitudes, Practices (KAP) assessment a representative study of a specific population to collect information on what is known, believed and acted on relation to a particular topic (WHO, 2008) by using questionnaires.

KAP studies can be conducted by quantify and measure an incident through the use of questionnaires and statistical processing of the information collected. KAP assessment can generate the level of knowledge and the awareness of personal workers in food production. Thus, the KAP information should be transferred to educational training programs in order to address the lack of knowledge and increase the awareness of personal incentive roles in slaughterhouse.

### **Objectives of the study:**

1. To assess awareness and the knowledge level, attitudes and practices related to meat safety among the slaughterhouse workers at Ed dueim slaughterhouse.
2. To show the affect of educational level and professionally experiences on hygiene practices in the slaughterhouse.

# Chapter one

## Literature Review

### 2.1 Food safety

Food safety is the assurance that food will not cause any harm to the consumers when taken in its current state and as it is (FAO/WHO, 2001). Food-borne diseases and zoonoses exerts a major toll on health as thousands of millions of people fall ill and many die as a result of unsafe food. Serious outbreaks of food-borne diseases and zoonoses have been documented on every continent illustrating both their public health and social significance. Due to this, WHO (2000) recognized food safety as an essential public health priority and later on adopted the WHO global food safety strategy (WHO, 2002). According to the WHO (2000) global food safety strategy, traditional food safety management systems have not been effective in preventing food-borne diseases and zoonoses over the last decades. The strategy therefore, advocates food safety programmers based on a broader science based concept of risk assessment, risk management.

Through process control long the entire production chains and risk communication. This is farm to table approach and involves consideration of every step in the chain, the community and all actors from raw material to consumption. The strategy also advocates sustainable agriculture production systems and redirection of some of the existing approaches to ensure they meet the challenges of global food safety (WHO, 2002).

## 2.2 Food borne diseases:

Contaminated food and water have been known to be sources of illness in human. Food borne diseases are still among the most widespread health problems in the contemporary world. In rich and poor countries alike, they pose substantial health burdens, ranging in severity from mild indisposition to fatal illnesses (Tracy, 2011). Every year food-borne outbreaks associated with consumption of contaminated foods cause millions of cases and thousands of deaths worldwide, making food-borne illness one of the most widespread public health problems in modern society (Cagri-Mehmetoglu, 2009). For example many communicable diseases, including emerging zoonoses, are transmitted through food, and many other diseases, including cancers are associated with chemicals and toxins in the food supply.

This existing burden will be compounded by the effects of climate change which is likely to increase the incidence of food-borne diseases because of the faster growth rate of microorganisms in food and water at higher temperatures, potentially resulting in higher levels of toxins or pathogens in food (WHO, 2010).

According to what Arie *et al.* (2010) microbes can enter the food chain at different steps are highly versatile and can adapt to the environment allowing survival growth and production of toxic compounds and therefore Cagri-Mehmetoglu (2009) recommended to decrease food-borne illness the implementation of safe food handling practices and protection from high-risk choices throughout the entire farm-to-fork continuum with the home food preparer being the last link in this chain and ensuring washing hands with soap and water before preparing food which decreases the risk of food-borne illnesses. The FDA recommends that hands be washed with

soap and warm water for at least 20 seconds before and after handling food, especially raw meat (Cagri-Mehmetoglu, 2009). Critical control points preventing food-borne illness include preventing cross- contamination from the raw products to ready-to eat, using adequate times and temperatures for cooking, avoiding recontamination after cooking by surfaces previously contaminated with the raw meat and properly chilling and storing meat after cooking (Iossaso *et al*,2012). Bruhn and Schutz(1998) failure to fully recognized the symptoms or sources of food-borne disease prevents consumers from taking corrective action, and when consumers mishandle food during preparation, the health community, food industry, regulators and the media are ultimately responsible.

Whether inappropriate temperature control, poor hygiene or another factor, the error occurs because consumers have not been informed about how to handle food the food safety message has not been delivered effectively (Bruhan, 1997).

Although acute gastrointestinal diseases are not all food-borne and food-borne diseases do not always result in acute gastroenteritis, food does represent an important vehicle for pathogens causing acute gastroenteritis (Tracy, 2011). The FAO estimated that as much as 70% of diarrheal diseases in developing countries are believed to be of food-borne origin also the World Health Organization (WHO) recognizes that food-borne diseases include a wide spectrum of illnesses which are a growing public health problem worldwide and are a major contributor to illness, compromised nutritional status, less resistance to disease and loss of productivity (Tracy, 2011).

### **2.3. Food hygiene and quality of meat:**

According to the World Health Organization WHO (2010) "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases. The term "food hygiene" is used to describe the preservation and preparation of foods in a manner that ensures the food is safe for human consumption, and to prevent – as far as possible – the contamination of food.

Personal hygiene of food handlers pertains to the hygiene practices that prevent contamination food with mixing chemicals, spreading from people, pets, and pests.

Personal hygiene is performed by an individual to care for one's bodily health and wellbeing, through cleanliness. Motivations for personal hygiene practice include reduction of personal illness, healing from personal illness, optimal health, social acceptance and prevention of spread of illness to others.

Other practices are generally considered proper hygiene include washing hands regularly and especially before handling food, washing scalp hair, wearing clean clothing, cutting finger nails. Moreover, it is an important factor to be aware of dangers of cross contamination between raw and cooked food by separating raw and cooked food. Temperature and length of time should appropriate for cooking. Food handlers store food at the proper temperature.

Meat is a medium vehicle for multiplication and colonization of microorganisms particularly bacteria and contamination are the major concern associated with prevention of food borne diseases. The high level of contamination is following at any stages of the food chain. In slaughtering process, mainly during scalding, dehairing, singeing, and evisceration, chilling, cutting

and slicing (Borch *et al.*, 1996; Berends *et al.*, 1998; Gill *et al.*, 2000; Kennedy *et al.*, 2014).

The five key principles of food hygiene, according to WHO(2010) Are:

1. To prevent contaminating food with pathogens spreading from people, pets, and pests.
2. To separate raw and cooked food to prevent contaminating the cooked food.
3. To cook food for the appropriate length of time and at the appropriate temperature to kill pathogens.
4. To store food at the proper temperature.
5. To use safe water and raw materials.

## **2.4. Best Employee Work Practices:**

Establishments must ensure that the facility is designed properly to provide sufficient sanitation stations, tools, gloves, equipment, etc., to allow the employees to properly conduct the

recommended procedures. It is important that the sanitizing process for all equipment (knife, steel, hook, etc.) is sufficient to effectively sanitize the equipment. If using hot water, then the establishment may need to leave the knife in the dip long enough to sanitize (**180°F** has been shown to take approximately

**4-6** seconds, but this varies based on the level of contamination). Other options include adding a chemical sanitizer. Remember it is important that the plant be able to demonstrate proper

sanitation (Kerri and Savell *et al.*, 2003). Also the hide removal personnel must follow procedures for hand washing, cleaning of arms and gloves based on the task being performed to prevent contamination. These practices will vary based upon

the task being done and should be monitored and evaluated on a routine basis (Kerri and Savell *et al*, 2003).

## **2.5. Knowledge, Attitudes and Practices (KAP):**

The relationship between knowledge, attitudes and practices is often explained through the (KAP). It has been traditionally assumed that knowledge is automatically translated into behavior (Glanz *et al.*, 2002).

A KAP survey is a quantitative type method by interviewing through the use a structured, standardized questionnaires and statistical method for collected information. It serves as an educational diagnosis of the community. A KAP survey is widely used to gather information through various types of cross-sectional surveys that planning public health programs.

The public health programs are implemented to improving the health of poor people across the world that depends upon adequate understanding of the socio-cultural and economic aspects of the context in countries (Launiala, 2009).

KAP study show that food handlers who have never trained in food safety related with poor knowledge of food borne illness. It is a significant positive correlation between the level of knowledge, attitudes and practices of meat handlers. Food handlers should practice all the skill and ongoing training to get more knowledge in hygiene and food safety (Powell *et al.*, 1997).

Knowledge accumulates through learning processes and these may be formal or informal instruction, personal experience and experiential sharing (Tracy, 2011). Knowledge however is not insignificant and it is found to be vital in the cognitive processing of information in the attitude-behavior relationship.

Attitudes involves evaluated concepts associated with the People think, feel and behave, it comprises a cognitive, emotional and behavioral component ( Keller, J. 2007 ).

In health related studies, however, it has been found that knowledge is not the only factor that influences treatment seeking practice and in order to change behavior, health programs need to address a number of issues including socio-cultural, environmental, economical and structural factors (Tracy 2011).

Behaviorists further add that a number of factors can influence one or more of the KAP variables such as self-esteem, self-efficacy and misconception.

World Health Organization (2010) introduced simpler, more generally applicable and essential food safety messages or principles linked to behaviors. If adopted and practiced, these messages will reduce the probability of food borne illness. The core messages of the five keys to safer food are (1) keep clean ;( 2) Separate raw and cooked;(3)cook thoroughly;(4) keep food at safe temperatures; and (5)Use safe water and raw materials.

On the other hands Byr *et al*,(2007)developed a food safety knowledge into five concepts or keys inspired by WHO(2010), which are cross contamination prevention/disinfection procedures; safe times/temperatures for cooking/storing foods ; groups at greatest risk for food borne disease ;food that



increase risk of food borne disease ; and food borne disease pathogens.

Across sectional study by Maryam *et al.*, (2010) from school of veterinary medicine, Shiraz University, Iran the evaluated the knowledge, attitudes and practices of workers in meat processing plant. The results indicated that there was an acceptable level of knowledge, excellent attitudes and poor practices towards food hygiene measures. The study also showed lack of knowledge about microbial food hazards and negative correlation between knowledge and practices, attitudes and practices.

Study done by Siow and Norrakiah (2011) in Malaysia to evaluate the level knowledge, attitudes and practices among food handlers. The study revealed that the respondents share a good knowledge on personal hygiene and definition of food-borne diseases (93.85%) and poor knowledge on food storage and preparation temperature (28%) and they showed good attitudes in food handling.

Studies have found that food safety training is positively associated with self-reported changes in food safety practices (Clayton *et al.*, 2002). Other studies found that training helps to improve the overall employee knowledge about food safety Castello *et al.*, 1997.

Another study by Sufen Liu *et al.*, (2015) from china evaluated the knowledge, attitudes and practices of food safety among risk factors contributing to food-borne disease out breaks. The majority of respondents did not know the maximum stored time at room temperature, they have positive attitudes about food safety and training, and there was significant variance among different food establishments, different ages and different times of training.

A recent study by Ola (2014) in Khartoum state showed that television and radio are the most important sources of information for the consumers and there was a direct relationship between the internet and the level of consumer's knowledge, also the degree of knowledge of each individual has strong link with his life style.

Other studies by Khalid (2016) in Khartoum state found that there was a need for more education to the consumers about food safety and food-borne diseases.

## **2.6. Knowledge, Attitudes and Practices (KAP) on food Safety and Food-borne Diseases**

A study to evaluate knowledge, attitudes, and behavior concerning food-borne diseases and food safety issues amongst formal food handlers conducted in Italy found that the majority of food handlers who had attended a training course had knowledge and apposite attitude toward food-borne diseases control and preventive measures (Tracy 2011). The positive attitude was not supported when asked about self-reported behaviors and when observed during food preparation for practice of hygienic principles (Tracy, 2011).

On other hand Abdalla *et al.*, (2009) considering food handling personal play important role in ensuring food safety throughout the chain of food production and storage, although there are also many gaps in food safety knowledge and practices that may result in food-borne diseases according to (Eduarda *et al.*,2007).

Food safety experts have identified the most common food-handling mistakes made by consumers at home. These mistakes include serving contaminated raw food, cooking or

heating food inadequately, allowing 12 hours or more between preparations and eating, and having a colonized person handle implicated food or practice poor hygiene. The same factors were identified in mishandling associated with specific pathogens. (Bruhan 1997)so the authors suggested that emphasis should continue on improving knowledge and control of foodborne diseases amongst food handlers (Angelillo *et al.*, 2000), these included the perception that unsafe food is a personal health threat, the perception that one could do something about the threat (self-efficacy),and the motivation to maintain good health (Robert *et al.*, 1993) so recent survey studies pinpointing the need for training and education of food handlers in public hygiene measures and revealed a general lack of knowledge of microbiologic food hazard, refrigerator temperature ranges, cross contamination and personal hygiene (Bas *et al.*, 2006).

## **2.7. Impact of education of food industry personnel in hygiene Matters:**

Educational materials may not be effective if they are designed without looking at the worksite social, physical, and environmental factor surrounding the target audience. Food safety education is most likely to be effective when it is designed specifically for the audience (workers) and the particular hazard of interest (Nieto- Montenegro *et al.*, 2005) so requires a re-examination of food safety educational messages to conform epidemiological changing of food borne illnesses and the increase in knowledge concerning emerging food borne pathogens to ensure that the guidance given to consumers is appropriate for controlling pathogens that are prevalent in the food supply chain (Jevsnik *et al.*, 2008).

Also research is needed to establish reliable and valid evaluation measures for five behavioral constructs which are practice personal hygiene, cook foods adequately, avoid cross-contamination, keep foods at safe temperatures, and avoid food from unsafe sources. If evaluation instruments focus on these five behavior areas, the result will be more easily summarized across food safety education programs for consumers (Lydia *et al.*, 2001) because at the end of the day the best ways to manage risk of food-borne illness to promote safer handling of food at the consumer end of the food chain are communication and consumer education (Patil *et al.*, 2005). Education of food industry personnel in hygiene matters is recommended for improving safer food handling practices (Tracy, 2011).

Media presentation can motivate people to listen and change behavior because consumers need to understand how to protect themselves through kitchen and personal hygiene, including thoroughness and frequency of hand washing, temperature control, and safe food choices such as foods processed by heat or energy pasteurization (Bruhan, 1997). Educational material regarding Good Housekeeping Practice should be available to the general public from many sources. Only safety-conscious consumers can become active partners within the food safety circle (Jevsnik *et al.*, 2008).

## **Chapter two**

### **Materials and Methods**

#### **3.1. Study area and target population:**

Ed Dueim city it is big city in the White Nile is one of the 18 states of Sudan. The city lies between longitudes 32° 19' east and Latitude 14° 0' north, and it's about 129 km from the Khartoum (google map).

The target population of this study was the workers at Ed- dueim abattoir, the workers population consists of veterinarians and all the staff of workers in different stages of processing meat.

#### **3.2. Study design:**

Cross sectional study was conducted in December 2018, in Ed dueim abattoir by using a questionnaire based on interview and designed to obtain the demographic characteristic of respondents and educational level beside professional experiences and training and the affect that on their practices and attitudes in the work. Good practices and attitudes its strong indicator for awareness of personnel.

Face –to-face questionnaire was used to collect information about knowledge, attitudes and practices of the target population regarding food safety.

Questionnaired people were composed of 100 workers selected randomly who directly involved in slaughtering process in the abattoir.

In the knowledge part, there were close-ended questions emphasizing personal hygiene, cross contamination, microbiological food hazards and specific food-borne disease. Subsequent part of the questionnaire was dealing with the attitudes of the respondents about various hygienic measures

for food safety. The handlers were asked to indicate their level of agreement to the statements. Practices of food workers were assessed by their self-reported hygienic behaviors in the last part of the questionnaire.

### **3.3. Data analysis:**

#### **Statistical Methods:**

The use of comparative analytical method using the SPSS statistical program based on descriptive statistics and comparative and association hypothesis tests (0.05 sig. level), to demonstrate the differences in food safety knowledge, attitude, and practice among worker in slaughterhouses.

The test was used for Chi-square test to study the hypothesis which states there are no significant differences in (food safety knowledge, attitude, and practice) among worker in slaughterhouses with respect to their gender, age, education level nor occupation.

## Chapter three

### Results

**Table 1.** Socio-demographic characteristics of slaughter personnel interviewed in the Eldueim abattoir.

Characteristic/Category	Proportion of abattoirs respondents (%)
<b>Age group</b>	
21-30yrs	16
31-40yrs	41
41-50yrs	17
>50yrs	26
<b>Marital status</b>	
Single	21
Married	79

The results of the social-demographic information about slaughter personnel interviewed from the Ed dueim abattoir has showed in Table 1 most of workers (41%) their age between 31-40 years old. While 26% of respondents were over 50 years old ( $p < 0.05$ ). The percentage of married worker is 79% it was greater than single peoples 21%.

**Table 2.**The educational level and Training of slaughter personnel on meat safety and their professional experiences in Eldeium slaughterhouse .

<b>Characteristic/Category</b>	<b>Proportion of abattoirs respondents (%)</b>
<b>Educational Level</b>	
None	31
Primary	26
Secondary	18
Tertiary	25
<b>Professional training</b>	
Yes	52
No	48
<b>Professional experience</b>	
<2 yrs	20
2-5 yrs	36
>5 yrs	44

### **Knowledge:**

Most of workers was none educated (31%) and it was greater than tertiary, secondary and primary (25%, 18% and 26% respectively)  $p < 0.05$ . That indicated for decreased their awareness about food safety knowledge. Overall the percentage of workers was attended professional training was (52%) it's bigger than a percent of none trained workers 48 % ( $p < 0.05$ ) .The greater proportion of workers experiences category 44% refer to (over 5 years).



**Table 3.** Practices for monitoring the health status of workers in

<b>Characteristic/Category</b>	<b>Proportion of abattoirs respondents (%)</b>
<b>Valid Health Certificate</b>	
Yes	70
No	30
<b>Report illness</b>	
Yes	31
No	69
<b>Action/Treatment</b>	
Self-medication	10
Clinic/Hospital	90

Eldeium slaughterhouse.

### **Practices:**

Table 3 showed that a greater percent of respondents had valid health certificates (70%), while (30%) of workers haven't certificates. Beside that a bigger numbers of respondents don't reported illness (69%) whereas the majority of them (90%) received treatment for their illness in clinics or hospitals. This study showed that there is no any type of monitoring of workers health except health certificates and the follow system by checking examination was not applied in the slaughterhouse.

**Table 4.** Cross-tabulation of educational level against respondents' general personal hygiene and handling practices regarding meat safety in Eldeuim slaughterhouse.

Characteristic/attitude	Respondents in Educational level category (%)				Total proportion (%)	p-value
	Tertiary	Secondary	Primary	None		
<b>Reporting illness</b>						
Yes	32	11.1	50	25.8	31	0.044
No	68	88.9	50	74.2	69	
<b>Washing of work clothes</b>						
Daily	56	22.2	42.3	32.3	39	0.052
After two days	16	16.7	34.6	16.1	21	
More than two days	28	61.1	23.1	51.6	40	
<b>Wearing gloves</b>						
Yes	32	0	50	22.6	28	0.003
No	68	100	50	77.4	72	

### Attitudes:

In reporting illness attitude that table 4 showed the all category of educational level was high percentage of unreported illness workers (69%). While was (31%) of workers are reporting illness. This theory was clearly happened in none educated and secondary level workers (74.2%, 88.9%) respectively ( $p < 0.05$ ). Educated worker in tertiary (32%) have more awareness to reported illness more than no educated workers (25.8%) ( $p < 0.05$ ).

All workers washed their clothes without any type of disinfectant (water and soap). Most of them washed after more than two days (40%), and some of them after 2 days (21%), and part of workers washed daily (39%). Educational level was significantly different from washing clothes and wearing gloves attitude.

**Table 5.** Cross-tabulation of professional training of respondents against respondents' general personal hygiene and handling practices regarding meat safety.

Characteristic/attitude	Respondents Professionally trained (%)		p-value	OR	Total (%)
	Yes	No			
<b>Reporting illness</b>					
Yes	42.3	18.8	0.011	3.178	31
No	57.7	81.2			
<b>Washing of work clothes</b>					
Daily	51.9	25	0.008		39
After two days	11.5	31.2			
More than two days	36.5	43.8			
<b>Wearing gloves</b>					
Yes	38.5	16.6	0.015	3.125	28
No	61.5	83.3			

The table 5 showed the respondents attended professionally training and reported illness was 42.3% and the respondents un attended training and no reported illness was 81.2% ( $p < 0.05$ ). also workers wearied gloves and attended training was 38.5%. While workers no trained and un wearied gloves was 83.3%.attending professional training was significantly different from Reporting illness, Washing of work clothes and Wearing gloves attitude.

The respondents attending professional training were more wiliness to report illness and wearing gloves (3.1 times) more than no attending professional training. Generally result showed strong adherence between good education and training and good hygienic practices and attitudes, this study show poor and unsatisfactory awareness and KAP levels.

## Chapter four

### Discussion

Personal hygiene practices investigated in this study included wearing of protective clothing, cleaning and disinfection of working clothes. These practices are considered as mandatory preventative measures which have to be implemented during the slaughter process to reduce chances of cross contamination (Nel *et al.*, 2004, Wambui, *et al.*, 2017).

But this study showed that all workers washed their clothes without any type of disinfectant (water and soap) at more than two days (40%). In reporting illness attitude table 4 showed that the all category of educational level was high proportion to unreported illness (69%). All category showed high percent to unwearied gloves specially in none educated and secondary (77.4% ) that was disagreed with the study showed Procedures should be available to ensure that all maintenance employees, equipment, tools, etc. are cleaned and sanitized or used in designated areas to control contamination. These procedures should address proper dress (frocks, boots, and gloves) (Kerri and Savell, 2003).

In table 1 the research don't study the age and marital status that was just for showing . it's doesn't like the other studies according to considerable depot of empirical studies, demographic characteristics of consumers, especially like gender, age and levels of education and income, influence the consumer attitudes towards food safety (Robert *et al.*, 1993, Julie, 1995, Wilcock *et al.*, 2004 ).

The results table 5 was agreed with study showed food hygiene training, meat handler training represents one of the most effective strategies to maintain and mitigate food safety risks (Jianu and Gole, 2014).

The study showed there was no specific place to wash hands in the slaughterhouse, and major of the workers washed their hands in their houses and washed hands with water without soap in the abattoir. Reports indicated that simple act of washing hands with soap and water reduces the incidence of diarrhea caused by shigella and other causes by up to (35%) WHO (1999).

In this study monitoring the health status of slaughtered persons (Table 3) was recorded and this important to do for pre-employment health assessment for food handlers and inclusion of routine salmonella screening session at least every year (Harker, 2001, Haileselassie *et al.*, 2013 , Abd-Elaleem *et al.*, 2014).

An increase in meat safety knowledge can be seen increasing along the educational levels and also as the professional years of experience increases. This result in agreement with previous studies showed high level of knowledge that associated with workers who had better education (Jianu *et al.*, 2014, Talaeia *et al.*, 2015, Ababio, *et al.*, 2016).

## **Conclusion**

This study showed poor and unsatisfactory awareness of KAP levels among the slaughterhouse workers, also underlines the link between educational level and professional training on level of knowledge and personal hygiene practices regarding meat safety.

## **Recommendations**

- Therefore, proper training, monitoring and educating slaughter personnel will help to assure that the workers are provided with good quality wholesome meat all the times.
- Routine inspections by responsible authorities are also advisable to assess compliance with the standards and requirements according to the rules and regulations for safer meat processing in abattoirs.
- Based on the outcome of this study, public education and enlightenment regarding the risk associated with noncompliance with abattoir laws, particularly to the abattoir workers, should be routinely practiced through mass media.
- Similarly, future educational programs in the mode of the spread of pathogens, zoonotic diseases, and personnel to carry out meat inspection should be properly taken into account for an effective compliance with abattoir laws.
- However, a proper motivation of the workers toward maintaining a positive attitude and good practice regarding compliance with abattoir laws as well as enforcing all the existing laws governing the abattoir operation in the country should be encouraged.

- It is also recommended that future research should focus on the determination of KAP and the level of compliance with abattoir laws in both licensed and unlicensed slaughterhouses across the State.

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# Appendix

## Assessment of meat safety knowledge, attitudes and practices among slaughter house workers in ED dueim\_ White Nile (questionnaire)

---

Date.....

Slaughter house type .....

1-Name of person surveyed (optional)

.....

2-Types of workers?

.....

3-In which age group:

- 20-30
- 31-40
- 41-50
- >50

4-Marital status:

- Single
- Married
- Divorced

5- Educational level:

- None
- Primary
- Secondary
- Tertiary

6-Whats your tribe name?

.....

**7-Your professional experiences:**

- <2 yrs
- 2-5 yrs
- >5 yrs

**8-Do you have a professional training?**

- Yes
- No

**9-Numbers of training session received:**

- None
- <2
- 2-5
- >5

**10-Last training session:**

- None
- <2 yrs ago
- 2-5 yrs ago
- >5 yrs ago

**11- Do you have a valid health certificates?**

- Yes
- No

**12-Checking by medical examination:**

- None
- Every month
- Every 6 month
- Annually

**13-Do you reported illness?**

- Yes
- No
- Sometimes

**14- Action and treatment**

- Self medication
- Traditional healers
- Pharmacy
- Clinic /hospital

**15-How many times you are disinfecting your work clothes?**

- Daily
- After 2 days
- After 3 days

**16- How many times you are disinfecting of contact surfaces?**

- Always
- Sometimes

**17-Frequency of wearing gloves:**

- Always
- Sometimes
- Never

**18- How many times you are disinfecting your equipments?**

- Always
- Sometimes
- Never

**19-Routine inspection by responsible authorities:**

- Always
- Sometimes
- Never

**20-How you are washing your hands?**

.....

**21-Are you drying your hands?**

- Yes
- No

**22-If yes what are you using?**