

**FOOD SAFETY KNOWLEDGE, ATTITUDE AND  
PRACTICES OF SMALL-SCALE BROILER CHICKEN  
FARMERS IN LUSAKA PROVINCE -A CROSS-SECTIONAL  
STUDY**

**BY**

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**A Mini-Dissertation submitted to the Department of Disease Control, School of  
Veterinary Medicine, in partial fulfilment of the requirements for the award of the  
degree in Master of Science in One Health Food Safety.**

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## DECLARATION

I, M'sampa Mvula, hereby declare that the mini dissertation being submitted herein to the University of Zambia is my original work and has not been previously submitted to any university for the award of a degree or other qualification.

.....

Signature

.....

Date

## **CERTIFICATE OF APPROVAL**

The University of Zambia, School of Veterinary Medicine approves this Dissertation submitted by **M'sampa Mvula** in partial fulfilment of the requirements for the award of the degree of Master of Science in One Health Food Safety.

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## ABSTRACT

The poultry industry in Zambia is a critical sector for the national economy. Over the last two decades, the country has experienced rapid growth in poultry production with a large share being contributed by small-scale urban producers. Among the major concerns that are related to this development are health issues threatening the consumers of the broiler meat, issues such as *Campylobacter spp*, *Salmonella spp* and *E. coli spp* related food poisoning as a result of poor hygiene during the processing of broiler meat. This study's objectives were to assess small-scale broiler farmers' level of food safety knowledge, determine their attitude towards food safety and establish the practices concerning good hygiene during the processing and handling of the broiler carcasses.

The study was a cross-sectional study comprising of 146 small-scale broiler farmers in Lusaka Province. Data concerning their food safety knowledge, attitude and practices (KAP) as well as their demographic characteristics such as age, gender, level of education and length of doing business in broiler production were collected using a semi-structured questionnaire. Respondents who scored  $\geq 60\%$  of the maximum possible score were categorized as having good knowledge, a positive attitude and good practices.

The respondents generally had good food safety knowledge (66.4%), positive attitudes toward food safety (97.9%), and good practices (78.8%) with mean scores of 23 out of 36 ( $\pm 9$ ), 11 out of 12 ( $\pm 1.2$ ), 16 out of 22 ( $\pm 3$ ) respectively. Further, the Pearson chi square test of association revealed that the knowledge levels were significantly associated with age, education, gender and length of doing business ( $p < 0.05$ ). Food safety practices were significantly associated with gender and length of doing business ( $p < 0.05$ ). Following a binary logistics regression, predictors of good knowledge were: respondents between 36-45 years old (OR=7.34, 95% CI: 1.40-38.42), respondents above 40 years old (OR=8.44, 95% CI: 1.39-51.20), Secondary school education (OR=0.10, 95% CI: 0.03-0.33), Tertiary education (OR=0.16, 95% CI: 0.06-0.417), 5-10 years in broiler chicken production business (OR=0.32, 95% CI: 0.10-0.96) and being female (OR=0.26, 95% CI: 0.10-0.65). The predictors of good practices were: Secondary school education (OR=0.21, 95% CI: 0.07-0.66)

Study findings suggest the need for food safety education on safe poultry meat handling and hygiene among small-scale broiler farmers. This will ensure that the poultry meat produced from these farms is safe for consumption.

## **DEDICATION**

I would like to dedicate this dissertation to my dear husband Mathews Mbewe for his unwavering support through this work and my three children Khondwani, Mbawemi and Khuwala Mbewe for their patience as I undertook this journey and finally to God for His mercy.

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## **LIST OF ABBREVIATIONS AND ACRONYMS**

CAC	Codex Alimentarius Commission
CI	Confidence Interval
DALY	Disability-Adjusted Life Years
DVO	District Veterinary Officer
FAO	Food and Agriculture Organisation
KAP	Knowledge Attitude and Practice
VA	Veterinary Assistant
WHO	World Health Organisation

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background

According to the Codex Alimentarius Commission (CAC), Food safety is the assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use and the World Health Organization (WHO), states that an estimated 600 million—almost one in ten people in the world, fall ill after eating contaminated food and 420 000 die every year, resulting in the loss of 33 million healthy life years (WHO,2017). Children under five years of age carry 40% of the foodborne disease burden with 125,000 deaths every year (WHO, 2017). Historically, documented human tragedies and economic disasters due to consuming contaminated food occurred as a result of intentional or unintentional personal conduct and governmental failure to safeguard food quality and safety. An example of an economic disaster is the 2002 case in which Thailand was banned from exporting poultry to the European Union due to residues of Nitrofurans found in poultry meat. Exports decreased significantly causing economic losses (Phongvivat, 2004). Challenges and tragedies in food safety include chemical, biological, personal and, environmentally related incidences. There is well- documented history of incidents of food products being contaminated with industrial pollutants. These incidents have been experienced in Japan, Iraq, the United States of America, and other nations where people fell ill and died.

While earlier incidents were mainly chemical contaminants, more recent outbreaks have been due to microbial agents. The Disability-Adjusted Life Years (DALYs) attributed to these agents are most devastating to children younger than five years of age, the elderly, and the sick (Fang, Wang, and Menon,2018). There have been several studies that have documented the prevalence of Salmonellosis in dressed chickens and it has been found that the proportion of chickens infected with *Salmonella spp* was 4.2% in the greater Washington D.C, USA area (Zhao *et al.*,2001), and in Nepal, it was found to be 14.5% (Padungtod and Kaneene,2006),in both cases, the prevalence was in dressed chickens. In 2010, the WHO estimated that non-typhoidal salmonellosis caused three disability-adjusted life years (DALYs) per 100,000 Population (95% uncertainty interval (UI): 2–5) in the WHO European Region (WHO, 2015).

Poultry meat is considered to be the main foodborne source of human Campylobacteriosis. Campylobacteriosis is often associated with the consumption of undercooked meat, or a result of handling raw poultry meat (Perez-Arnendo and Gonzalez-Fandos, 2019). It was estimated that in 2010, *Campylobacter* spp. caused the highest number of laboratory-confirmed food-borne bacterial infections worldwide (96 million, 95% UI: 51–177) and food-borne Campylobacteriosis was estimated to cause nine (9) DALYs per 100,000 Population (95% UI: 6–13) in the WHO European Region (WHO,2015).

In a study done at the University of Zambia Teaching Hospital (Chiyangi *et al.*,2017), paediatric ward, stool samples collected from children 0-59months of age who presented with diarrhoea it was found that out of the 271 samples analysed, the second most commonly detected pathogen was *Salmonella* spp at 25.5%. The least was *Campylobacter* spp at 3.5%. The majority of the isolated bacteria which included *Salmonella* spp and *Campylobacter* spp were multidrug-resistant.

In developing countries, the need to produce sufficient food to meet the requirements of the population increase, accompanied by bad economic situations, often overshadow the need to ensure safe food products. Regardless of this fact, safe food is a fundamental requirement for all consumers, rich or poor.

Modern-day food safety regulations were developed on sound scientific principles to protect consumers from incidents of foodborne illnesses and death. Food represents one of the largest globally traded commodities and can pose a major safety risk if not controlled. With globalization, the supply chain must be carefully monitored to ensure imports meet food safety regulations and are free from tampering. Governments around the world are acting swiftly to update and modernize their legislation. Adopting industry-leading best practices, food safety regulations are increasingly outcome-based and transparent. Each government has a different interpretation of what constitutes a risk for its citizens.

The poultry industry in Zambia is a critical sector for the national economy which constitutes 4.8% of the agricultural gross domestic product and 48% of the livestock sector (Bukasa,2019). The industry anchors on the small and medium enterprises that operate 60% of poultry production farms (Bronkhorst and Chongo, 2015).

Over the last two decades, Zambia has experienced rapid growth in poultry production and a large share of broiler meat production has been contributed by small-scale urban producers. (Musaba and Mseteka, 2014).

Currently, the food legislation in Zambia that directly deals with food safety is the new Food Safety Act of 2019. The food safety Act is timely and appropriate considering issues of food safety are becoming important worldwide.

The Zambian small-scale broiler farmers produce poultry meat from farm to fork and hence are responsible for all stages of the production chain. With this in mind, it is imperative to ensure that the meat produced is free from biological, chemical, and physical hazards.

The proposed study aims to determine if small-scale broiler farmers have knowledge of food safety, their attitudes and practices towards food safety.

## **1.2 Statement of the problem**

Consumers demand safe food that is free from harm. Chicken is currently the most highly consumed meat in Zambia, totalling an estimation of 50% of the total meat consumption in the country (Ministry of Fisheries and Livestock, 2006), this could be because it is affordable to the majority. The high consumption rate of poultry meat causes the potential for Salmonellosis, Campylobacteriosis and *Escherichia coli* (*E. coli*) related foodborne disease outbreaks. A study conducted on commercial broiler carcasses revealed a 2% contamination with *Salmonella spp* which was found to be resistant to gentamycin and tetracycline following an antimicrobial susceptibility test (Shamaila *et al.*, 2018). This may lead to resistance to key antibiotics and may lead to prolonged stay of the infected people in the hospital, an increased burden on the national health service, reduced man-hours, and eventually economic losses. The world bank stated that total productivity loss associated with foodborne illnesses in low and middle-income countries is estimated to be US\$95.2 billion per year and the annual cost of treating these illnesses is estimated to be US\$ 15 billion (The World Bank, 2018).

Broiler chickens can be colonized by *Campylobacter spp* and *Salmonella spp* both of which cause deadly foodborne diseases in humans. The transmission of these deadly pathogens is a result of poor handling of poultry meat due to a lack of knowledge of hygiene practices during processing. The reduction of raw chicken contamination levels at different processing stages can have a significant impact on the reduction of the incidences of these foodborne illnesses (Keener *et al.*, 2004).

There is an increase in small-scale broiler production in Zambia as a whole and this could be because the business requires minimum capital, no special expertise and it is a profitable venture. Among the major concerns that are related to this development are health issues threatening the consumers of the broiler meat, issues such as *Campylobacter spp*, *Salmonella*

*spp.*, and *E. coli spp* related food poisoning and resistance problems as a result of poor hygiene during the processing and the imprudent use of antibiotics respectively.

Broiler chickens are kept in basic structures usually in the backyard and sometimes in the home and the producers are mostly pressed for space and hence tend to overcrowd the birds. The overcrowding provides a conducive environment for microbes to spread among the chickens and thrive.

There are no monitoring and surveillance programs that are deliberately set to check on what the small-scale broiler farmers are doing during the production process and hence consumers may not be entirely confident in the safety of the final product. Without these programs, we do not know for sure if poultry production is done safely to ensure a final product that is free from biological, physical, and chemical hazards.

In Zambia, the Ministry of Health reporting system does not specify the source and specific cause of diarrheal illnesses; the information available in the records has limited precision on the burden of illnesses by specific bacterial contaminants (LDHMT, 2013). This affects the planning and allocation of resources for the prevention and control of foodborne related diseases.

With the improvement in the Zambian food legislation through the new Food Safety Act of 2019, information on the knowledge, attitudes, and practices towards food safety among these small-scale broiler chicken farmers need to be gathered to have a clear understanding of whether they understand the concept of food safety.

### **1.3 Purpose of the study**

The purpose of this study was to describe food safety knowledge, practices and attitudes of small-scale broiler farmers in Lusaka Province with an emphasis on hygienic practices during broiler chicken processing.

### **1.4 Research questions**

1. Do small-scale broiler chicken farmers have good or poor food safety knowledge?
2. What are the attitudes of small-scale broiler chicken farmers toward food safety?
3. What are the practices of small-scale broiler chicken farmers during the handling and processing of broiler meat?

## **1.5 General Objectives**

The general objective of this study is to assess the level of food safety knowledge, food safety attitudes and practices of small-scale broiler chicken farmers in Lusaka Province.

## **1.6 Specific objectives**

1. To assess the level of knowledge in food safety with regard to good hygiene practices during the processing and handling of broiler carcasses.
2. To determine the attitude towards food safety.
3. To establish practices during the processing and handling of broiler carcasses.

## **1.7 Significance of Study**

Safe food is a human right. Producers of food, therefore, must ensure the food they produce is safe and free from any hazards. Foodborne diseases have a significant negative impact on public health and this has ripple effects on the economy. Following an extensive literature review, no study on food safety Knowledge, attitude, and practices (KAP) among small-scale broiler farmers in Lusaka Province was found. It is against this background that this study is to be carried out. The study will be conducted to bring out information on the level of food safety KAP of small-scale broiler farmers in Lusaka Province, thus adding to the existing body of knowledge on food safety KAP and trying to provide baseline information for future studies that may want to link levels of knowledge and bacterial contamination levels of broiler carcasses from small-scale broiler farmers. It will also be an opportunity to identify any training needs for these farmers.

## **1.8 Scope of Study**

The study was conducted in Lusaka Province in selected districts namely; Kafue, Chongwe, and Lusaka. This study targeted small-scale broiler farmers rearing chickens for sale as dressed chickens.

## **1.9 Operational definitions**

- I. **Knowledge** - Familiarity gained by experience.
- II. **Attitude**- One's settled mode of thinking about food safety as indicated by their opinion.
- III. **Practice**—Actual application or use of an idea, belief, or method, as opposed to theories relating to it.
- IV. **Food safety**-The assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

- V. **Broiler Processing-** An operation that includes slaughtering, scalding, de-feathering, eviscerating, washing, chilling and packaging.
- VI. **Small-scale broiler farmer-** A broiler farmer keeping 5000 or fewer broilers per cycle.
- VII. **Hygiene-** Conditions and practices that help maintain health and prevent the spread of disease.
- VIII. **Contamination-**The presence in the food of harmful chemicals and microorganisms which can cause the consumer illness.
- IX. **Food-borne illness-** A disease transmitted through the consumption of contaminated food.
- X. **Portable water-** Water that is suitable for human consumption, thus contains no toxins, pathogenic microorganisms or other health hazards.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Overview

Small-scale broiler production is significant in many developing countries including Zambia. It contributes to food security and is a source of daily nutrition. However, with this background comes a number of food safety issues regarding production of the poultry meat and how knowledgeable the producers are of food safety.

Good knowledge is critical in broiler production as it will influence attitudes and practices during the production process. In similar studies respondents generally had poor food safety knowledge (Ovai *et al.*,2019) . Concerning factors associated with these findings included level of education, work experience and training. Specifically, meat handlers who had higher education and received some form of training reported greater likelihood of having high levels of food safety knowledge (Al banna *et al.*,2021). Some of the respondents only recognised extraneous matter and toxic chemicals in food as possible causes of foodborne illnesses. This makes it probable that they may disregard the need to take necessary measures to limit the occurrence of hazards during meat production (Ovai *et al.*,2019). However other studies reviewed that respondents had good food safety knowledge levels. Despite this outcome, several gaps such as knowledge of exact causes of foodborne illnesses were noted along with lack of understanding of the importance of the health status of the workers which reflects a poor knowledge of the fact that humans are a potential source of some pathogens(Abunna *et al.*,2022)The lack of knowledge contributes to poor practices such as lack of personal hygiene which may lead to contamination of carcasses and cause life threatening diseases such as Campylobacteriosis and Salmonellosis. Such lapses will need to be identified and prevented by means of training of the small scale broiler farmers.

The European Food Safety Authority attributes cross-contamination as one of the causes of the 9,000,000 cases of Campylobacteriosis each year in Europe of which 20-30% of these cases are associated with broiler meat (European Food Safety Authority,2017).

Food safety is a global public good and ensures food security and life-sustaining nutrition. Foodborne illnesses lead to a significant economic burden on society. The ill often incur medical costs and are temporarily unable to work thus resulting in a loss of productivity. Unsafe

food has a negative economic impact on producers as well, these include loss of farm and company sales, loss of consumer confidence, and reduced access to local and global markets (Ohio State University,2020). Broiler meat consumption is known as one of the main sources of foodborne infections in humans (Fitzgerald *et al.*, 2001).

Over the last two decades, Zambia has experienced rapid growth in poultry production and a large share of broiler meat production has been contributed by small-scale urban producers (Musaba and Mseteka, 2017).

## **2.2 Food safety and foodborne illnesses**

Food can become contaminated at any point during its production and distribution. It is the primary responsibility of the producers to ensure its safe for consumption. However, not all food handlers and consumers understand the roles they must play to ensure food safety. These roles include adopting basic hygienic practices when preparing, buying, and selling food (WHO,2020).

Globally, poultry meat has been identified as an important vehicle for the transmission of disease-causing organisms to humans (FAO, 2019). According to the European Food Safety Authority, it was estimated that of the 9 million individuals with Campylobacteriosis each year in Europe,20-30% of the cases were associated with broiler meat. This strong association has been attributed to poor handling during processing operations, cross-contamination, and inadequate cooking (European Food Safety Authority,2017). Foodborne illnesses are usually infectious or toxic and are caused by bacteria, viruses, parasites, or chemical substances entering the body through contaminated food or water. Bacteria, namely; *Salmonella*, *Campylobacter*, and *Enterohaemorrhagic Escherichia coli* are among the most common foodborne pathogens that affect millions of people worldwide (WHO, 2020). In their study, Elwaraqi *et al.*, (2019) isolated Salmonella species from chicken giblets and also human faeces concluding its potential zoonotic spread and the role of food from animal origin in the transmission of Salmonellosis.

## **2.3 Food safety knowledge, attitudes and practices**

### **2.3.1 Knowledge**

Relevant knowledge of food safety is critical in broiler production as it influences attitudes and practices during the production process. Sheinberg *et al.*, (2013) identified knowledge gaps concerning pathogens and opportunities for cross contamination during poultry processing by

vendors, in a study they conducted on Food safety knowledge, behaviour, and attitudes of vendors of poultry products sold at Pennsylvania farmers' markets. The study also revealed that although the vendors were not utilizing optimal chilling and storage processes, they had an understanding that the processes require strict temperature controls (Sheinberg *et al.*,2013).

### **2.3.2 Attitude**

Having relevant food safety knowledge in broiler food production is vital, however, it is the right attitude that will finally count. In a study conducted by Garayoa *et al.*, (2014), it was found that although food handlers knew the importance of separating raw from cooked food, they still mixed the containers an act which demonstrates how attitude can present barriers between knowledge and practice. Having a positive attitude during handling strongly influences the reduction in the incidence of foodborne illnesses (Akabanda *et al.*,2017). In their study, Ovai *et al.*, (2019) found that despite the low levels of formal education of the respondents, there was a strong show of positive attitude toward practices such as safe food handling, temperature control, and keeping unwell staff away from processing areas.

### **2.3.3 Practices**

The poor practice of personal hygiene during broiler meat processing can be a source of cross-contamination from the handler to the carcasses and vis -versa. Bacteria are transferred from the poultry carcasses to the hands of the handler and then to other carcasses.

## **2.4 The Slaughtering Process**

### **2.4.1 Slaughter**

The most common killing method in poultry involves cutting blood vessels. The carotid arteries and the jugular veins are cut on both sides of the neck by a deep cut in the front. The oesophagus should not be cut to prevent microbial contamination due to leakage (Fanatico, 2003).

### **2.4.2 Scalding**

This is done by immersing birds in hot water to make the feathers loose. On-farm processors use a single tank of hot water, usually scalding one to four birds at a time. Labour is saved when a mechanism such as a basket or an arm dunks several birds together (Fanatico,2003). In their experimental study, Mulder *et al.*, (1977) found that after artificially contaminating broiler carcasses with a strain of *Escherichia coli* K12, cross-contamination occurred during the scalding and plucking stages when the carcasses were contaminated externally.

### **2.4.3 De-feathering**

This is done to remove feathers from the carcass. Small-scale broiler producers do this by hand. Although the de-feathering step in poultry processing has been identified as an opportunity for bacterial contamination from the intestinal tract and cross-contamination between carcasses, the presence of feathers and feather follicles does not make a significant difference in carcass bacterial contamination immediately after de-feathering or in spoilage bacteria after 1 week of refrigeration (Cason *et al.*,2007).

### **2.4.4 Evisceration**

This is done manually and involves opening the chicken's abdominal cavity and pulling out its contents which include intestines, oesophagus, and lungs. The crop is loosened so that it comes out with the rest of the gut contents (Fanatico,2003). Manual opening of the abdominal cavity and evisceration can result in contamination especially when intestines are cut during the process.

### **2.4.5 Washing**

This should be done with potable water to prevent any possible contamination of the carcass from the water. In their study “Analysis of a poultry slaughter process: influence of process stages on the microbiological contamination of broiler carcasses” Althaus *et. al.*, (2017) found that washing tended to reduce counts of *Campylobacter*.

### **2.4.6 Chilling**

The carcass temperature must be lowered quickly to prevent microbial growth. Soaking the carcass in chilled water is a common method used in the United States of America (Fanatico,2003). Freezing and frozen storage reduce the number of certain microorganisms on poultry.

## CHAPTER THREE

### 3.0 RESEARCH METHODOLOGY

#### 3.1 Study design

The study was a descriptive cross-sectional survey involving small-scale broiler chicken farmers. A cross-sectional study design is applicable for investigating exposures that are fixed characteristics such as knowledge, attitude, and practices (Bonita, Beaglehole, and Kjellstome,2006). The advantage of cross-sectional studies is that in general, they are quick and cheap since data is collected only once and multiple outcomes can be studied hence fewer resources are required to carry out the study.

#### 3.2 Study area

The study was conducted in Lusaka Province, Zambia. According to the livestock and aquaculture census of 2018, Lusaka Province accounted for the highest number of households keeping broiler chickens in Zambia, at a total of 2,282,752 broilers (Ministry of Fisheries and Livestock-Zambia,2019). Three districts namely; Kafue, Chongwe, and Lusaka were selected on the basis that they have an estimated larger population of small-scale broiler farmers in the province.

#### 3.3 Study population

The study units of interest were male and female small-scale broiler farmers.

Inclusion criteria: keeping broiler chickens either in their backyards or smallholder farms, registered with the district veterinary office, and supplying dressed chickens directly to individuals, restaurants, and institution cafeterias.

Exclusion criteria: Farmers who supply live broiler birds and did not consent to the study were excluded from the study.

#### 3.4 Sample size calculation

The sample size was calculated according to the following formula by Chochran, (1963) with the following assumptions;

50% was taken as the level of acceptable knowledge to estimate the sample size at a confidence level of 95%, tolerating a precision of 5%. Below is the calculation;

$n = z^2 \cdot pq / e^2$ ,  $p=0.5$ ,  $q=0.5$ ,  $z=1.96$ ,  $e=0.05$ .  $n=384$  for each of the three districts. Adding 10% for non-response;

$n=384+38.4=422.4$  rounding off to 422. Adjusting for Finite population correction;  $n = n_0 / [1 + (n_0 - 1) / N]$ , where  $n_0$  is 422. The formula for adjusting finite population correction was used after sample calculation was done using Cochran's formula. This is done when a population is small (Singh and Masuku, 2014). Therefore, the samples were not the same for each district after adjusting to finite population for each district.

Table 3.1: Sample size tabulation.

District	The population of small-scale broiler farmers (N) From the register of each of the districts.	Sample (n) after finite population adjustment
Lusaka	85	70
Chongwe	45	41
Kafue	38	35
	TOTAL	<b>146</b>

### 3.5 Sampling Techniques

Simple random sampling was used to select the participants. The sampling frame was small-scale broiler farmers registered with the District Veterinary Office of the three districts selected for the study namely; Chongwe, Lusaka and Kafue.

With the help of the District Veterinary Assistants for each district of interest, participants selected from the district register were contacted for the study. District Veterinary Assistants (DVA) were in touch with farmers in their camps and conversant with where the farmers are found.

### 3.6 Instruments for Data Collection

An interviewer-administered structured questionnaire was used to collect data from the participants. The questionnaire was prepared based on validated questionnaires used in similar studies by Ovai *et al.*, (2019) and Adesokan and Raji, (2014) and it focused on demographic characteristics, knowledge, and attitudes toward food safety (Ovai *et al.*, 2019, Adesokan and Raji 2014) A checklist, adopted from Ovai *et al.*, (2019) was used to record self-reported

practices regarding the use of preventive measures against cross-contamination during processing. This instrument was pre-tested and adjustments were made to refine it. The sample for the pre-test was drawn from all the three (3) districts. 10 from Lusaka, five from Kafue and 15 from Chongwe. These were added to the final sample.

### **3.7 Procedure for Data Collection**

Upon contacting the participants, the DVA together with the principal investigator followed the participants to their locations and face-to-face interviews were conducted to collect data employing a semi-structured questionnaire.

The questionnaire was developed in English but administered not only in English but also in the local language, Nyanja, used in the selected districts depending on the respondents' language preference. The interviewer read out the questionnaire in Nyanja when required. The questionnaire was divided into three sections; (A) Demographic characteristics which had questions on age, Gender, religion, level of education, and length of doing the broiler production business. (B) Knowledge of food safety, (C) Attitude towards food safety and (D) A checklist was used to note the self-reported practices of interest during the slaughter-packaging process.

### **3.8 Data Analysis**

The data from the questionnaire was coded manually and entered in Microsoft Excel, 2013 for windows and exported to Statistical package for social sciences (SPSS) version 21 for analysis. Descriptive statistics were used to describe percentages and frequencies of both independent and dependent variables. Overall participants' knowledge, practices and attitudes were scored.

Dependent variables; Knowledge, attitude, and practices were scored. Response to knowledge and attitude questions was scored at 2 points for each correctly answered question. Incorrect responses received a zero score. For questions with more than one correct response, each correct response was scored with 2 points. Food safety knowledge and practice were categorized as poor with less than 60% of the maximum possible score. Respondents whose score was equal to or above 60% were classified as having good food safety knowledge and good practices. Attitudes were classified as inappropriate for scores less than 60% and appropriate for equal or greater than 60% score.

The association between Knowledge attitudes and practices and the independent variables was tested by use of Pearson's Chi-square. Statistical significance was set at  $p < 0.05$ . All variables

at 0.05 significance level were included in the binary logistic regression model to determine the predictor variables for small scale broiler farmers KAP level. The Odds Ratios (OR) were reported with their 95% confidence interval.

Table 3.2 Variables and cut off points

<b>Variable</b>	<b>Measurement</b>	<b>Cut-off point</b>	<b>Points for correct answer</b>	<b>Points for wrong answer</b>	<b>Maximum points for correct answers</b>
Knowledge	Good	$\geq 21.6(60\%)$	2	0	36
	Poor	$<21.6(60\%)$			
Attitude	Positive	$\geq 7.2(60\%)$	2	0	12
	Negative	$<7.2(60\%)$			
Practice	Good	$\geq 13.2(60\%)$	2	0	22
	Poor	$<13.2(60\%)$			

### **3.8.1 Validity and Reliability**

Validity is an expression of the degree to which a measurement measures what it purports to measure. (Bonnita *et al.*2006). In this study, validity was addressed by including only small-scale broiler farmers registered with the District Veterinary Office. Other than this the instrument of data collection was also pre-tested.

Reliability is the degree to which results obtained by a measurement procedure can be repeated producing consistent results (Schoenbach and Rosamand. 2000). In this study it was addressed through the study design which included a large approximate sample size with p-value set at 95% confidence level, thus the findings where not by chance.

### **3.9 Ethical Considerations**

Ethical clearance to undertake this study was sought from ERES CONVERGE IRB, reference number 2021-Nov-026. Consent was sought from the participants to participate in the study.

Permission was sought from the Provincial Veterinary Office of the Province where participants will be sampled.

The information sheet was read to them and then handed to them. Participants were only interviewed following their consent to participate in the study. The consent was read to them beforehand after which they signed/thumb printed then the interview would commence using an interviewer-administered questionnaire. The consent was given either in Nyanja or English depending on the respondents' language of preference.

This was done while observing all Covid -19 guidelines. Thus, the participants were provided with masks and hand sanitizers before and after signing/thumb printing the consent form. A distance of one meter was maintained between the interviewer and participant to encourage social distancing

## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1 Demographic Profile of Small-scale Broiler Farmers

The total number of respondents interviewed was 146 of which 70(47.9%) were female and 76(52.1) were male. The majority of the respondents did not have significant experience in the broiler production business; 73 (50%) had been in business for less than five years, 52 (35.6) had been in business between 5 and 10 years, and only 21 (14.4%) had been in the business for more than 10 years. (Table 4.1).

Table 4.1 Demographic Characteristics of small scale broiler farmers (N=146)

Variable		N	N %
Age	18-25	10	6.8%
	26-35	40	27.4%
	36-45	51	34.9%
	Above 45	45	30.8%
Gender	Female	70	47.9%
	Male	76	52.1%
Level of Education	None	2	1.4%
	Primary	21	14.4%
	Secondary	59	40.4%
	Tertiary	64	43.8%
Religion	Christian	146	100.0%
	Islam	0	0.0%
	Hinduism	0	0.0%
	Not Religious	0	0.0%
Years in broiler Production Business	Below 5 years	73	50.0%
	5-10 years	52	35.6%
	Above 10 years	21	14.4%

#### 4.2 Food Safety Knowledge

Table 4.2. indicates the participants' responses to knowledge questions.54% of the participants revealed that they had no training in hygienic practices during broiler production.

Diarrhoea, vomiting and abdominal pains were the most recognized symptoms of food borne illnesses at 78.1%,77.4% and 74% respectively. (Table 4.2).

Table 4.2 Participants' responses to knowledge questions on food safety. (N=146)

Question	Response	N	N %	Correct Response(N%)
Have you had any training in the production of broilers in a clean manner?	No	79	54.1%	Yes(45.9)
	Yes	67	45.9%	
Have you heard of illnesses that come as a result of eating food that is contaminated?	No	32	21.9%	Yes (78.1)
	Yes	114	78.1%	
What are the symptoms of food-borne illnesses?				
Diarrhea	No	32	21.9%	Yes (78.1)
	Yes	114	78.1%	
Vomiting	No	33	22.6%	Yes (77.4)
	Yes	113	77.4%	
Abdominal pain	No	38	26.0%	Yes (74.0)
	Yes	108	74.0%	
Fatigue	No	86	58.9%	Yes (41.1)
	Yes	60	41.1%	
Paralysis	No	109	74.7%	Yes (25.3)
	Yes	37	25.3%	
Dizziness	No	80	54.8%	Yes (45.2)
	Yes	66	45.2%	
Do you know if some diseases can be transmitted from chickens to humans?	No	50	34.2%	Yes (65.8)
	Yes	96	65.8%	
How do you think these diseases can be transmitted?				
Eating contaminated poultry meat that was not properly stored.	No	53	36.3%	Yes (63.7)
	Yes	93	63.7%	
Eating contaminated poultry meat that has not been thoroughly cooked.	No	47	32.2%	Yes (67.8)
	Yes	99	67.8%	
From gastrointestinal contents during evisceration.	No	83	56.8%	Yes (43.2)
	Yes	63	43.2%	
Do you think humans can transmit germs to poultry meat while processing and packaging?	No	9	6.2%	Yes (93.8)
	Yes	137	93.8%	
How do you think these diseases are transmitted?				
Not washing hands before handling poultry meat.	No	14	9.6%	Yes (90.4)
	Yes	132	90.4%	
Not washing hands after using the toilet.	No	18	12.3%	Yes (87.7)
	Yes	128	87.7%	
Using non-portable water for meat processing.	No	43	29.5%	Yes (70.5)

	Yes	103	70.5%	
Not washing utensils and surfaces thoroughly after use.	No	35	24.0%	Yes (76.0)
	Yes	111	76.0%	
Do you know about the Zambian law that looks into the safety of food produced and distributed to consumers?	No	78	53.4%	Yes (46.6)
	Yes	68	46.6%	

The total maximum knowledge score was 36 points for all correct answers, with each correct answer carrying 2 points, in the knowledge section which represented 100%. The cut-off point for good knowledge was  $\geq 21.6$  ( $\geq 60\%$ ). As indicated in table 4.3, the mean percent score for level of knowledge was  $23 \pm 9$  ( $63\% \pm 26$ ). Overall 97 respondents had good knowledge of food safety. This represented 66.4% of respondents with good knowledge of food safety. 33.6% had poor food safety knowledge.

Table 4.3: Participants' food safety knowledge score and level

Knowledge Scores	Mean score	Standard Deviation	Mean % score	Standard Deviation
	23	$\pm 9$	63	$\pm 26$
Knowledge Level	Frequency		Percentage	
	Poor	49	33.6	
	Good	97	66.4	

### 4.3 Food Safety Attitudes

Table 4.4 shows the responses to the attitude questions. 98.6% of the respondents believed that food safety in broiler production was important. All respondents agreed that there should be training in on farm food safety for small scale broiler farmers.

Table 4.4 Participants' responses to questions on attitudes toward food safety. (N=146)

Questions	Response	N	N %	Expected Response(N%)
Do you believe Food Safety in broiler production is important?	No	2	1.4%	Yes (98.6)
	Yes	144	98.6%	
Whose responsibility is it to ensure that the poultry meat produced from your farm is free of disease and safe for human consumption?	Mine	108	74.0%	Mine (74.0)
	The Government	38	26.0%	
	No one	0	0.0%	
Do you feel there should be training on on-farm food safety for small-scale broiler farmers?	No	0	0.0%	Yes (100.0)
	Yes	146	100.0%	
Should someone who has a food-borne illness be allowed to handle poultry meat during processing?	No	143	97.9%	No (97.9)
	Yes	3	2.1%	
Are you willing to change your food handling practices when you are told they are incorrect?	No	1	0.7%	Yes (99.3)
	Yes	145	99.3%	
Do you believe good personal hygiene can prevent foodborne disease?	No	1	0.7%	Yes(99.3)
	Yes	145	99.3%	

The total maximum possible score for food safety attitude questions was 12, with 2 points for each correct answer, which represented 100%. The mean percent score for attitude was  $11 \pm 1.2$  ( $95\% \pm 10$ ). The cut-off for positive attitude towards food safety in broiler production was  $\geq 7.2$  points ( $\geq 60\%$ ). 143 respondents scored above the cut-off point and therefore had positive attitude towards food safety in broiler production and this represented 97.9% of respondents with positive attitude towards food safety. Three respondents had negative attitude towards food safety, which represented 2.1%. (Table 4.5).

Table 4.5: Participants' food safety attitude score and level

<b>Attitude Score</b>	<b>Mean score</b>	<b>Standard Deviation</b>	<b>Mean % score</b>	<b>Standard Deviation</b>
	11	±1.2	95	±10
<b>Attitude Level</b>		<b>Frequency</b>	<b>Percentage</b>	
	<b>Negative</b>	3	2.1	
	<b>Positive</b>	143	97.9	

#### **4.4 Food Safety Practices**

There were 11 questions to assess the practices of small scale broiler farmers. The majority, 57.5% reported that they did not wash their hands before slaughtering birds. Only 52.9% said they washed their hands after eviscerating each bird. During processing 28.8% of the participants reported that they cover their mouths with masks and 71.2% said they do not. 88.4% said they use soap and portable water to wash their hands. (Table 4.6)

Table 4.6: Participants' responses to questions regarding practices during broiler production(N=146)

Question	Response	N	N%	Correct Response(N%)
Do you wash your hands before slaughter?	No	84	57.5%	Yes(42.50)
	Yes	62	42.5%	
Do you wash your hands after using the toilet during processing?	No	1	0.7%	Yes (99.3)
	Yes	145	99.3%	
Do you wash your hands after eviscerating each bird	No	98	67.1%	Yes (32.9)
	Yes	48	32.9%	
Are your hands washed with soap and potable water?	No	17	11.6%	Yes (88.4)
	Yes	129	88.4%	
Are surfaces washed and disinfected?	No	47	32.2%	Yes (67.8)
	Yes	99	67.8%	
Are utensils washed with soap and portable water?	No	8	5.5%	Yes (94.5)
	Yes	138	94.5%	
Is your mouth covered with a mask during processing?	No	104	71.2%	Yes (28.8)
	Yes	42	28.8%	
Is there availability of portable water for washing carcasses?	No	6	4.1%	Yes(95.9)
	Yes	140	95.9%	
Do you cut through intestines during evisceration?	No	126	86.3%	No (86.3)
	Yes	20	13.7%	
Are carcasses washed with portable water?	No	7	4.8%	Yes (95.2)
	Yes	139	95.2%	
Are carcasses immediately chilled after washing?	No	77	52.7%	Yes (47.3)
	Yes	69	47.3%	

Generally, the reported food safety practices among the small-scale broiler farmers were good. The cut-off for good practices score was  $\geq 60\%$ .

The total maximum score for practices was 22, with 2 points for each correct answer, which represented a 100% score. 115 out of the 146 participants reported good practices which represented 78.8% and a mean score of  $16 \pm 3 (72\% \pm 16)$ . (Table 4.7).

Table 4.7: Participants reported practices and scores

<b>Practice Score</b>	<b>Mean score</b>	<b>Standard Deviation</b>	<b>Mean % score</b>	<b>Standard Deviation</b>
	16	$\pm 3$	72	$\pm 16$
<b>Practices</b>		<b>Frequency</b>	<b>Percentage</b>	
	<b>Poor</b>	31	21.2	
	<b>Good</b>	115	78.8	

#### **4.5 Association Between Participants' Demographics and Their Level of Food Safety Knowledge, Attitude and Practices.**

A test of association, by use of Pearson's Chi-square, between food safety Knowledge, Attitude and Practice (KAP) levels and the demographic variables was done. Statistical significance was set at  $p < 0.05$ . The Phi and Cramer's V values were used to determine the strength of the associations.

There was significant association between the level of food safety knowledge and the demographic characteristics gender, age, level of education and length in business with p-values of 0.023, 0.003, 0.001 and 0.001 respectively. The association between level of food safety knowledge and education was strong with Cramer's V value of 0.42. The association with age, gender and length of doing business was moderate with Cramer's V of 0.31, 0.18 and 0.33 respectively.

There was no significant association between demographic characteristics and food safety attitudes. There was a significant but weak association between food safety practices and Gender with p-value and Cramer's V of 0.049 and 0.163 respectively. There was moderate association between food safety practices the level of education with p values and Cramer's V of 0.047 and 0.246 respectively. Age and length in business had no significant association with food safety practices. (Table 4.8).

Table 4.8: Association between participant demographics and their KAP levels

KAP Levels	Demographics	Number of Respondents N(N%)		P-value	Phi & Cramer's V	Association	
		Poor	Good				
Knowledge Level				0.023	0.189	Yes	
	<b>Gender</b>	F M	17(24.3) 32(42.1)	53(75.7) 44(57.9)			
	<b>Age</b>	18-25 26-35 36-45 Above 45	7(70) 19(47.5) 14(29.5) 9 (20)	3(30) 21(52.5) 37(72.5) 36(80)	0.003	0.310	Yes
	<b>Level of Education</b>	None Primary Secondary Tertiary	2(100) 12(57.1) 27(45.8) 8(12.5)	0(0) 9(42.9) 32(54.2) 56(87.5)	0.001	0.421	
	<b>Length in Business</b>	Less than 5years 5-10 years Above 10 years	36(49.3) 8(15.4) 5(23.8)	37(50.7) 44(84.6) 16(76.2)	0.001	0.338	Yes
			<b>Negative</b>	<b>Positive</b>			
Attitude Level	<b>Gender</b>	F M	2(2.9) 1(1.3)	68(97.1) 75(98.7)	0.509	0.054	No
	<b>Age</b>	18-25 26-35 36-45 Above 45	1(10) 0(0) 1(2) 1(2.2)	9(90) 40(100) 50(98) 44(97.8)	0.346	0.165	
	<b>Level of Education</b>	None Primary Secondary Tertiary	0(0) 1(4.8) 1(1.7) 1(1.6)	2(100) 20(95.2) 58(98.3) 63(98.4)	0.857	0.079	No
	<b>Length in Business</b>	Less than 5years 5-10 years Above 10 years	2(2.7) 1(1.9) 0(0)	71(97.3) 51(98.1) 21(100)	0.597	0.065	
			<b>Poor</b>	<b>Good</b>			
	<b>Gender</b>	F M	10(14.2) 42(55.3)	60(85.7) 34(44.7)	0.049	0.163	Yes
	<b>Age</b>	18-25 26-35 36-45 Above 45	1(10) 11(27.5) 11(21.6) 8(17.8)	9(90) 29(72.5) 40(78.4) 37(82.2)	0.569	0.118	
	<b>Level of Education</b>	None Primary Secondary Tertiary	1(50) 9(42.9) 12(20.3) 9(14.1)	1(50) 12(57.1) 47(79.7) 55(85.9)	0.047	0.246	Yes
	<b>Length in Business</b>	Less than 5years 5-10 years Above 10 years	20(27.4) 7(13.5) 4(19.0)	53(72.6) 45(86.5) 17(81.0)	0.166	0.157	

#### 4.6 Association among participant food safety knowledge, attitude and practices.

A summary of association among participant food safety KAP is presented in table 4.6.1 below. A test of association by use of Pearson chi-square among the KAP was done at alpha level 0.05. The Phi and Cramer's V values were used to measure the strength of the associations. Association between knowledge and practices was significant ( $p=0.049$ ) though weak (Cramer's V 0.163). There was no significant association found between practice and attitude and also between knowledge and attitude. (Table 4.9).

Table 4.9: Association among participant food safety knowledge, attitude and practices.

Level	Pearson Chi-Square	Asymp. Sig	Phi & Cramer's V	Association
Knowledge & Practice	3.879	0.049	0.163	Yes
Practice & Attitude	0.268	0.605	0.043	No
Knowledge & Attitude	1.505	0.220	0.102	No

#### **4.7 Predictors of Knowledge, Attitudes and Practices**

A binary logistics regression was conducted to predict factors leading to good knowledge, positive attitude and good practices among small scale broiler farmers. Odds ratios(OR) were reported with their 95% confidence intervals(CI).

Significant predictors of good knowledge level, positive attitude and good practices for participants were with p value < 0.05. For good food safety knowledge level, the significant predictors were age, level of education, length in business and gender. Small scale broiler farmers within 36-45 years of age (OR=7.340,95%CI:1.402-38.427) and above 45 years old (OR=8.442,95% CI:1.392-51.209) were 7 times and 8 times more likely to have good food safety knowledge level than those between 18-25 years of age. However, those with secondary education (OR=0.107,95% CI:0.034-0.334) and tertiary education (OR=0.169, CI :95%0.069-0.417) were 0.10 and 0.16 times less likely to have good food safety knowledge level than those without any formal education. Respondents within 5-10 years' work experience (OR=0.321,95% CI:0.0106-0.969) were 0.32 times less likely to have good food safety knowledge than those below 5 years in the business. Female small scale broiler farmers (OR=0.264,95%CI:0.106-0.654) were less likely to have good food safety knowledge levels than their male counterparts.

Age was the strongest predictor of having good food safety knowledge, specifically being 45years old and above.

Small scale farmers with secondary education (OR=0.0218,95%CI:0.072-0.665) were likely to have good food safety practices than those with no formal education. Similarly, females (OR=0.400,95% CI:0.165-0.969) were less likely to exhibit positive food safety practices. The results for predictors of positive attitudes towards food safety were insignificant.

Table 4.10: Binary Logistics Regression for predictors of good knowledge, positive attitudes and good practices.

<b>KAP</b>	<b>Variable</b>	<b>P value</b>	<b>Odds Ratio</b>	<b>95% Confidence Interval (Odds Ratio)</b>	
				Lower	Upper
<b>Knowledge</b>	Age: 18-25	0.037	Ref		
	26-35	0.248	2.543	0.523	12.373
	36-45	0.018	7.340	1.402	38.427
	Above 45	0.020	8.442	1.392	51.209
	Gender: Female	0.004	0.264	0.106	0.654
	Male	Ref			
	Education: None	0.000	Ref		
	Primary	0.999	0.000	0.00	
	Secondary	0.000	0.107	0.330	0.340
	Tertiary	0.000	0.169	0.069	0.414
	Experience: Below 5 years	0.000	Ref		
	5-10 years	0.000	5.066	2.097	12.240
	Above 10 years	0.398	1.710	0.490	6.031
<b>Attitude</b>	Age: 18-25	0.886	Ref		
	26-35	0.998	110745	0.00	
	36-45	0.451	3.325	0.146	75.728
	Above 45	0.815	1.644	0.250	106.321
	Gender: Female	0.665	1.880	0.108	32.657
	Male	Ref			
	Education: None	0.947	Ref		
	Primary	0.999	0.000	0.000	
	Secondary	1.000	0.000	0.000	
	Tertiary	1.000	0.000	0.000	
	Experience: Below 5 years	0.976	Ref		
	5-10 years	0.827	1.451	0.52	40.713

	Above 10 years	0.998	487186	0.00	
<b>Practices</b>	Age: 18-25	0.685	Ref		
	26-35	0.248	0.262	0.027	2.538
	36-45	0.395	0.371	0.380	3.631
	Above 45	0.375	0.334	0.030	3.757
	Gender : Female	0.042	0.400	0.165	0.969
	Male				
	Education: None	0.044	Ref		
	Primary	0.767	1.600	0.071	36.101
	Secondary	0.007	0.218	0.072	0.665
	Tertiary	0.196	7.071	0.364	137.389
	Experience: Below 5 years	0.447	Ref		
	5-10years	0.227	2.026	0.644	4.334
	Above 10 years	0.914	1.080	0.269	1.113

Ref= Reference

## CHAPTER FIVE

### 5.0 DISCUSSION

The general objective of this study was to assess the food safety knowledge, attitude and practices of small-scale broiler farmers in Lusaka Province. This chapter will discuss the research findings in relation to the study objectives and review of literature.

Good food safety knowledge, positive attitudes and good practices during broiler production are very key to the overall safety and quality of the broiler meat delivered to consumers. This study revealed good food safety knowledge level, positive attitudes and good practices among the small scale broiler farmers. It was noted that the majority of the respondents were male, indicating males dominating the broiler production business, between the age of 36-45 years and attained tertiary education and had less than five years in the broiler production business.

Good knowledge of food safety is critical in broiler production as it may influence attitudes and practices during the production process. Overall, the respondents had good food safety knowledge. In a similar study (Abunna *et al*,2022) respondents had good knowledge levels towards food safety. However, another study (Ovai *et al*,2019) reported poor knowledge levels from their respondents. Despite having an overall good knowledge level score, the majority of the respondents had no training in food safety during broiler production. This could attribute to the gaps noted in knowledge regarding symptoms of foodborne illnesses along with the ignorance on the Zambian Food Safety act of 2019.

The Pearson chi square test of association revealed an association between knowledge level and age, level of education attained, gender and the number of years in the business. Following a binary logistics regression, age was found to be the strongest predictor of levels of good food safety knowledge with respondents older than 45years more likely to have good food safety knowledge. This could be attributed to the fact that the older respondents would have acquired some general food safety knowledge over their life time and apply it in broiler production having experience with common food borne disease outbreaks such as cholera. However, Adosekan and Raji, (2014) found that younger respondents were more likely to have good food safety knowledge. Our study found that those in business between 5-10 years were less likely to have good food safety knowledge than those who were in business less than 5 years. This was in agreement with Adosekan and Raji, (2014) who also found that those meat handlers with lower years in experience had higher levels of food safety knowledge. This study also

found that respondents with tertiary education were less likely to have good knowledge of food safety. This result is contrary to a similar study (Ansari-Lari *et al.*, 2010) in which they revealed that respondents with higher level of education were highly likely to have good knowledge of food safety.

Positive attitudes were documented in this study. Having good food safety knowledge in broiler production is vital, however, it is the right attitude that will finally count. Attitude can present barriers between knowledge and practice. It was encouraging to note that the majority were willing to change their handling practices if they were found to be incorrect when corrected and also that they were open to receiving training on food safety during broiler production. A similar study, (Abunna *et al.*, 2022) also found that their respondents had good attitudes towards food safety. However, in our study, there was no association between respondents' attitudes and age, level of education attained, gender and number of years in business. This meant that these variables had no effect on the small scale broiler farmers' attitudes towards food safety. On the contrary Adenoskan and Raji, (2014) found that there was significant association between food safety attitudes of meat handlers and age, gender, level of education and experience in years.

Personal hygiene during broiler meat processing is vital in the prevention of cross-contamination from handler to carcass. With the poor practice of personal hygiene bacteria can be transferred from the handler to the poultry carcass and vis-versa, also from the poultry carcass to the hands of the handler and then to other carcasses. In our study, the small-scale broiler farmers self-reported their practices during the processing and storage of broiler meat before it is sold to the public. Generally, the reported food safety practices among the small-scale broiler farmers were good. On the contrary, in a similar study, Al banna *et al.*, (2021) reported poor food safety practices.

Nonetheless, majority of the respondents in this study reported some lapses in hand washing practices and chilling of carcasses. They reported not washing their hands before slaughter and after evisceration of each bird. This was noted as a gap in good food safety practices that needs to be emphasized on in an event of a training on good hygiene practices during broiler production to avoid cross contamination. The majority reported that they do not immediately chill the carcasses, a rather disappointing finding as proper cold storage is a critical step in preventing the growth and survival of potential pathogens present on raw poultry. Primary chilling of poultry carcasses is carried out to produce a safe product by the temperature of the

meat to a point where the rate of growth of spoilage microorganisms is reduced and the growth of most pathogenic microorganisms is prevented (James *et al.*,2006).

Our findings revealed that level of education and gender were significantly associated with food safety practices. Specifically, respondents who attained the level of secondary education were less likely to have good practices during broiler production. Although studies have shown that workers with no formal education are unlikely to follow good food safety practices (Clayton *et al.*,2002) our study showed otherwise. Female respondents were less likely to have good food safety practices than their male counterparts. On the contrary, Alterkruse *et al.*, (1996) revealed that poor practices were reported more often by men than by women.

No significant association was found between practices and attitudes and knowledge and attitudes. There was significant association between knowledge and practices. This was evident in the fact that good food safety knowledge translated to good food safety practices during broiler production, for example, the majority believed that humans can transmit germs to poultry meat (cross-contamination) while processing and also reported washing their hands after using the toilet, an act that can prevent cross-contamination. In their study, Al banna *et al.*, (2021) found that there was association between food safety knowledge and food safety practices among meat handlers. This association implies that food safety knowledge could be an essential component to the promotion of good food safety practices.

### **5.1 Limitations of the study**

- Due to the fact that the famers had different cycles in rearing the chickens, it was a challenge to be present during the slaughtering process for every farmer to conduct an observation on their practices with regards to processing and storage. Therefore, the data collector relied on self-reported practices which could result in exaggerating or trivializing certain responses.
- Regarding attitude, since an interviewer-administered questionnaire was used, participants may have responded in a manner they thought the data collector would have wanted to know as opposed to their true feelings.

## CHAPTER SIX

### 6.0 CONCLUSIONS AND RECOMMENDATION

#### 6.1 Conclusion

This study found that there was good food safety knowledge and positive attitude towards food safety among small- scale broiler farmers in Lusaka Province. However, poor practices were reported by the farmers despite having sufficient knowledge and a positive attitude. Our findings have also shown that higher education, female farmers and older age groups significantly enhance food safety knowledge and practices during broiler meat production. During broiler production, it is key that the processing steps can incorporate systems that eliminate bacterial populations and limit the presence of foodborne pathogens. Systems such as good personal hygiene which include good hand washing practices and chilling of the carcasses immediately after processing, which the respondents did not adhere to and were seen as a significant gap.

#### 6.2 Recommendations

Small-scale broiler farmers need continuous education in food safety in broiler production and this education should be focused on; practicing personal hygiene, avoiding cross-contamination, the importance of chilling carcasses immediately after processing to ensure that no bacteria grows on the carcass and ensuring that the *Zambian Food Safety Act of 2019* is reinforced. This education can be provided through either cooperatives that the small scale broiler farmers belong to, poultry associations or the government of the republic of Zambia through extension work.

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## APPENDICES

### Appendix i: Information Sheet

**STUDY TITLE:** FOOD SAFETY KNOWLEDGE, ATTITUDES, AND PRACTICES OF SMALL-SCALE BROILER FARMERS IN LUSAKA PROVINCE: A CROSS-SECTIONAL STUDY- 2022

Good morning/afternoon madam/sir. My name is M'sampa Mvula a post-graduate student studying One Health Food Safety at the University of Zambia. I am surveying the knowledge, attitudes, and practices of small-scale broiler farmers in food safety in Lusaka province.

Food safety is the assurance that food will not cause any harm to the consumer when it is prepared according to the intended use. You may be interested to note that historically documented human tragedies and economic disasters due to consuming contaminated food occurred as a result of intentional or unintentional personal conduct and governmental failure to safeguard food quality and safety. It is also worth noting that of the 600 million people in the world who fall ill after eating contaminated food, 40 percent of these are children under the age of 5. This is according to the world health organisation.

In Zambia, the poultry industry is a critical sector for the national economy and it has grown over the years. Small scale broiler poultry farmers produce poultry meat from farm to table and hence are responsible for all stages of the production chain. This means that it is important that the farmers produce this meat free of biological, chemical and physical hazards. As such it is for this reason that we want to find out if you have food safety knowledge, your attitudes and practices as you produce broiler meat for consumption.

The information collected will help us inform relevant authorities what is on the ground concerning food safety among small-scale broiler farmers and if there is a need for more awareness on the importance of ensuring good hygiene practices during poultry production and identifying training needs.

You have been selected to participate in this study because you are a small-scale broiler farmer. This survey is purely voluntary and if you so wish you may decline to participate without being penalized. Feel free not to answer questions that you are not comfortable answering for any reason. These uncomfortable questions may be skipped. During the interview, if you feel

uncomfortable you are free to stop. I will be very glad if you are willing to participate in this study because your participation will help with answering the research question.

Any information you give here will remain confidential and your identity will remain anonymous.

If you have any questions after this interview concerning the study, you may contact me on my phone at 0977660692 or send an email to [msampamvula@gmail.com](mailto:msampamvula@gmail.com). My physical address is C/o The University of Zambia, School of Veterinary Medicine. P.O Box 32379,Lusaka.Zambia.

Should you wish to have clarification concerning ethical issues you may get in touch with Eres Converge either through phone at 0955155633/0955155634/0977493220. Email [eresconverge@yahoo.co.uk](mailto:eresconverge@yahoo.co.uk) or you can physically go to plot No.272,cnr Olive Tree Meanwood Road, Meanhood. Lusaka, Zambia.

This interview will take approximately 30 minutes to complete. Thank you very much for your participation.

## Appendix ii: Consent Form

I understand all that has been explained to me as above and it is clear to me what this study is all about and so I voluntarily consent to take part in the study. I agree to participate in the study on my own without being forced. If I feel uncomfortable answering questions that may be personal or otherwise I will skip those questions. I understand that if at any point I wish to withdraw from the study I am free to do so without any penalty.

Respondents Signature/ Thumb print ..... Date.....

Witness Signature /Thumb print ..... Date.....

Interviewers Signature ..... Date.....

### Appendix iii: Ethical Clearance Certificate



### Appendix iv: Questionnaire

Questionnaire number.....Respondents Location.....Date of interview.....

	A. DEMOGRAPHIC DATA	CODE
Q1.	<p>How old are you?</p> <p>18-25 <input type="checkbox"/>    26-35 <input type="checkbox"/>    37-45 <input type="checkbox"/>    Above 40 <input type="checkbox"/></p>	
Q2	<p>Gender of respondent</p> <p>Female <input type="checkbox"/></p> <p>Male <input type="checkbox"/></p>	
Q3	<p>What is the highest level of education attained?</p> <p>A) None <input type="checkbox"/></p> <p>B) Primary <input type="checkbox"/></p> <p>C) Secondary <input type="checkbox"/></p> <p>D) Tertiary <input type="checkbox"/></p>	
Q4	<p>What is your religion?</p> <p>A) Christian <input type="checkbox"/></p> <p>B) Islam <input type="checkbox"/></p> <p>C) Hinduism <input type="checkbox"/></p> <p>D) Not religious <input type="checkbox"/></p>	

**Q5**

How long have you been in this broiler production business?

5 years and below  5-10 years  10 years and above

	<p style="text-align: center;"><b>B. KNOWLEDGE OF FOOD SAFETY</b></p>	<p style="text-align: center;"><b>CODE</b></p>
<p><b>Q6</b></p>	<p>Do you have any training in the production of broilers in a clean manner?</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	
<p><b>Q7</b></p>	<p>Have you heard of illnesses that come as a result of eating food that is contaminated?</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If yes to Q 7, answer Q8, if no proceed to Q9</p>	
<p><b>Q8</b></p>	<p>What are the symptoms of foodborne illnesses?</p> <p>A) Diarrhea <input type="checkbox"/></p> <p>B) Vomiting <input type="checkbox"/></p> <p>C) Abdominal <input type="checkbox"/></p> <p>D) Fatigue <input type="checkbox"/></p> <p>E) Paralysis <input type="checkbox"/></p> <p>F) Dizziness <input type="checkbox"/></p>	
<p><b>Q9</b></p>	<p>Do you know if some diseases can be transmitted from chickens to humans?</p>	

Yes  No

If Yes answer Q10, if no proceed to Q11.

**Q10** How do you think these diseases can be transmitted?

A) Eating contaminated poultry meat that was not properly stored

B) Eating contaminated poultry meat that has not been thoroughly cooked

C) From gastrointestinal contents during evisceration

**Q11** Do think humans can transmit germs to poultry meat while processing and packaging? (Cross-contamination).

	<p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If yes answer 12, if no proceed to Q13.</p> <p><b>Q12</b> How do You think these germs are transmitted?</p> <p>A) Not washing hands before handling poultry meat <input type="checkbox"/></p> <p>B) Not washing hands after using the toilet <input type="checkbox"/></p> <p>C) Using non-portable water for meat processing <input type="checkbox"/></p> <p>D) Not washing utensils and surfaces thoroughly after use <input type="checkbox"/></p> <p><b>Q13</b> Do you know about the Zambian law that looks into the safety of food produced and distributed to consumers?</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>		
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**C. FOOD SAFETY ATTITUDE**

**Q14**

Do you believe food safety in poultry production is important?

Yes  No

**Q15**

Whose responsibility is it to ensure that the poultry meat produced from your farm is free of disease and safe for human consumption?

A) Mine

B) The government

C) No one

**Q16**

Do you feel there should be training on on-farm food safety for small-scale broiler farmers?

Yes  No

**Q17**

Should someone who has a food-borne illness be allowed to handle poultry meat during processing?

Yes  No

**Q18**

Are you willing to change your food handling practices when you are told they are incorrect?

Yes  No

**Q19**

Do you believe good personal hygiene can prevent foodborne diseases?

Yes  No

	<b>D. QUESTIONS ON PRACTICES WITH REGARDS TO</b>	<b>YES</b>	<b>NO</b>
	<b>PROCESSING AND STORAGE</b>		
<b>1</b>	Do you wash hands before slaughter?		
<b>2</b>	Do you wash hands after using the toilet during processing?		
<b>3</b>	Do you wash hands after eviscerating each bird?		
<b>4</b>	Are your hands washed with soap?		
<b>5</b>	Are your working surfaces disinfected?		
<b>6</b>	Are utensils washed with soap and portable water?		
<b>7</b>	Do you use of masks during processing?		
<b>8</b>	Is portable water available for washing carcasses?		
<b>9</b>	Do you cut intestines during evisceration?		
<b>10</b>	Are carcasses washed with portable water?		

**11**

Are carcasses immediately chilled after washing

**THANK YOU VERY MUCH FOR SPARING YOUR TIME TO PARTICIPATE IN THIS STUDY**