MINISTRY OF HEALTH

UNIVERSITY OF HEALTH SCIENCES, FACULTY OF PUBLIC HEALTH

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KHAMPHOU CHANTHAPANY

KNOWLEDGE, PRACTICES AND RELATED FACTORS OF FOOD HYGIENE AMONG STREET FOOD VENDORS IN VIENTIANE CAPITAL, LAOS

MASTER THESIS

MASTER OF PUBLIC HEALTH

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Assoc. Prof. La Ngoc Quang, PhD **Dr. Sengchanh Konnavong**

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ACKNOWLEDGEMENTS

This independent study would not have been possible without the help and support of many people. First of all, I would like to give praise and thanks to the Lord Buddha who made it possible for me to come to the end of this program.

I am very thankful to the Ministry of Health of the Lao People's Democratic Republic (Lao PDR) and to the European Union (EU) for funding my studies at the both the University of Health Sciences (Laos) and the Hanoi University of Public Health (Vietnam).

The Department of Public Health, Vientiane Capital is also gratefully acknowledged for allowing me to study at both the universities, which are among the best institutions of higher learning in Laos and Vietnam.

I wish to express my gratitude to my supervisors, Prof. La Ngoc Quang and Dr. Sengchanh Kounnavong, who took time to read and make the necessary criticisms, suggestions and comments in the course of my writing this thesis.

Special thanks go to my research assistants and study participants, without whom it would have been difficult to obtain data. I also want to thank the members of staff in the Food and Drug Section of the Department of Public Health, Vientiane Capital for their help with data collection for my study. This study could not have been completed without their generous assistance.

I am grateful to all the lecturers, teachers and staff of the Hanoi University of Public Health (Vietnam) and the University of Health Sciences (Laos) for their continuous assistance and helpful advice.

I would like to thank my classmates for their kindness throughout our Masters' program.

Finally, I would like to thank my family for their love, understanding, support and encouragement during the period of my studies at the two universities.

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ABBREVIATIONS

HACCP	Hazard Analysis of Critical Control Points
Lao PDR	Lao People’s Democratic Republic
MOH	Ministry of Health
VTE	Vientiane Capital
WHO	World Health Organization

ABSTRACT

Introduction: One principle of food hygiene requires that there should be minimal handling and sanitary preparation of food items. Food handlers are thus expected to observe proper hygiene and sanitation methods as the chances of food contamination largely depend on their health status and hygiene practices. Attention is also required where foods are often prepared under unsanitary conditions and stored for long periods in unsuitable conditions before selling. Recently the WHO has had a comprehensive goal of urging member countries to ensure safe food intake. In the Lao People's Democratic Republic (Lao PDR), it has been estimated that 11% of the under-5 mortality is due to diarrhea because of a lack of good hygiene practices and improper processing handling or storage of food (Houatthongkham et al., 2016).

Methodology: A quantitative descriptive study design was used. Data was collected through interviewing street food vendors using questionnaires and an observational checklist. The study was carried out in four urban districts of Vientiane capital (VTE); the total sample was 196 subjects. The data was entered into the Epidata software version 3.0 and analyzed in the STATA software version 11.0.

Results: A poor level of knowledge and practices among the 196 street food vendors was reported. The scores obtained were lower than the mean value. Of the six knowledge groups about the causes of food contamination, one was significantly associated with practices of hygiene. After multivariate analysis, the other factors related to food hygiene that were positively associated with practices of hygiene (p-value < 0.05) were possession of a health certificate, need to know about food hygiene, training on hygiene, main occupation, and regulation by the local government.

Conclusion: The study identified that the knowledge and practices of street food vendors were at poor levels. There is a need for educational programs to improve knowledge, especially to emphasize translation to practice. In general,

insufficient knowledge affects the hygienic practices of street food vendors. In order to find the solutions to the problem of food hygiene in the future, the purpose of this study has been to study the knowledge, practices and its related factors on food hygiene among street food vendors in Vientiane Capital, Laos.

INTRODUCTION

The term "street food" refers to a wide variety of ready-to-eat foods and beverages sold and sometimes prepared in public places. Street food may be consumed where it was purchased or can be taken away and eaten elsewhere (Abdalla, Suliman, & Bakhiet, 2009).

Street vendors provide a source of inexpensive, convenient and relatively nutritious food. Street food vendors may be divided into two groups: mobile vendors and stationary vendors. Mobile vendors travel from place to place with prepared and packaged food intended for sale placed on their heads or on carts, bicycles, motorcycles or tricycles. Stationary vendors have fixed stalls where food is prepared, stored and served to consumers (Aluko, Ojeremi, Olaleke, & Ajidagba, 2014). The street food vending sector of the economy has expanded in low and middle-income countries and provides access to a diversity of inexpensive food for a variety of customers (Aluko et al., 2014). One of the frequent problems in the sale of street foods is their actual and potential hazard caused by bacterial contamination (Badrie, Joseph, & Chen, 2004). The conditions under which street vendors operate are often undesirable for both the preparation and the selling of food (Lues, Rasephei, Venter, & Theron, 2006). They are prepared in very dirty surroundings with waste water and garbage disposed of nearby, providing nutrients and breeding grounds for rodents and vermin (Sharif, Obaidat, & Al-Dalalah, 2013). Food-borne related illnesses have increased over the years and negatively affected the health and economic well-being of many developing nations (Akabanda, Hlortsi, & Owusu-Kwarteng, 2017). There is inadequate supervision and proper monitoring by food safety officers, and the enforcement of food hygiene regulation is weak (Kibret & Abera, 2012). Food borne diseases are an important cause of morbidity and mortality worldwide with significant public health impact. The global burden of food borne diseases in 2010 was 33 million healthy life years lost (disability-adjusted life years or DALYs) with about 600 million food borne illnesses and 420,000 deaths, of which food borne diarrheal diseases, the most frequent cause of

food borne illnesses, contributed about 230,000 deaths (World Health Organization, 2015).

Lack of training in food safety and good hygiene practices is also rife among food handlers (Okojie & Isah, 2014). Investigations of outbreaks of food-borne disease throughout the world show that, in nearly all instances, they are caused by the failure to observe satisfactory standards in the preparation, processing, cooking, storing or retailing of food (Zain & Naing, 2002). It is recognized that street food vendors are often poor, uneducated and are lacking in knowledge and hygienic practices of safe food handling. Consequently, they are perceived to be a major public health risk to the community (Martins, 2006).

In the Lao People's Democratic Republic, it has been estimated that 11% of the under-5 mortality is due to diarrhea. However, diarrhea remains a significant disease burden and one of the leading causes of death in children under age 5 in less developed countries, where there are ongoing problems with poor nutrition and sanitation and access to safe food and water (Houatthongkham et al., 2016).

Therefore, poor knowledge and hygienic practices and inadequate sanitary conditions play major roles in the increased burden of communicable diseases within developing countries. This study evaluated the knowledge, practices and its related factors on hygiene among street food vendors in four urban districts in Vientiane Capital (VTE), Laos.

OBJECTIVES

1. To describe the knowledge and practices on food hygiene among street food vendors in four urban districts in VTE.
2. To identify the related factors affecting food hygiene practices of street food vendors in four urban districts in VTE.

Chapter 1

LITERATURE REVIEW

1.1. Definition

1.1.1. Knowledge of street food vendors

Knowledge accumulates through learning processes and these may be formal or informal instruction, personal experience and experiential sharing. It has been traditionally assumed that knowledge is automatically translated into behavior and practices. Knowledge of the consequences of unsafe food hygiene practice can enhance adherence to food safety guidelines. Empirical studies on food hygiene have been carried out across the globe (Glanz, Rimer, & Viswanath, 2008; Prochaska et al., 2002).

Knowledge is the ability to remember and understand facts, details and rules of things that have been experienced. According to Aiken et al, practices refer to the ways in which people demonstrate their knowledge and attitudes through their actions (Aiken, Clarke, Cheung, Sloane, & Silber, 2003). In a study of school children regarding their knowledge, attitudes and practices of hygiene, the students surveyed were classified as having good proper knowledge of hygiene. This knowledge is necessary for the practice of proper hygiene in the school environment (Vivas et al., 2010).

In addition, authors McIntosh and Peckarsky (1994) define knowledge as the practice which in turn affects willingness to change current practices if it is learned that current practices are unsafe.

1.1.2. Practices of street food vendors

Food hygiene practice is a subject of wide scope and it is a broad term used to describe the preservation and preparation of foods in a manner that ensures the food is safe for human consumption. Food hygiene deals with the prevention of contamination of food stuffs at all stages of production, collection, transportation, storage, preparation, sale and consumption. Food borne illness is defined as a

disease, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food (World Health Organization, 2015).

Correct food hygiene practices can prevent the spread of foodborne illnesses and are necessary to ensure the safety of food from the farm to the fork. Proper food hygiene is essential when it comes to food preparation. Without washing hands and kitchen utensils, diseases may easily spread. In some places though, this crucial matter is not always known and is unfortunately taken lightly (Newman, 2005).

1.1.3. Food hygiene

Food hygiene is the set of basic principles employed in the systematic control of the environmental conditions during production, packaging, delivery or transportation, storage, processing, preparation, selling and serving of food in such a manner as to ensure that food is safe to consume and is of good keeping quality.

According to the World Health Organization (WHO), "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. Food hygiene is an increasingly important public health issue. Governments all over the world are intensifying their efforts to improve food safety. These efforts are in response to an increasing number of food safety problems and rising consumer concerns. The action of monitoring food to ensure that it will not cause food-borne illness is known as food safety (Doyle & Erickson, 2006).

In another definition, "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 (Jenpanich, 2015).

Food safety continues to be a public health problem worldwide because food borne illnesses are widespread. Consequently, consumers are increasingly concerned about food safety and quality and demand more transparency in

production and distribution. Reports have it that food borne and waterborne diarrheal diseases together kill about 2.2 million people each year (Akonor & Akonor, 2013a).

Although food contamination may occur at any point from production, processing and preparation to distribution, food handlers and other people responsible for food preparation have a critical role in the occurrence and spread of food borne illnesses as their hands and other body parts may harbor micro-organisms and their actions, as well, may compromise the chain of safety from "farm-to-fork" (Akonor & Akonor, 2013a).

1.2. Translating food safety (general food hygiene) knowledge into practice

The provision of knowledge to change food safety attitudes and behaviors has not been adequately proven in the literature. An effective food training course should not only provide food safety information, it should also implement knowledge into practice for proper information retention (Seaman & Eves, 2006).

Food safety training will lead to an improvement in food safety if the knowledge imparted reflects a positive change in behavior. The study suggests food safety training can have a significant impact on improving knowledge and behaviors of food operators; however, an increase in knowledge alone does not necessarily guarantee a change in behavior. The majority of food safety courses rely solely on the dissemination of information with very little emphasis on practice, which is ineffective. Behavioral changes in food safety will not occur as a result of training alone (Roberts et al., 2008).

1.3. Standard of food hygiene practices

Five keys to safer food manual

More than a million people are infected by diseases from food poisoning and more than a thousand deaths occur every year due to eating unsafe food. By adopting proper food handling practices, most foodborne diseases can be prevented. The WHO has grouped the messages under simpler headings and introduced the five keys: (World Health Organization, 2014).

a) **Keep clean**

- Wash your hands before handling food and often during food preparation.
- Wash your hands after going to the toilet.
- Wash and sanitize all surfaces and equipment used for food preparation.
- Protect kitchen areas and food from insects, pests and other animals.

b) Separate raw and cooked food

- Separate raw meat, poultry and seafood from other foods.
- Use separate equipment and utensils such as knives and cutting boards for handling raw food.
- Store food in containers to avoid contact between raw and prepared food.

c) Cook thoroughly

- Cook food thoroughly, especially meat, poultry, eggs and seafood.
- Bring foods like soup and stews to boiling to make ensure that they have reached 70 ℃. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer.
- Reheat cooked food thoroughly.

d) Keep food at safe temperatures

- Do not leave cooked food at room temperatures for more than two hours.
- Refrigerate promptly all cooked and perishable foods (preferably below 5 ℃).
- Keep cooked food piping hot (more than 60 ℃) prior to serving.
- Do not store food too long even in the refrigerator.
- Do not thaw frozen food at room temperature.

e) Use safe water and raw materials

- Use safe water or treat it to make it safe.
- Select fresh and wholesome foods.
- Choose foods processed for safety, such as pasteurized milk.
- Wash fruits and vegetables, especially if eaten raw.
- Do not use food beyond its expiry date.

1.4. Food hygiene strategies

The maintenance of good food hygiene shall be achieved through ensuring that:

a) Food preparation, handling and storage areas are kept clean and food handlers maintain good standards of personal hygiene at all times.

b) All foods are cooked properly, especially meat.

c) Foods are kept at the right temperature with chilled foods maintained cold and hot foods cooled as quickly as possible and then chilled.

d) Raw foods are prevented from cross-contaminating ready-to-eat foods

1.5. Food vendors' hygiene

Personal hygiene

a) Thoroughly wash (using warm water and liquid soap) and dry (using disposable towels or air, not aprons) their hands regularly when handling food, in particular:

- Before handling food
- Immediately after handling raw food, especially raw meat or poultry
- After going to the toilet
- After handling money
- After blowing their nose, sneezing or coughing
- After breaks (i.e., on returning to the restaurant after a break).

b) Wear clean clothes, aprons and, where practicable, protective food handling gloves and food handling tongs (to reduce direct contact with food).

c) Tie hair back and use a hair net or cap.

d) Cover cuts or sores with clean water resistant dressings.

e) Avoid wearing jewelry, false nails or other items that might fall into food.

f) Avoid touching their face or hair.

g) Do not cough or sneeze over food.

h) Do not smoke

1.6. Environmental hygiene

Training and supervision

Food business owners and license holders are responsible for ensuring that all food handlers receive adequate supervision, instruction and training in food hygiene (Ehiri & Morris, 1996)

Illnesses

Food handlers with symptoms of food poisoning, such as diarrhea, vomiting or stomach pains, must not handle food and must leave food preparation areas immediately. All other illnesses and skin conditions must be reported to a manager or the license holder, who then needs to determine if these conditions pose a risk of spreading bacteria or disease should the person continue to handle food (MOH, 2001).

Refuse disposal

External refuse containers are to be clean and in good repair, and have tight fitting lids. Waste food containers must be washed out before being stored outside. The general food hygiene regulations require that food waste and other refuse not be allowed to accumulate in food rooms, except when unavoidable for the proper functioning of the catering department. It is recommended that systems of work are in place to ensure that refuse containers in food rooms are not over filled and are emptied regularly. All waste is to be removed at the end of the working day. Adequate drainage and waste disposal systems and facilities should be provided. They should be designed and constructed so that the risk of contaminating food or the potable water supply is avoided (Codex Alimentarius Commission, 2003).

Food preparation

Food should be handled so as to prevent contamination and handlers should:

- Observe good personal hygiene.

- Use different chopping boards or work surfaces, equipment and utensils for raw and ready-to-eat food.

- Clean equipment and surfaces thoroughly before and after use.

- Avoid unnecessary handling of food.

- Minimize the time chilled food remains out of the fridge (World Health Organization, 2014).

Cooking

All poultry, pork, minced or chopped meat (including burgers and sausages) should be cooked thoroughly with the center of the meat maintained at:

- 60 ℃ for at least 45 minutes; or
- 65 ℃ for at least 10 minutes; or
- 70 ℃ for at least 2 minutes; or
- 75 ℃ for at least 30 seconds; or
- 80 ℃ for at least 6 seconds (World Health Organization, 2014).

Where cooked food is not being kept hot until served, it should be cooled as quickly as possible

Reheated food should be piping hot all the way through and should not be reheated more than once.

All probes, skewers and thermometers should be maintained clean and disinfected between foods (World Health Organization, 2014).

Transporting food

Contamination of foods during transportation shall be prevented through ensuring that:

- All food types are transported in packaging or containers
- Chilled or hot foods are maintained at the correct temperature
- Raw foods and ready-to-eat foods are kept apart
- Vehicles used to transport foods are maintained in good repair and clean with separate storage for food and non-food products

Food handling areas

Where appropriate, the internal design and layout of food establishments should permit good food hygiene practices, including protection against cross-contamination between and during operations for foodstuffs (Mynistry of Health, 2009a).

Temporary/mobile premises and vending machines

Premises and structures covered here include market stalls, mobile sale and street vending vehicles and temporary premises in which food is handled such as

tents and marquees. Such premises and structures should be sited, designed and constructed to avoid, as far as reasonably practicable, contaminating food and harboring pests.

In applying these specific conditions and requirements, any food hygiene hazards associated with such facilities should be adequately controlled to ensure the safety and suitability of food (Mynistry of Health, 2009b).

Facilities

Suitable facilities (including hot and cold water supply) for staff to wash their hands, food and equipment shall be provided:

- Separate basins stocked with liquid soap and hot air dryers or disposable towel facilities
- Separate sinks for washing food
- Sinks for cleaning of premises, equipment, utensils, etc. (Mynistry of Health, 2009a)

Mobile/temporary premises

Mobile and temporary premises for storing, preparing and handling food are, as far as is practicable, subject to the same provisions as other food service facilities. In particular these premises must ensure that:

- There are adequate facilities to store, prepare and serve food safely in accordance with the provisions of this policy.
- Adequate washing facilities are accessible (World Health Organization, 2014).

1.7. Hazard Analysis of Critical Control Point (HACCP) and food safety

HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical and physical hazards from raw material production, procurement and handling, to processing, preparation, distribution and consumption of the finished product (Verde, Tenreiro, & Botelho, 2004).

The HACCP system consists of seven principal activities which should be considered during the HACCP process, but in implementing the process, each step

should be applied in a manner consistent with the needs and resources of the premises. The steps in the HACCP process can be outlined as follows:

a) Hazard analysis: This will consist of pre-visits to the food premises, description of the products and their intended use, and finally listing all potential hazards associated with each step.

b) Determine critical control points: This is the heart of the HACCP study and the success is dependent on flexibility and common sense.

c) Establish critical limits: Critical limits must be specified for each control measure so as to monitor the CCPs (critical control points). This will include characteristics like temperature, time, etc., for example, clear running of juices in meats and boiling of liquids, which are an indication of thorough cooking.

d) Establish monitoring procedures: Monitoring is the scheduled measurement or observation at a CCP of the compliance with the critical limits set out for each control measure. Physical, chemical and sensory monitoring methods are preferred because of their speed of response. To monitor the critical control point, observations are made through use of the senses to evaluate the characteristics of foods, or measurements are taken of the physical or chemical attributes of the foods.

e) Establish corrective action procedures: Each deviation in the HACCP process has two types of action needed. Corrective actions are those that will bring the CCP back under control and disposition actions are those actions to be taken with the food that has been produced in the time period when CCP was out of control. This might include increasing cooking temperature and time, adjusting quantities of some ingredients, adjusting preparation or storage at a later stage, decreasing holding time, increasing holding temperature, reheating, re-washing and sanitizing, rejecting incoming goods and, finally, proper disposal of products. Disposal actions will require judgments based on the hazards and their assessed severity and risks.

f) Establish verification procedures: This should be done by health personnel who are experienced in HACCP and knowledgeable about preparing the foods of concern.

g) Establish documentation procedures: This calls for maintenance of log or record forms in which to put results of monitoring. This is essential for food processing operations and prudent in marketing of food service operations in the restaurants.

1.8. Regulations on food hygiene of street food vendors

Regulations on food hygiene are based on established codes for food safety, a major one being the Recommended International Code of Practice, which deals with general principles of food hygiene (CAC/RCP 1-1969, Rev. 4-20031).

In keeping with such a code, street food vendors in different places such as main streets, closed fresh markets and other public places should ensure food safety by operating in a clean environment, free of dust, insects, chemicals and other potentially harmful or contaminating matter.

A regulatory announcement on food hygiene issued in 2009 by the Department of Hygiene and Health Promotion (Food and Drugs Division, Ministry of Health, Lao PDR) recommends the following for street food premises:

- Tables for selling foods are made from solid, smooth, easy-to-clean material and should be at least 60 cm in height from the ground.

- Cooked foods are covered with or protected from pests and insects.

- Food additives used must comply with the types recommended by the local Food and Drug Division.

- Drinking and ice water must be stored in a clean container with a lid and at least 60 cm in height from the ground.

- Drinks must be placed in clean, covered containers

- Ice for consumption should be kept in a clean container with a lid and at least 60 cm from the ground, without food or other items stored together with the ice.

- Equipment or utensils for cooking must be washed with liquid soap, then rinsed with clean, flowing water twice and the wash area at least 60 cm above the ground.

- Chopsticks, spoons and forks must be placed in a vertical position in a clean container with a cover and stored under shelter at least 60 cm from the ground.

- Baskets should be available for garbage and containers with lids for food scraps.

- Food handlers must wear clean clothes, and cooks must wear aprons, hats and masks.

- Any wounds or abrasions especially on the hands of handlers and cooks should be sealed with bandages which should be changed regularly.

1.9. Food policy

At a broader level, the Recommended International Code of Practice, General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 4-2003) provides essential guidelines to food safety authorities as follows:

a) Identify the *essential* principles of food hygiene applicable *throughout the food chain* (from primary production through to the final consumer), to achieve the goal of ensuring that food is safe and suitable for human consumption;

b) Recommend a HACCP-based approach as a means to enhance food safety;

c) Indicate *how* to implement those principles; and

d) Provide *guidance* for specific codes which may be needed for sectors of the food chain, processes or commodities to amplify the hygiene requirements specific to those areas (Codex Alimentarius Commission, 2003).

Laos National Food Safety Policy, 2009 on food hygiene and safety

The National Food Safety Policy was implemented to ensure the application of laws, regulations and standards that are appropriate from farm to table. This policy includes the following measures:

a) Use risk analysis to carry out science-based evaluations and for reaching sound, consistent solutions to food safety problems.

b) Address food safety and control throughout the food chain from farm to table, engaging all key activities such as food security, food production, food processing, food distribution, consumer participation, review systems and emergency response.

c) Ensure that the knowledge and skills of regulators, inspectors, and food analysts will be strengthened and improved in both quality and quantity.

d) Promote collaboration and cooperation at the national level across all the ministries and committees involved in food safety and quality, e.g., between the Food and Drug Committee, the National Codex Committee and other related sectors (both government and private).

e) Promote better food safety management by strengthening information collection, including inspection and surveillance activities, and analysis for risk management decision making.

f) Promote and support food trade to be safe, following the standards of Codex Alimentarius and agreements related to food safety such as those of ASEAN and the World Trade Organization.

g) Promote and strengthen international cooperation and assistance in developing a national program of food safety. It shall also recognize international obligations of the Lao PDR in relation to food safety and trade.

1.10. Studies on knowledge and practices of street food vendors

Knowledge and practices on food hygiene, based on WHO recommendations, are so that the food handlers and consumers can

a) know the food they use (read labels on food packaging, make an informed choice and become familiar with common food hazards);

b) handle and prepare food safely, practicing the WHO Five Keys to Safer Food at home, or when selling at restaurants or at local markets;

c) Grow fruits and vegetables using the WHO Five Keys to Growing Safer Fruits and Vegetables to decrease microbial contamination.

In this study, these guidelines have been adopted to develop a questionnaire to measure the knowledge and practices of street food vendors and organize the findings into two levels, “good” and “poor”. Based on the overall scores, knowledge and practices at both the good and poor levels must be improved.

There are also other ideas and theories about such knowledge and practices. Some researchers such as Glanz maintain that it has been traditionally assumed that knowledge is automatically translated into behavior and practices (Glanz et al., 2008; Prochaska et al., 2002).

A study by Nigusse and Kumie to assess food hygiene practices and the prevalence of intestinal parasites among food handlers showed that the knowledge of food hygiene was fair (64.6%) (Nigusse & Kumie, 2012).

In addition, authors McIntosh, and Peckarsky (1994) define knowledge as the practice which in turn affects willingness to change current practices if it is learned that current practices are unsafe.

In a study of the knowledge, attitudes and hygiene practices in schools, the students surveyed were considered as having good, proper knowledge of hygiene. This knowledge is necessary for the practice of proper hygiene in the school environment (Vivas et al., 2010).

1.11. Some factors related to food hygiene

Age: In studies conducted by Annor and Baiden (2011) and Soares et al. (2012), the authors opined that age and sex apparently do not appear to play a role in the food safety knowledge of street food.

Forsythe (2009) in their study identified that the level of food safety knowledge associated with the socio-demographic characteristics shows a positive correlation. This means that academic level and age, which are both characteristics of socio demography, influence food safety knowledge positively.

Sex: Sanlier (2010) observed that food safety knowledge and practices between males and females showed dominance on the part of females in food preparation compared to males. However, in terms of knowledge, males and females were equal.

Education: The study by Roseman and Kurzynske reported that educational levels influence food safety and the hygiene knowledge of street food vendors. It was evident in the study that respondents with higher academic qualifications showed a higher level of food safety skills than respondents with a lower academic qualification (Roseman & Kurzynske, 2006).

In addition, Norazmir et al found that an increase in food safety knowledge is positively associated with the socio-demographic and academic variables (Norazmir et al., 2012).

However, the study by Annor and Baiden (2011) argued that a person's educational level does not guarantee a higher knowledge and attitude in relation to food safety.

Accessibility to information on food: Providing information in the community on various topics has an important role to play in improving knowledge and leading to positive behavioral changes. The Safe Food Intervention Program implemented in Vientiane Province of Lao PDR showed such progress after training to trainers to continue to provide knowledge in the food safety community. In a study among rural households in Cambodia, the rural communities were found to have changed their food hygiene behaviors positively (Warnock, 2007).

Training on hygiene: A study to assess the knowledge, attitudes, and behavior concerning foodborne diseases and food safety issues amongst food handlers conducted in Italy found that the majority of food handlers who had attended a training course had knowledge and a positive attitude toward foodborne diseases control and preventive measures. With training, it was expected that the food handlers would adopt good hygienic practices that would lead to the reduction of food-borne diseases. Education, training, and the development of food safety certification examinations are key components in the process of ensuring that food handlers are proficient in and knowledgeable about food safety and sanitation principles (Jacob & WHO, 1989).

1.12. Some studies on knowledge and practice of food hygiene

A study to assess the knowledge and practice of food safety and hygiene among food vendors in primary schools in Jos, Plateau State, North Central Nigeria showed that the proportion of the food vendors in this study with good knowledge of food safety and hygiene was 106 (60.9%), while 68 (31.9%) had poor knowledge with the mean knowledge score of 18.59 ± 5.90 out of a total of 34 (Afolaranmi, Hassan, Bello, & Misari, 2015).

In a study entitled "Assessment of personal hygiene knowledge and practices in Al Ain, United Arab Emirates", the results of the assessment section were found to be related to the personal hygiene practices of the respondents. This study classified the respondents according to their knowledge on food safety information into four levels (25%, 50%, 70% and 90%). Results illustrate that 38% of the total studied population have an information level of 70%, while around a third of the population (31%) have a medium level of information (50%). In addition, 27% of the respondents have the highest level of information (90%). On the other hand, only 4% of all respondents have a knowledge level of 25% with regard to food safety information. Furthermore, statistically, results show that there is no significant relation between the educational levels of the participants and the level of food safety information. As a conclusion, the findings of this study illustrate that there is no relation between knowledge and personal hygiene practices in the public, even at the higher levels of education (Afifi & Abushelaibi, 2012).

A study by Galgamuwa et al entitled "Knowledge and practices of food hygiene among food handlers in the plantation sector, Sri Lanka" assessed the knowledge of food handlers regarding food hygiene and showed that among the 375 food handlers, the majority of them were females. Out of all the respondents, 71% had completed only primary education and 13% had no formal education. Most of the study subjects were unemployed, had more than five years' food handling experience and had low household income. 59.5% of the food handlers studied were found to have good practices of food safety and hygiene. The gender of the respondents showed a statistically significant relationship with the practices of food

safety and hygiene ($p < 0.05$). Similarly, the level of education of the food vendors had a statistically significant influence on the practice of food safety and hygiene (Galgamuwa, Iddawela, & Dharmaratne, 2016).

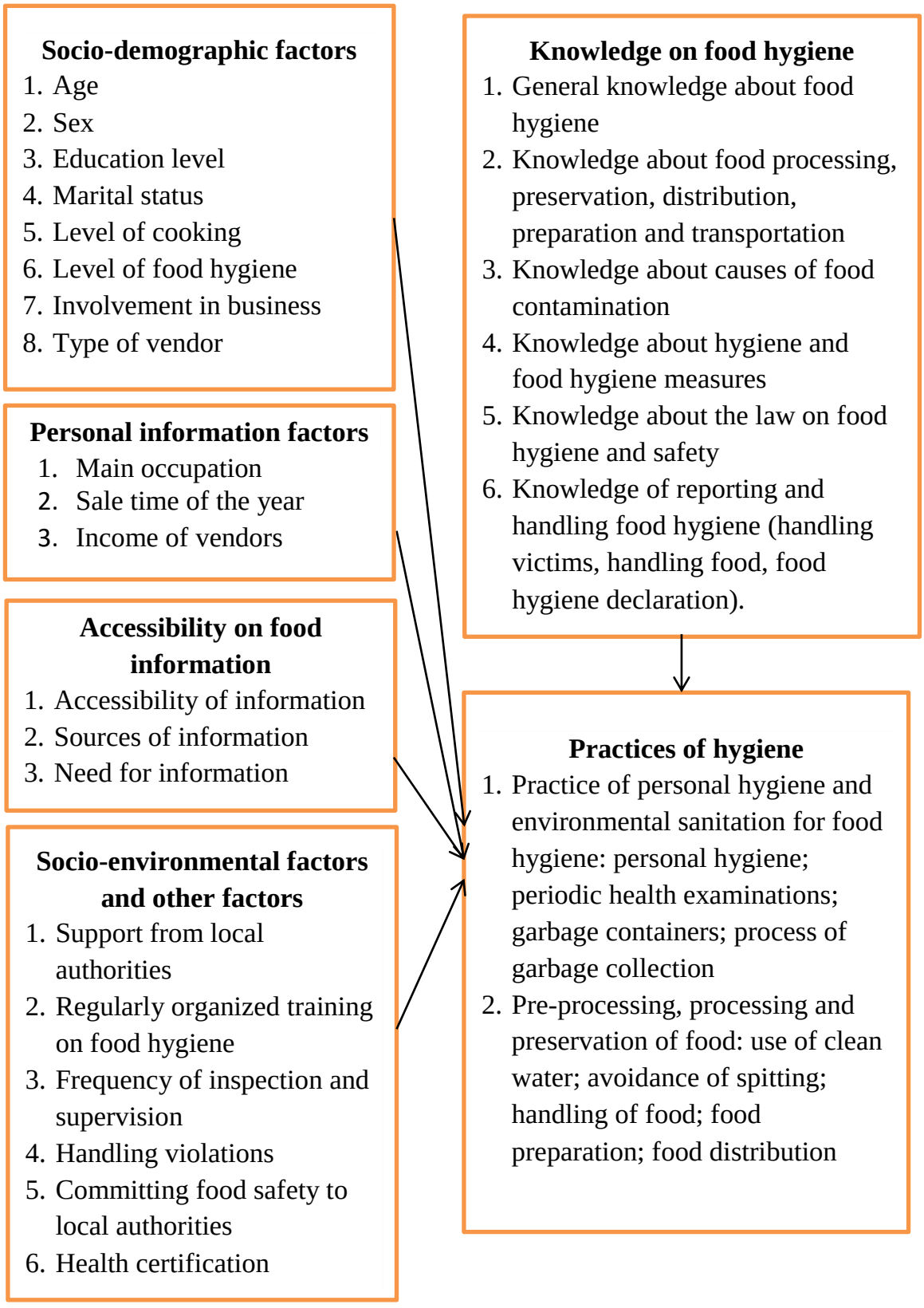
A study of food safety knowledge, attitudes and hygiene practices among the street food vendors in northern Kuching city, Sarawak, Malaysia involving 361 street food vendors revealed that only 36.8% of the vendors had good knowledge of food hygiene. About 41.6% of the vendors had fair knowledge of food hygiene. In determining factors that affect knowledge, attitudes and practices, a multinomial regression model was fitted with knowledge, attitude and practice. In regression analysis, age and ethnicity appeared to be important factors for good knowledge of food safety. This indicated that Malays had 2.898 (95% CI) times better knowledge compared to poor knowledge ($p<0.05$) (Rahman, Arif, Bakar, & bt Talib, 2016).

In the literature mentioned above, it may be noted that most food handlers have knowledge about food hygiene, but this did not lead to good practices in food hygiene. The majority of these handlers had unacceptable practices especially with regards to hand washing at the right time and with the right materials, wearing of protective apparel, proper cleaning of cutlery and utensils, etc.

1.13. Conceptual framework

Figure 1 illustrates the conceptual framework of knowledge and practices and the related factors on food hygiene among street food vendors in VTE, Laos. There are five groups of factors associated with practices on food hygiene, namely, 1) Socio-demographic factors, 2) Personal information factors, 3) Accessibility of food information, 4) Socio-environmental factors and other factors and 5) Knowledge of food hygiene.

Figure 1.1: Conceptual framework of knowledge, practices and related factors of food hygiene among street food vendors in VTE.



This theoretical framework, derived from the literature review, is based on the Law on Food No: 37/PO, 15 May 2004 and the Law on Hygiene, Disease Prevention and Health Promotion No: 13/PO, 10 April 2001, National Food Safety Policy No 020/MOH, 13/01/2009 and has been developed from reviews of several similar theoretical frameworks before.

Chapter 2

RESEARCH METHODOLOGY

2.1. Study setting and duration

2.1.1. Study setting

Vientiane city is the capital of the Lao PDR. It consists of nine districts and is divided into three regions: four districts are in urban, three districts in peri-urban and two districts in suburban areas. The four urban districts of Sikhottabong, Sisattanak, Saysettha, and Chanthabouly are identified for this study as street food vendors are widespread in these areas.

2.1.2. Study duration

The duration of the study was 14 months, from May 2018 to June 2019.

2.2. Study design

The study was a descriptive, cross-sectional study.

2.3. Study population

Street food vendors on the main streets, close to fresh markets and in some public places were identified for the study.

2.3.1. Inclusion and exclusion criteria in study

a) Inclusion criteria: Subjects included in the study were

- Street food vendors who were willing and consented to participate in this study.

- Street food vendors who operated their businesses near the main fresh markets in the four urban districts of Sikhottabong (Kokpho, Sikhay and Nongniew markets), Sisattanak (Thongphanthong and Souanmone markets), Saysettha (Nongnieng and Houakhoua markets), and Chanthabouly (Vangthong, Thongkhankham and Houayhong markets).

- Street food vendors who operated their businesses near or in main public places (bus stations and public parks or squares in each district).

- Street food vendors who could communicate in the Lao language

b) Exclusion criteria: Food handlers who were not willing to participate in the study were excluded from this study.

2.3.2. Sample size

$$n = \frac{Z^2_{1-\alpha/2} \cdot p(1-p)}{d^2}$$

Where:

- n: Sample size
- p: expected prevalence of street food vendors who have good knowledge of food hygiene, but due to there not having been any study in Vientiane, we applied p = 61% with reference to a study in Nigeria (Afolaranmi et al., 2015).
- q = 1- p
- d: Absolute precision (d = 0,07)
- α: level of significance 95%, α = 0,05.
- $Z_{1-\alpha/2}$: = 1,96

$$\text{Sample size } (n) = \frac{1.96^2 \ X \ 0{,}61(1-0{,}61)}{0{,}07^2} = 186$$

Applying 5% contingency on the sample for subjects not meeting or refusing to be interviewed, the sample size of the study was 196 street food vendors.

2.3.3. Sampling selection method

As there were no available records or databases for the total population of the street food vendors in each of the previously randomly selected districts, the researcher had to use a haphazard sample selection. Accordingly, those street vendors available in the main streets close to fresh markets and in public places were included in the study. Prior to administering the questionnaire, research assistants were trained on the appropriate skills needed for interviewing respondents. These assistants were recruited from among staff members of the Department of Public Health, VTE. The data collection was performed over a

period of ten (10) days. During the data collection, the research assistants interviewed the street food vendors using the questionnaire forms and ticking in the observation lists. Responses obtained from the sampling collection taken in the four urban selected districts were recorded accordingly. The numbers of vendor outlets in the study are shown in table 2.1.

Table 2.1: Number of outlets to be recruited for the study

District	Number of outlets	Name of the market (number)	Public places (number)	Main streets (number)
Chanthabouly	55	Vangthong (20) Houayhong (15)	Savang (20)	
Sikhottabong	45	Kokpho (10) Sykhai (15) Nongniew (10)		Luangphabang (Sykhai zones) (10)
Saysettha	55	Houakhoua (15) Nongnieng (10)	Thatluang (30)	
Sisattanak	41	Thongphanthong (10) Souanmone (10)		Phonethan (10) Khouvieng (11)
Total	**196**	**115**	**50**	**31**

2.4. Variables measured

The variables measured included both independent and dependent variables.

2.4.1. Independent variables

The independent variables were knowledge and other factors related to food hygiene.

2.4.2. Dependent variables

The dependent variables were the practices of street food vendors in food hygiene such as the practice of personal hygiene and environmental sanitation and the practices in pre-processing, processing and preservation of food.

The concepts and definitions of the terms of knowledge, practices and other related factors on food hygiene are in Annex 3.

2.5. Measures and assessment criteria

2.5.1 Measures

Based on a previous study by Koraish and El-Lassy on an assessment of food safety knowledge and hygienic practices among street food vendors in Alexandria (2014), this study included food safety knowledge and hygiene practices among street food vendors. The questionnaire was developed from review of many previous studies for measuring knowledge, practices and related factors in food hygiene among street food vendors. Its validity was first tested in a pilot survey among 30 street food vendors in Chanthabouly district, which was out of the actual sample researched. Completing the questions took them 25-30 minutes. The design was assessed as complete and sufficient; only small adjustments were made. The response rate for the knowledge questions was good. Internal consistency was calculated at 0.74 on the scale of Cronbach's alpha.

2.5.2. Assessment criteria

The measurement of the level of hygiene in the knowledge and practices of the vendors was achieved by the questionnaire, which consisted of six parts and included 79 questions.

Part 1. Socio-demographic factors

This part contained eight questions to determine the vendors' age, sex, education level, marital status, knowledge of cooking, level of hygiene, experience in the food business and type (stationary or mobile).

Part 2. Personal information

The part on personal information consisted of three questions to obtain data on the vendors' main occupation, sale time of the year and income from sales.

Part 3. Social environmental factors and other factors

The part on socio-environmental factors and other factors had five questions regarding support from local authorities, training organized on food hygiene,

frequency of inspection and supervision, assurance of food safety to local authorities and health certification.

Part 4. Accessibility of food information

This part consisted of three questions asking about accessibility to food information, sources of information and need for more information.

Answer choices to the questions of each part above were in multiples of two, three, four, five and as many as ten options and the choices were number coded. This was with the exception of income per month which provided a blank for the amount to be filled in. The data from the two continuous questions was classified into two groups by values of mean or median.

Part 5. Knowledge of street food vendors on food hygiene

Knowledge on food hygiene was ascertained via 41 questions in six groups: 10 questions on general knowledge about food hygiene;10 questions on knowledge about food processing, preservation, distribution, preparation and transportation; eight questions on knowledge about causes of food contamination; five questions regarding knowledge about hygiene and food hygiene measures; six questions on knowledge about the law on food hygiene and safety and two questions on knowledge of reporting and handling of food in the event of food poisoning.

To assess street food vendors' knowledge, the respondents were given three answer choices: (Yes), (No), and (Don't know), with Yes indicating the "right" answer, no meaning the "Wrong" answer and "Don't know" meaning no idea.

The scoring system for assessing the vendor's knowledge regarding food hygiene was "1" for each right answer and "0" for each wrong or uncertain answer. A summated composite score for each sub-part of Part 5 was generated with the minimum score and the maximum score of that sub-part.

The questionnaire was adapted and developed from some studies which were done to determine the two levels of knowledge as good and poor knowledge on food hygiene. The total knowledge score ranges were 0-10 for general knowledge; 0-10 for knowledge about food processing, preservation, distribution, preparation and transportation; 0-8 for knowledge about causes of food contamination; 0-5 for

knowledge about hygiene and food hygiene measures; 0-6 for knowledge about the law on food hygiene and safety and 0-2 for knowledge of reporting and handling food in food poisoning cases. Then the mean value of each group of knowledge was calculated to consider the level of knowledge. If the knowledge score was equal to or less than the mean value, it was considered as poor knowledge whilst a knowledge score of more than the mean value was considered as good knowledge regarding food hygiene (Megersa et al., 2017).

Part 6. Practices on food hygiene

Questions on food hygiene practices comprised 12 questions on practices in personal hygiene and environmental sanitation and nine questions on practices in pre-processing, processing and preservation, a total of 21 questions. The interviewers observed and gave scores of "1" point if the street food vendors followed what was on the list and "0" points if they did not follow what was on the list. The total practice scores obtained for each vendor were thus from (0-12) for personal hygiene and environmental sanitation and (0-9) for practices of pre-processing, processing and preservation. Then the mean value to determine the level of practices was calculated. A practices score equal to or less than the mean value was considered poor while a practices score of more than the mean value was considered good regarding food hygiene.

2.5.3. Definitions of operational terms

For the purpose of the RCP code (CAC/RCP 1-1969, Rev.4-2003) on food hygiene (see 1.9), the following expressions are explained or defined as follows:

Knowledge on food hygiene: This is accumulated through learning processes such as formal or informal instruction, personal experience and sharing of experience by others.

Practices on food hygiene: This is a subject of wide scope and it is a broad term used to describe the preservation and preparation of foods in a manner that ensures the food is safe for human consumption.

Street vendors: Two types of street vendors operate in the Lao PDR: permanent (trolleys or other vehicles that sell or serve food at streets or other places

with seating arrangements with/without roof) and temporary/mobile (sale or service of prepared food, ready to eat or drink without permanent location, by carrying or from a portable stall, or by pushcart or basket with or without a vehicle) (World Health Organization, 2012).

Street food: The definition of street food given by the Food and Agricultural Organization (2013) posits that the practice encompasses the ready-to-eat beverages and foods cooked and/or traded by vendors and cooks particularly in the open or in an enclosed public location for quick consumption or taking food home to eat without further cooking (Frank, 2015).

Food handler: Any person who directly handles packaged or unpackaged food, food equipment and utensils, or food contact surfaces and is therefore expected to comply with food hygiene requirements.

Food hygiene: This is the handling or serving of food without contamination of bacteria, chemical substances or toxic or adulterated agents that are dangerous to the consumers' health.

2.6. Data collection methods

Both face to face interviews by questionnaire forms and direct observation with a checklist were used for data collection for the study.

2.6.1. Interview and observation methods

The knowledge, practices and its related factors on food hygiene among street food vendors were determined by means of a face to face interview utilizing a structured questionnaire. Two methods of data collection were used:

2.6.1.1. Interviews with street food vendors to collect data on knowledge

Face to face interviews utilizing trained investigators were carried out from 21 November 2018 to 15 December 2018 utilizing a standardized questionnaire. Interviews were conducted in the Lao language. The questionnaires were divided into various sections and comprised different questions. Data was collected on socio-demographic characteristics, personal information, accessibility of food information, social environmental factors and knowledge regarding food hygiene. Possible answers were listed, for example, answer choices such as 'yes', 'no',

'correct', 'wrong' and 'do not know', while some questions required amounts to be filled in. The questionnaire contained mostly structured, close-ended questions. It was used to collect information from each street food vendor in the sample. The questionnaires (see Annex 1) were administered by the investigators.

The interview questions mostly required ticking (✓) to indicate the interviewees' responses, although some questions required amounts to be provided. Street food vendors were interviewed at their outlets and the questionnaire took approximately 25 to 30 minutes to complete.

2.6.1.2. Observation to collect data on practices related to food hygiene

Observation of the street vendors' food hygiene practices was carried out for duration of about 25 minutes per vendor while the interview did not have a specific time for completion. The street food vendors were observed based on a checklist on personal hygiene, environmental sanitation and practices on pre-processing, processing and preservation of food to ascertain their level of food hygiene (see Annex 2).

2.7. Testing tools for collecting information

The questionnaire on food hygiene knowledge, practices and its related factors was developed based on previous studies but was adjusted to suit the purpose of this study. After that, the questionnaire was submitted to a specialist for the contents to be checked and was then revised again before use in conducting an initial pilot survey with a group of 30 street food vendors who were not included in the target group. After collecting the data, the questionnaires were entered into a computer using the Epidata version 3.0 program and then transferred for analysis using STATA version 11.0 for the query of the reliability coefficients using Kuder-Richardson's formula (Kuder-Richardson, KR20).

2.8. Data analysis process

Data entry was done in EpiData software and the data was then transferred to STATA software version 11.0 where the data was cleaned and analyzed. Descriptive statistics were thus obtained to reflect for each variable the percentages, frequencies, mean, standard deviation (SD) and minimum and maximum values.

For the analysis of the factors associated with hygiene practices, logistic regression analysis was performed. Associations were considered significant with a p-value < 0.05, 95% confidence interval (95% CI) and Adjusted odds ratio (OR) value.

2.9. Data analysis methods

In the preparation phase, all the interview forms collected were examined for completeness.

In the data entry stage, the following steps were carried out:

1) Data input: All the collected data was entered using EpiData 3.0 software.

2) Data cleaning: After completing the entry, the data was cleaned by full review and correction of errors during the input process.

3) Application of statistical methods of description: The frequency and percentage distribution of some variables were calculated.

4) The odds ratio (OR) and the 95% confidence interval (CI) were used to demonstrate the strength of the correlation between the independent variables of the knowledge and other factors related to food hygiene and the dependent variables of the hygiene practices.

2.10. Ethical considerations

The study was conducted only after it was approved by the Ethics Committee of the Faculty of Health Sciences, Ministry of Public Health. All participants were notified of the details of the study team, the research objectives and the procedures for the conduct of the research activities with the participants. Participation was voluntary and participants could withdraw from the research at any time and could choose not to respond without any effect on their food business if they found that the questions infringed on their privacy. The information acquired was kept confidential and only used in the research work.

2.11. Limitations and bias and how to minimize this bias

2.11.1. Limitations of the study

- Discrepancies in this study may occur because the food hygiene variables cannot be measured accurately but only through the subjective factor of the investigators without the use of tests or measuring machines.

- This is a cross-sectional study, which only determines the knowledge and correctness of the processors at a given point in time. It is therefore difficult to conclude causal relationships between knowledge and practices and a number of factors.

2.11.2. Errors

a) Errors in the collection of data may be encountered during the investigation due to the following:

- The interviewers not remembering or carefully following the research procedures;

- The interviewees not understanding the questions;

- The researcher and interviewers collecting inaccurate data;

- The interviewers not being clear when asking their questions or conducting their observations; and

b) The researcher making mistakes during data entry.

2.11.3. Ensuring reliability

a) For the researchers

-The questionnaire was pre-tested before conducting the survey on the research population, and then adjusted accordingly.

-Thorough training of investigators on the data collection was conducted (interviews, observation, approaches and creation of a comfortable atmosphere for the respondents).

-The researcher collected, checked and completed the questionnaires after each survey day. The original questionnaires were accounted for and checked by the researcher.

b) For the interviewees

- The purpose and significance of the survey and interview were explained clearly so that the subjects could understand and accept the terms for their cooperation.

- The best conditions were created for the subjects to understand the questions and to answer honestly and clearly.

- The observations to evaluate the hygiene practices were conducted independently and without warning time.

Chapter 3

RESULTS

This study was a cross-sectional study to assess the knowledge, practices and its related factors on food hygiene among street food vendors in VTE of Lao PDR, with a sample of 196 street food vendors. At the same time, data collection was through a face to face interview with a questionnaire and an observation checklist. The data analysis employed descriptive statistics such as number distribution, frequencies, mean, standard deviation, and minimum and maximum values to find a relationship using Multiple Logistic Regression by setting p-value<0.05, reporting value as p-value, confidence interval at 95% (95% CI) and an adjusted OR value.

3.1. Factors related to hygiene practices

The sample size for the study was 196; the completion was 100%. This response rate gave an indication of the enthusiasm of the respondents in taking part in the issue under study.

3.1.1. Socio-demographic characteristics

196 street food vendors with 196 outlets in four urban districts of VTE, namely, Chanthabouly, Sikhottabong, Saysettha and Sisattanak districts, were selected for this study,. Figure 3.1 shows the number of vendors in each district.

Figure 3.1: Sample sizes in the four urban districts of VTE

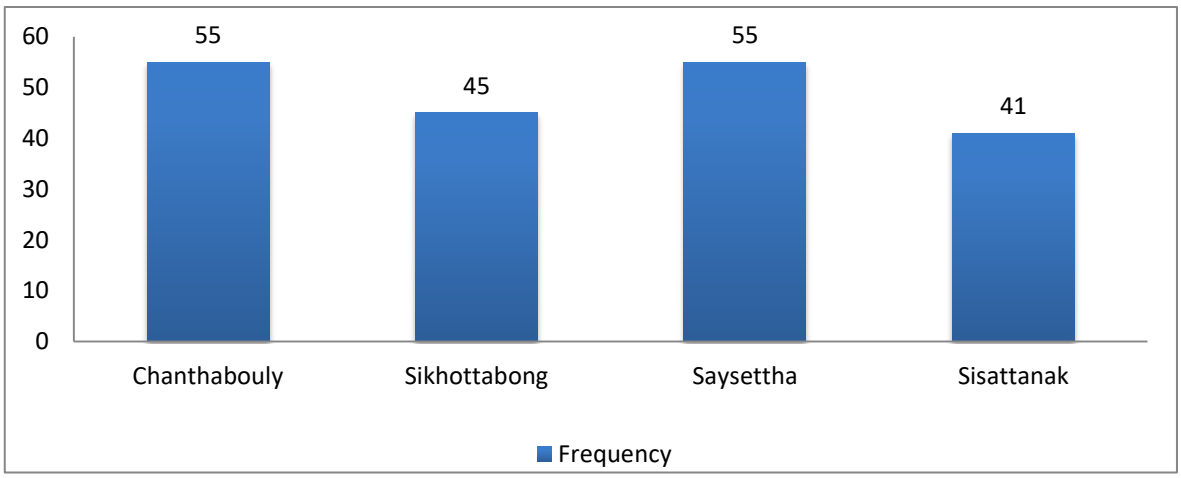


Table 3.1: Frequency and percentage of socio-demographic characteristics

Variable	Frequency (n=196)	Percentage (%)
Age (mean=39.07, age range 14-61, SD ±10.6)		
Age group		
≤20 years	9	4.5
21-30 years	39	19.9
31-40 years	54	27.5
>40 years	94	47.9
Sex		
Female	160	81.6
Male	36	18.3
Marital status		
Single	39	19.9
Married	128	65.3
Widow(re)d	18	9.1
Divorced	11	5.6
Education level		
Illiterate	4	2.0
Primary school	93	47.4
Junior high school	65	33.1
High school	29	14.8
College or above	5	2.5
Have been trained in cooking		
Yes	70	35.7
No	126	64.2
Have been trained in food hygiene		
Yes	64	32.6
No	132	67.3
Have been involved in this type of business		

Less than 1 year	7	3.5
From 1 to 3 years	33	16.8
For 3 years or more	156	79.5
Type of vendor		
Stationary	124	63.2
Mobile	72	36.7

Table 3.1 shows the socio-demographic characteristics of the 196 street food vendors in the four urban districts. The majority of respondents, nearly half (47.9%), were over 40 years of age (age ranging from 14 to 61), with a mean of (39.07 ±10.6) years. Among those surveyed were more females (81.6%) than males (18.3%). Of the respondents, 65.3% were married while 19.9% were single. In terms of education, 47.4% of them had completed primary school and 33.1% had completed junior high school. As for training, 64.2% of the vendors did not have basic formal training relevant to food cooking while 35.7% were trained in food cooking. The training in food hygiene was quite similar to the training in cooking, with 67.3% of respondents not having basic formal training in food hygiene. Further, 79.5% of street food vendors had been in business longer than three years. More than half (63.2%) of the respondents sold food at stationary outlets while 36.7% were mobile vendors (Table 3.1).

3.1.2. Personal information

Table 3.2: Frequency and percentage of personal information

Variable	Frequency (n=196)	Percentage (%)
Main occupation		
Street vendor	153	78.1
Worker (factory, company, etc.)	18	9.1
Employee (government staff)	25	12.7
Sale time of year		

Continuous (all day, all year)	161	82.1
Part time	35	17.8
Monthly income of vendors		
≤500,000 LAK	41	20.9
500,001-2,000,000 LAK	90	45.9
2,000,001-4,000,000 LAK	39	19.9
>4,000,000 LAK	26	13.2

Table 3.2 shows that 78.1% of the respondents had food vending as their main occupation, while only 9.1% and 12.7% were employees in the private sector and government staff respectively. For the sale time of the year, 82.1% of them sold food continuously while 17.8% sold part time. In terms of income, the highest proportion of the respondents (45.9%) earned between 500,000 and 2,000,000 Kip per month (Table 3.2).

3.1.3. Socio-environmental and other factors

Table 3.3: Frequency and percentage of socio-environmental and other factors

Variable	Frequency (n=196)	Percentage (%)
Regulated and licensed by local government		
Yes	139	70.9
No	57	29.0
Attended training on food hygiene organized by district health center		
Yes	57	29.0
No	139	70.9
Frequency of inspection by local food and drug authorities		
Once in less than 3 months	21	10.7
Once every 3-6 months	63	32.1
Once in over 6 months	80	40.8
Not yet	32	16.3

Signed food safety commitment with local food and drug authorities		
Yes	111	56.6
No	85	43.3
Obtained health certificate		
Yes	86	43.8
No	110	56.1

Table 3.3 demonstrates that almost 70.9% of the respondents were regulated or licensed by the local authorities to run their businesses and 70.9% had not been trained in food hygiene by the district health center. In terms of food inspections and supervision, 40.8% were inspected by local authorities once in over 6 months while 32.1% were inspected every 3-6 months and 10.7% were inspected every three months or less. Out of the 196 vendors, 16.3% were not or had not yet been inspected. As for the signing of a food safety commitment with the local food and drug authorities, 56.6% of respondents had signed for food safety whilst 43.3% had not signed to commit to food safety. Regarding their annual health checkup, 43.8% of the respondents had tested for health while 56.1% were not covered by a health check (Table 3.3).

3.1.4. Access to food information

Table 3.4: Frequency and percentage of access to food information

Variable	Frequency (n=196)	Percentage (%)
Heard of food hygiene		
Yes	99	50.5
No	97	49.4
Source of most information on food hygiene		
TV	119	60.7
Radio	31	15.8
Newspapers	13	6.6

Internet	4	2.0
Friends, relatives	20	10.2
Parents	4	2.0
Training	4	2.0
Health staff	1	0.5
Community loudspeakers	0	0.0
Others	0	0.0
Need to know more about food hygiene		
Yes	123	62.7
No	73	37.2

Table 3.4 shows the vendors' access to food information. Half of the respondents (50.5%) had heard of food hygiene. Most of the respondents (60.7%) had received information on food hygiene from television and some respondents had obtained food information from friends, radio, newspapers, the Internet, parents, trainers and health staff but none from loudspeakers in the community. Over half (62.7%) of the respondents needed to know more about food hygiene (Table 3.4).

3.2. Knowledge of street food vendors on food hygiene

3.2.1. General knowledge

Table 3.5: General knowledge on food hygiene

Variable	Yes		No		Don't know	
	(n)	(%)	(n)	(%)	(n)	(%)
The basic requirements for washing hands is to use soap and clean water	127	64.8	62	31.6	7	3.5
The reason for drying your hands after washing is to avoid dripping onto or wetting food, ingredients, utensils, etc.	116	59.1	68	34.6	12	6.1

During preparation of food, the best way of drying hands after washing is to wipe with a damp cloth**	97	49.4	60	30.6	39	19.9
The fingernails of the food vendor can be long**	84	42.8	90	45.9	22	11.2
Food contaminated with microorganisms cannot be detected by scent or sight and cannot be consumed	109	55.6	77	39.2	10	5.1
We should wash the cooking utensils after use	138	70.4	54	27.5	4	2.04
We need to wash the cooking utensils with soap and clean water	129	65.8	65	33.1	2	1.02
Unsafe food can cause food poisoning and risk of disease	135	68.8	57	29.0	4	2.04
Food poisoning is caused by contaminated and toxic food matter	140	71.4	53	27.0	3	1.53
Fresh vegetables should be washed with warm water and soap**	137	69.9	54	27.5	5	2.55

The results in Table 3.5 reveal that the majority of street food vendors had some general knowledge of food hygiene: 64.8% understand that the basic requirements for washing hands is to use soap and clean water, 70.4% know the need to wash cooking utensils after use and 65.8% were aware that the cooking utensils should be washed with soap and clean water. In addition, 71.4% understood the causes of food poisoning through contaminated food matter and 69.9% understood that fresh vegetables should not be washed with warm water and soap (Table 3.5).

3.2.2. Knowledge of food processing, preservation, distribution, preparation and transportation

Table 3.6: Frequency and percentage of knowledge about food processing, preservation, distribution, preparation and transportation

Variable	Yes		No		Don't know	
	(n)	(%)	(n)	(%)	(n)	(%)
The correct temperature for storing frozen food should be 0 °C	90	45.9	17	8.6	89	45.4
Raw meat should be stored in the top box of a refrigerator	90	45.9	84	42.8	22	11.2
The key to preparing food safely is to prevent food poisoning	152	77.5	41	20.9	3	1.5
Serving food to customers can be done with utensils that do not need to be cleaned**	143	72.9	45	22.9	8	4.0
Residual foods do not need to be warmed up to kill the disease**	108	55.1	74	37.7	14	7.1
The length of storage of raw food before processing must be one month or more**	116	59.1	64	32.6	16	8.1
We should use chemicals for food storage**	96	48.9	89	45.4	11	5.61
We need to keep residual food for many days for resale**	116	59.1	71	36.2	9	4.59
Food suppliers should have full particulars of their business and food quality certificates	127	64.8	53	27.0	16	8.16
Food should be properly wrapped and stored at temperatures of <5 or >60°C	69	35.2	21	10.7	106	54.08

From Table 3.6, which shows the level of knowledge of street food vendors about food processing, preservation, distribution, preparation and transportation, it was found that most scores were around 50%. Only two points had high scores: 77.5% of the vendors were aware that the key to preparing food safely is to prevent food poisoning and 72.9% knew the hygiene requirements for serving food to customers.

3.2.3. Knowledge about causes of food contamination

Table 3.7: Frequency and percentage of knowledge about causes of food contamination

Variable	Yes		No		Don't know	
	(n)	(%)	(n)	(%)	(n)	(%)
You can reheat food leftovers 2-3 times for sale**	76	38.7	102	52.0	18	9.1
All kinds of microorganisms can cause toxic food	106	54.1	71	36.2	19	9.6
Foods with bad smell contain microorganisms that cause food poisoning	75	38.2	56	28.5	65	33.1
Food poisoning is caused by unclean cooking equipment and improper processes	108	55.1	75	38.2	13	6.63
When you have an infection such as diarrhea, hepatitis A and E, yeast infections, you can cook **	119	60.7	24	12.2	53	27.04
You should always wash your hands while cooking	61	31.1	129	65.8	6	3.06
Do you use the same cooking tools for fresh and processed foods? **	85	43.3	98	50.0	13	6.63
Glass cabinets should be used when	139	70.9	54	27.5	3	1.53

selling food to avoid insects and dust

The scores on level of knowledge among street food vendors in Table 3.8 revealed that 70.9% of the street food vendors had knowledge on selling food in glass cabinets to prevent food contamination, 60.7% knew to avoid cooking when they had an infection or illness, but some street food vendors (65.8%) had still not understood the importance of hygiene precautions against food contamination such as always washing their hands while cooking, etc. (Table 3.7).

3.2.4. Knowledge about hygiene and food hygiene measures

Table 3.8: Frequency and percentage of knowledge about hygiene and food hygiene measures

Variable	Yes		No		Don't know	
	(n)	(%)	(n)	(%)	(n)	(%)
The temperature for the growth of germs is 37 ℃	60	30.6	101	51.5	35	17.8
The proper temperature in your refrigerator should be 4-10 ℃	82	41.8	28	14.2	86	43.8
Wearing of an apron, hat and mask while processing and serving food is to look nice**	116	59.1	74	37.7	6	3.06
One symptom of food poisoning is convulsions**	98	50.0	85	43.3	13	6.63
Food poisoning protection is from personal hygiene, food hygiene and clean water and environment	151	77.0	31	15.8	14	7.14

The results in Table 3.8 indicate the level of knowledge about hygiene and food hygiene measures among street food vendors: 59.1% of them had the knowledge that wearing an apron, hat and mask while processing and serving food

was to prevent food contamination, and 77% understood that food poisoning protection came from personal and other hygiene (table 3.8).

3.2.5. Knowledge about law on food

Table 3.9: Frequency and percentage of knowledge about the law on food hygiene and safety

Variable	Yes		No		Don't know	
	(n)	(%)	(n)	(%)	(n)	(%)
Microbes need warmth to grow and multiply	66	33.6	83	42.3	47	23.9
Water for cooking can be from wells or other natural sources **	52	26.5	101	51.5	43	21.9
In order to prevent the risk of contamination from bacteria, we should remove rubbish every month**	118	60.2	70	35.7	8	4.1
Food vendors can wear jewelry such as rings, bracelets and watches**	73	37.2	113	57.6	10	5.10
Table for cooking and sale of food should be at least 60 cm from the ground	119	60.7	74	37.7	3	1.53
Cooked food for sale should be kept for not more than two hours	144	73.4	46	23.4	6	3.06

Table 3.9 shows the knowledge of street food vendors about the law on food hygiene and safety. Nearly half of them had knowledge about aspects of the food law as follows: 60.2% understood the risk of contamination from bacteria if rubbish was not disposed of frequently, 60.7% understood that tables for the preparation and sale of food should be at least 60 cm from the ground and 73.4% knew that cooked food for sale should be kept for not more than two hours (Table 3.9).

3.2.6. Knowledge of reporting and handling food in food poisoning situations

Table 3.10: Frequency and percentage of knowledge on reporting and handling food in cases of food poisoning

Variable	Yes		No		Don't know	
	(n)	(%)	(n)	(%)	(n)	(%)
When food poisoning occurs, you must report it to the nearest health facilities	121	61.7	68	34.6	7	3.57
When there is food poisoning in your premises, you should help the victim(s), inform the nearby health care authority, stop using the food and store the suspicious food item(s)	132	67.3	51	26.0	13	6.63

Table 3.10 illustrates that the street food vendors had very good knowledge (>50%) on reporting and handling food, especially reporting cases of food poisoning and assisting victims, informing the health care authority nearby, stopping the use of the food, and storing that suspicious food (Table 3.10).

3.2.7. Knowledge levels

An analysis of the knowledge levels of the street food vendors on food hygiene was done by dividing responses in the six groups of knowledge into two levels, "good" and "poor" knowledge, through the cut off points of mean values. Knowledge scores that were equal to or less than the mean value were considered as poor while knowledge scores that were more than the mean value were considered good (Table 3.11 below).

Table 3.11: Frequency and percentage of knowledge group

Variable	Female (n=160)		Male (36)		Total (196)	
	number	percent	number	percent	number	percent

General knowledge						
Poor	87	54.3	24	66.6	111	65.6
Good	73	45.6	12	33.3	85	43.3
(Mean=12.9, SD ±2.7, min=5, max=20)						
Knowledge of food processing, preservation, distribution, preparation and transportation						
Poor	104	65	15	41.6	119	60.7
Good	56	35	21	58.3	77	39.2
(Mean=12.7, SD ±2.6, min=6, max=19)						
Knowledge about causes of food contamination						
Poor	94	58.7	22	61.1	116	59.1
Good	66	41.2	14	38.8	80	40.8
(Mean=8.8, SD±2.5, min=1, max=15)						
Knowledge about hygiene and food hygiene measures						
Poor	100	62.5	22	61.1	122	62.2
Good	60	37.5	14	38.8	74	37.7
(Mean=5.9, SD±1.8, min=1, max=10)						
Knowledge about law on food hygiene						
Poor	130	81.2	33	91.6	163	83.1
Good	30	18.7	3	8.3	33	16.8
(Mean=4.9, SD±2.1, min=0,max=10)						
Knowledge of reporting and handling food in food poisoning situations						
Poor	87	54.3	14	38.8	101	51.1
Good	73	45.6	22	61.1	95	48.4
(Mean=2.6, SD ±1.3, min=0, max=4)						

The results show that in all six of the knowledge groups, the majority of the street food vendors surveyed demonstrated poor knowledge: 65.6% were poor in general knowledge, 60.7% in knowledge of food processing, preservation, distribution and transportation, 59.1% in knowledge about causes of food

contamination, 62.2% in knowledge about hygiene and food hygiene measures, 83.1% in knowledge about the law on food hygiene and 51.1% in knowledge of reporting and handling food, especially where there may be cases of food poisoning (Table 3.11).

3.3. Practices of food hygiene

3.3.1. Practice of personal hygiene and environmental sanitation

Table 3.12: Frequency and percentage of personal hygiene and environmental sanitation

Practice of personal hygiene and environmental sanitation	Yes		No	
	(n)	(%)	(n)	(%)
Wearing aprons	84	42.8	112	57.1
Wearing a mask	42	21.4	154	78.5
Wearing a hat	70	35.7	126	64.2
Wearing rings, bracelets, watches*	133	67.8	63	32.1
Leaving fingernails long, not keeping hands clean*	117	59.6	79	40.3
Keeping personal outfits clean, neat	123	67.3	64	32.6
When there is a wound on the skin, sealing wound with water resistant gauze bandages	123	67.3	64	32.6
Washing hands often when processing food	90	45.9	106	54.1
Not using hands directly to scoop or distribute food to be eaten immediately	122	62.2	74	37.7
Not coughing, sneezing, blowing your nose, spitting, spewing saliva through careless talking, smoking or chewing gum in food storage and selling areas	102	52.0	94	47.9
Having a sealed bin with a lid or plastic bag for containing waste	69	35.2	127	64.8
Ensuring waste is collected and disposed of	133	67.8	63	32.1

during the day

The investigation into the practices of personal hygiene and environmental sanitation of street food vendors show that 67.8% of them did not wear jewelry, 59.6% did not leave their fingernails long, 67.3% of them kept their personal outfits clean, 67.3% properly bandaged any external wounds, 62.2% did not use their hands directly to scoop or distribute food that was to be eaten immediately, 52.2% did not cough, sneeze, blow their noses, spit, smoke, chew gum or spew saliva in food storage areas or selling areas, and 67.8% collected and disposed of waste during the day. In contrast, high proportions of the vendors did not wear an apron (57.1%), mask (78.5%) or hat (64.2%), and did not cover waste bins or line them with plastic (64.8%) (Table 3.12).

3.3.2. Personal hygiene and environmental sanitation scores

Table 3.13: Frequency and percentage of personal hygiene and environmental sanitation

Practice of personal hygiene and environmental sanitation	**Female (n=160)**		**Male (n=36)**		**Total (n=196)**	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Poor	104	65	27	75	131	66.8
Good	56	35	9	25	65	33.1
Mean=5.7, SD±1.7, Min=1, Max=10						

The scores on hygiene practices and environmental sanitation were divided into two levels: good for scores higher than the mean value and poor for scores equal or less than the mean. The results were that 66.8% of the vendors studied were poor in their practices of personal hygiene and sanitation while only 33.1% were good (Table 3.13).

3.3.3. Practices of pre-processing, processing and preservation

Table 3.14: Frequency and percentage of practices of pre-processing, processing and preservation

Practice of pre-processing, processing and preservation	Yes		No	
	(n)	(%)	(n)	(%)
Appropriate area found	107	54.5	89	45.4
Clean water provided	130	66.3	66	33.6
Equipment separated from used containers	65	33.1	131	66.8
Table at least 60 cm above the ground	127	64.8	69	35.2
Glass cabinet used for displaying food	80	40.8	116	59.8
Food not mixed with dirty equipment	103	52.5	93	47.4
Clean utensils not mixed with dirty utensils	150	76.5	46	23.4
Food kept away from dust and flies	63	32.1	133	67.8
Food packaging made of safe materials	130	66.3	66	33.6

Table 3.14 contains the results of the assessment of the vendors' hygiene in pre-processing, processing and preservation of food. The majority of the food vendors (54.5%) had found appropriate areas, 66.3% used clean water, 64.8% had their tables for selling food at least 60 cm above the ground, 52.5% did not mix cooked food with dirty equipment, 76.5% did not mix clean utensils with dirty ones, and 66.3% used food packaging made of safe and clean materials (Table 3.14).

3.3.4. Pre-processing, processing and preservation scores

Table 3.15: Frequency and percentage of pre-processing, processing and preservation

Practice of pre-processing, processing and preservation	Female (n=160)		Male (n=36)		Total (n=196)	
	Number	Percent	Number	Percent	Number	Percent

Poor	98	61.2	23	63.8	121	61.7
Good	62	38.7	13	36.1	75	38.2
Mean=13.1, SD±1.3, Min=9, Max=16						

The scores of the vendors in observing these processing and preservation practices were divided into two levels: 66.8% of the vendors scored below the mean and were poor in these hygiene practices while 33.1% scored above the mean value and were considered good in them (Table 3.15).

3.4. Determinants of the associated factors

General characteristics of vendors

Analysis of the variables was a bivariate analysis of the relationship between a dependent variable and an independent variable. Notwithstanding the other variants, the result was Crude Odds Ratio (COR), confidence level at 95% CI and P-value <0.05. Each factor was related to the group of knowledge and its related factors of food hygiene among street food vendors in the four urban districts of VTE.

3.4.1. Relationship between socio-demographic characteristics and practice of personal hygiene and environmental sanitation

Table 3.16: Bivariate analysis of socio-demographic factors associated with practice of personal hygiene and environmental sanitation

Socio-demographic factors		**Personal hygiene and environmental sanitation**				**Crude OR**	
		No (n=131)		**Yes (n=65)**		**(95% CI)**	**P-value**
		(n)	**(%)**	**(n)**	**(%)**		
Age							
	14-39	69	71.1	28	28.8	1	
	40-61	62	62.6	37	37.3	1.4(0.7-2.8)	0.20
Sex							
	Male	27	75.0	9	25.0	1	

Female	104	65.0	56	35.0	0.6(0.2-1.4)	0.24
Marital status						
Single	26	66.6	13	33.3	1	
Married	89	69.5	39	30.4	0.8(0.4-1.8)	0.73
Divorced	8	44.4	10	55.5	2.5(0.7-7.8)	0.11
Widow(re)d	8	72.7	3	27.2	0.7(0.1-3.3)	0.70
Educational						
Illiterate	3	75.0	1	25.0	1	
Primary school	58	62.3	35	37.6	1.8(0.1-18.0)	0.61
Junior high school	47	72.3	9	27.6	1.1(0.1-11.7)	0.90
High school	20	68.9	8	31.0	1.3(0.1-14.8)	0.80
college, university and postgraduate	3	60.0	2	40.0	2.0(0.1-35.8)	0.63
Trained in cooking						
No	90	71.4	36	28.5	1	
Yes	41	58.5	29	41.4	0.5(0.2-1.0)	0.06
Trained in food hygiene						
No	89	67.4	43	32.5	1	
Yes	42	65.6	22	34.3	0.9(0.4-1.8)	0.80
How long in the food business						
1 year	4	57.1	3	42.8	1	
2 years	22	66.6	11	33.3	0.6(0.2-3.5)	0.63
>3 years	105	67.3	51	32.6	0.6(0.1-3.0)	0.57
Type of vendor						
Stationary	82	66.1	42	33.8	1	
Part-time	49	68	23	31.9	0.9(0.4-1.7)	0.78

The table above presents the results of the relationship between the socio-demographic characteristics of street food vendors and their practice of personal

hygiene and environmental sanitation. No significant associations were observed between these practices and the street vendors' age, sex, marital status, education, training in cooking and hygiene, experience in the business and type of food business as indicated in the table, with all the p-values > 0.05 (Table 3.16).

3.4.2. Relationship between personal information factors and practice of personal hygiene and environmental sanitation

Table 3.17: Bivariate analysis of personal information factors associated with practices of personal hygiene and environmental sanitation

Personal information factors	Personal hygiene and environmental sanitation				Crude OR	
	No (n=131)		Yes (n=65)		(95% CI)	P-value
	(n)	(%)	(n)	(%)		
Main occupation						
Street vendor	105	68.6	48	31.3	1	
Worker	11	61.1	7	38.9	1.3(0.5-3.8)	0.52
Employee	15	60.0	10	40.0	1.4(0.6-3.4)	0.39
Sale time of the year						
Continuous	106	65.8	55	34.1	1	
Part time	25	71.4	10	28.5	0.7(0.3-1.8)	0.52
Income of vendors						
No	45	69.2	20	30.7	1	
Yes	86	65.6	45	69.2	0.8(0.4-1.6)	0.61

Considering the personal information factors of the vendors such as main occupation, sale time of the year and income in Table 3.18 above, there were no significant associations between the practices and the variables as all the p-values were >0.05 (Table 3.17).

3.4.3. Relationship between social environmental and other factors and practice of personal hygiene and environmental sanitation

Table 3.18: Bivariate analysis of social environmental and other factors and practice of personal hygiene and environmental sanitation

Social environmental and other factors	Personal hygiene and environmental sanitation				Crude OR	
	No (n=131)		Yes (n=65)		(95% CI)	P-value
	(n)	(%)	(n)	(%)		
Regulation and licensing by local government						
No	37	64.9	20	35	1	
Yes	94	67.6	45	32.3	1.1(0.5-2.2)	0.71
District Health Center regularly organized training on food hygiene						
No	97	69.7	42	30.2	1	
Yes	34	59.6	23	40.3	0.6(0.3-1.2)	0.17
Inspection by authorities						
No	110	67	54	32.9	1	
Yes	21	65.6	11	34.3	0.9(0.3-2.3)	0.87
Signed food safety commitment with local food and drug authorities						
No	55	64.7	30	35.2	1	
Yes	76	68.4	35	31.5	1.1(0.6-2.2)	0.57
Obtained health certificate						
No	82	74.5	28	25.4	1	
Yes	49	56.9	37	43.0	0.4(0.2-0.8)	0.00**

Table 3.18 conveys the relationship between the social environmental and other factors of the street food vendors and their practices of personal hygiene and environmental sanitation. Only one significant association was observed, between the possession of a health certificate and their practices of personal hygiene and environmental sanitation, the p-value being <0.05. Street food vendors who had their annual health checked were 0.4 times less likely to have poor practices of personal hygiene and environmental sanitation compared to the street food vendors who did not have their annual health check (COR=0.0; 95% CI=0.2-0.8) (Table 3.18).

3.4.4. Relationship between accessibility of food information and practice of personal hygiene and environmental sanitation

Table 3.19: Bivariate analysis of accessibility of food information and practice of personal hygiene and environmental sanitation

Accessibility of food information	Personal hygiene and environmental sanitation				Crude OR	
	No (n=131)		Yes (n=65)		(95% CI)	P-value
	(n)	(%)	(n)	(%)		
Heard of food hygiene						
No	65	67	32	32.9	1	
Yes	66	66.6	33	33.3	0.9(0.5-1.7)	0.95
Most common sources of food information						
Other	53	68.8	24	31.1	1	
TV	78	65.5	41	34.4	0.9(0.5-1.8)	0.95
Need to know more about food hygiene						
No	55	64.7	30	21.5	1	
Yes	76	68.4	35	35.2	1.1(0.6-2.1)	0.051

The study explored the relationship between accessibility of food information and practices of personal hygiene and environmental sanitation of the street food vendors. The findings showed no significant associations between the practices and the three variables of having heard of food hygiene, most common source(s) of food information and the need to know more about food hygiene (p-value of these variables >0.05) (Table 3.19).

3.4.5. Relationship between knowledge groups and practice of personal hygiene and environmental sanitation

Table 3.20: Bivariate analysis of knowledge groups and practice of personal hygiene and environmental sanitation

Variables	Personal hygiene and environmental sanitation				Crude OR	
	No (n=131)		Yes (n=65)		(95% CI)	P-value
	(n)	(%)	(n)	(%)		
General knowledge						
Poor	70	63	41	36.9	1	
Good	61	71.7	24	28.2	0.6(0.3-1.2)	0.19
Knowledge of food processing, preservation, distribution, preparation and transportation						
Poor	78	65.5	41	34.4	1	
Good	53	68.8	24	31.1	0.8(0.4-1.6)	0.63
Knowledge about causes of food contamination						
Poor	76	65.5	40	34.4	1	
Good	55	68.7	25	31.2	0.8(0.4-16)	0.63
Knowledge about hygiene and food hygiene measures						

Poor	81	66.3	41	33.5	1	
Good	50	67.5	24	32.4	0.9(0.4-18)	0.86
Knowledge about law on food hygiene of street food vendors						
Poor	106	65	57	34.9		
Good	25	75.7	8	24.2	05(0.2-1.4)	0.23
Knowledge of reporting and handling food in food poisoning cases						
Poor	70	69.3	31	30.6	1	
Good	61	64.2	34	35.7	1.2(0.6-2.3)	0.44

Between the knowledge group variables and the practices of personal hygiene and environmental sanitation, there were no statistically significant relationships either for general knowledge, knowledge of food processing, preservation, distribution, preparation and transportation, knowledge about causes of food contamination, knowledge about food hygiene and hygiene measures, knowledge about the law on food hygiene or knowledge on reporting and handling possibly contaminated food as the p-value for all groups was >0.05 (Table 3.20).

3.5. Relationship between each independent variable and the practice of pre-processing, processing and preservation

3.5.1. Relationship between the socio-demographic characteristics and the practice of pre-processing, processing and preservation

Table 3.21: Bivariate analysis of socio-demographic characteristics and practice of pre-processing, processing and preservation

Socio-demographic characteristics	**Practice of pre-processing, processing and preservation**		**Crude OR**	
	No (n=121)	**Yes (n=75)**	**(95% CI)**	**P-value**

	(n)	(%)	(n)	(%)		
Age						
14-39	62	63.9	35	36.0	1	
40-61	59	59.6	40	40.4	0.8(0.4-1.5)	0.53
Sex						
Male	98	61.2	62	38.7	1	
Female	23	63.8	13	36.1	0.8(0.3-2)	0.76
Marital status						
Single	25	64.1	14	35.9	1	
Married	76	59.3	52	40.6	1.2(0.5-2.5)	0.59
Divorced	13	72.2	5	27.7	0.6(0.2-2.3)	0.54
Widow(re)d	7	63.6	4	36.3	1.0(0.2-4.1)	0.79
Education						
Illiterate	3	75.0	1	25.0	1	
Primary school	56	60.2	37	39.7	1.9(0.1-19.7)	0.56
Junior high school	41	63.0	24	36.9	1.7(0.1-17.8)	0.63
High school	17	58.6	12	41.8	2.1(0.1-22.8)	0.53
college, university and postgraduate	4	80.0	1	20.0	0.7(0.0-17.5)	0.85
Trained in cooking						
No	84	66.6	42	33.3	1	
Yes	37	52.8	33	47.1	0.5(0.2-1.0)	0.05**
Trained in food hygiene						
No	75	56.8	57	43.1	1	
Yes	46	71.8	18	28.1	1.9(0.9-3.9)	0.04**
Experience in food business						
1 year	4	57.1	3	42.8	1	
2 years	21	63.6	12	36.3	0.7(0.1-3.9)	0.74
>3 years	96	61.5	60	38.4	0.8(0.1-3.8)	0.81

Type of vendor						
Stationary	78	62.9	46	37.1	1	
Part-time	43	59.7	29	40.2	1.1(0.6-2.1)	0.65

Table 3.21 shows the relationship between the socio-demographic characteristics of the 196 street food vendors and their practice of pre-processing, processing and preservation. Only two significant associations were observed, for training in cooking and training in hygiene, as indicated in the table ($p \leq 0.05$ and $p=0.04$ respectively). The street food vendors who obtained training in cooking were 0.5 times less likely to have good practices of pre-processing, processing and preservation compared to the street food vendors who had not been trained in cooking (CRO=0.5; 95% CI=0.2-1.0). Those vendors with training in hygiene were 1.9 times more likely to have good practices of pre-processing, processing and preservation compared to those without (COR=1.9; 95% CI=0.9-3.9) (Table 3.22). The other variables, namely, age, sex, marital status, experience in the business and type of vendor did not show significant associations with the practices of pre-processing, processing and preservation as indicated in the table as their p-values were >0.05 (Table 3.21).

3.5.2. Relationship between personal information and practices of pre-processing, processing and preservation.

Table 3.22: Bivariate analysis of personal information factors and practice of pre-processing, processing and preservation

Personal information factors	**Practice of pre-processing, processing and preservation**				**Crude OR**	
	No (n=121)		**Yes (n=75)**		**(95% CI)**	**P-value**
	(n)	**(%)**	**(n)**	**(%)**		
Main occupation						
Street food vendor	87	56.8	66	43.1	1	
Worker	13	72.2	5	27.7	0.5(0.1-1.4)	0.21

Employee	21	84.0	4	16.0	0.2(0.0-0.7)	0.01**
Sale time of the year						
Continuous	97	60.2	64	39.7	1	
Part time	24	68.5	11	31.4	0.6(0.2-1.5)	0.35
Income of vendors						
No	42	64.6	23	35.3	1	
Yes	79	60.3	52	39.6	0.8(0.4-1.6)	0.55
Mean =2.387.755; SD±169317; min=500.000; max=7.000.000)						

Table 3.22 shows there was a significant relationship between the vendors' main occupation and their practices of pre-processing, processing and preservation (p-value <0.05). Employees (government staff) who were also selling food on the streets were 0.2 times less likely to have good practices of pre-processing, processing and preservation than workers and full-time street food vendors (COR=0.2; 95% CI=0.0-0.7). However, the two variables such as sale time of the year and income of the vendors were not statistically significant with their practices of pre-processing, processing and preservation as indicated by the p-values being > 0.05 (Table 3.22).

3.5.3. Relationship between social environmental and other factors and practice of pre-processing, processing and preservation

Table 3.23: Bivariate analysis of social environmental and other factors and practice of pre-processing, processing and preservation

Social environmental and other factors	**Practice of pre-processing, processing and preservation**				**Crude OR (95% CI)**	**P-value**
	No (n=121)		**Yes (n=75)**			
	(n)	**(%)**	**(n)**	**(%)**		
Regulated and licensed by local government						
No	28	49.1	29	50.8	1	

Yes	93	61.9	46	33	2.0(1.0-4.1)	0.02**
Training on food hygiene regularly organized by District Health Center						
No	85	61.1	54	38.8	1	
Yes	36	63.1	21	36.8	1.0(0.5-2.1)	0.79
Frequency of inspection by authorities						
Once in less than 3 months	11	52.3	10	47.6	1	
Once in 3-6 months	40	63.4	23	36.5	0.6(0.2-1.7)	0.36
Once in over 6 months	50	62.5	30	37.5	0.6(0.2-1.7)	0.40
Not yet	20	62.5	12	37.5	0.6(0.2-2.0)	0.46
Food safety commitment signed with local food and drug authorities						
No	52	61.1	33	38.8	1	
Yes	69	62.1	42	37.8	1.0(0.5-1.9)	0.88
Obtained health certificate						
No	66	60	44	40	1	
Yes	55	63.9	31	36	1.1(0.6-2.2)	0.57

Table 3.23 above illustrates that a significant relationship was observed only between regulation and licensing by the local government and the vendors' practices of preprocessing, processing and preservation, with the $p<0.05$. Those street food vendors who were regulated and licensed by the government were 2.0 times more likely to have good practices of pre-processing, processing and preservation compared to vendors who were not government-regulated and licensed (COR=2.0; 95% CI 1.0-4.1) (Table 3.23).

3.5.4. Relationship between accessibility of food information and practice of pre-processing, processing and preservation.

Table 3.24: Bivariate analysis of accessibility of food hygiene and practice of pre-processing, processing and preservation

Accessibility of food information	Practice of pre-processing, processing and preservation				Crude OR (95% CI)	P-value
	No (n=121)		Yes (n=75)			
	(n)	(%)	(n)	(%)		
Heard of food hygiene						
No	63	64.9	34	35.0	1	
Yes	58	58.5	41	41.4	0.7(0.4-1.4)	0.35
Most common sources of food information						
Others	40	51.9	37	48.0	1	
TV	81	68	38	31.9	1.9(1.0-3.7)	0.02**
Need to know more about food hygiene						
No	50	42.2	23	31.5	1	
Yes	71	57.7	52	68.4	0.6(0.3-1.2)	0.13

Table 3.24 shows a significant relationship observed between television as the most common source of food information and the vendors' practices of pre-processing, processing and preservation (the p-value <0.05). Vendors who had received food information from television were 1.9 times more likely to have good practices of pre-processing, processing and preservation of food if compared to those who had received their food information from other sources such as radio, newspapers, the Internet, friends, parents, training, health staff, community loudspeakers and others (COR=1.9; 95% CI=1.0-3.7). The other two variables, heard of food hygiene and need to know more about food hygiene, did not reveal

statistically significant associations with the vendors' practices of pre-processing, processing and preservation, their p-values >0.05 (Table 3.24).

3.5.5. Relationship between groups of knowledge and practice of pre-processing, processing and preservation

Table 3.25: Bivariate analysis of knowledge group and practice of pre-processing, processing and preservation

Variables	Pre-processing, processing and preservation				Crude OR	
	No (n=121)		Yes (n=75)		(95% CI)	P-value
	(n)	(%)	(n)	(%)		
General knowledge						
Poor	65	58.5	46	41.4	1	
Good	56	65.8	29	34.1	0.7(0.3-1.3)	0.29
Knowledge of food processing, preservation, distribution, preparation and transportation						
Poor	68	57.1	51	42.8	1	
Good	53	68.8	24	31.1	0.6(0.3-1.1)	0.10
Knowledge about causes of food contamination						
Poor	65	56.0	51	43.9	1	
Good	56	70.0	24	30.0	0.5(0.2-1.0)	0.04**
Knowledge about hygiene and food hygiene measures						
Poor	77	63.1	45	36.8	1	
Good	44	59.4	30	40.5	1.1(0.6-2.1)	0.60
Knowledge about law on food hygiene						

Poor	99	60.7	64	39.2	1	
Good	22	66.6	11	33.3	0.7(0.3-1.8)	0.52
Knowledge of reporting and handling food in cases of food poisoning						
Poor	63	62.3	38	37.6	1	
Good	58	61	37	38.9	1.0(0.5-1.9)	0.84

The results in Table 3.25 above shows that no significant associations were observed for these knowledge group variables except the knowledge about the causes of food contamination where $p<0.05$. The good knowledge about the causes of food contamination meant that those vendors were 0.5 times less likely to have good practices of pre-processing, processing and preservation compared to those with poor knowledge about food contamination (COR=0.5; 95% CI= 0.2-1.0) (Table 3.25).

3.6. Multivariate analysis of factors associated with practices of personal hygiene and environmental sanitation

Table 3.26: Multivariate logistic regression analysis

Variable	Practice of personal hygiene and environmental sanitation		P-value
	COR (95% CI)	AOR(95% CI)	
Health certificate			
No			
Yes	0.4(0.2-0.8)	0.4(0.2-0.7)	0.007**
Need to know more about food hygiene			
No	1	1	
Yes	0.5(0.2-1.0)	0.4(0.2-0.9)	0.03**

The significant factors with a p-value <0.05 in these tests included having a health certificate and needing to know more about food hygiene. These two independent variables had significantly correlated with practices of personal hygiene and environmental sanitation, with p <0.05 (Table 3.26).

3.7. Multivariate analysis of factors associated with practices of pre-processing, processing and preservation

Table 3.27: Multivariate logistic regression analysis

Variable	Pre-processing, processing and preservation		P-value
	COR (95% CI)	AOR(95% CI)	
Training on food hygiene			
No	1	1	
Yes	1.9(0.9-3.9)	2.3(1.1-4.6)	0.014**
Main occupation			
Street food vendor	1	1	
Worker	0.5(0.1-1.4)	1	
Employee	0.2(0.08-0.7)	0.5(0.3-0.8)	0.018**
Regulated and licensed by local government			
No	1	1	
Yes	2.0(1.0-4.1)	2.3(1.2-4.6)	0.012**
Knowledge about causes of food contamination			
Poor	1	1	
Good	0.5(0.2-1.0)	0.4(0.2-0.8)	0.010**

The effort to identify the knowledge and hygiene practices and the related factors on food hygiene among street food vendors are presented in Table 3.27. Independent variables from the literature review were selected to be included for

results to be obtained from the multiple logistic regression models or from the bivariate analysis. The independent variables had to be significantly correlated with the dependent variables, with p-value <0.05. This study was performed to determine the association between each factor and the hygiene practices, including practices of personal hygiene and environmental sanitation and practices of food pre-processing, processing and preservation. Some independent variables that made the model unreliable were excluded and the results were presented by an adjusted odds ratio (AOR) and corresponding to 95% confidence level.

The multivariate logistic regression model showed that the health certificate factor (AOR=0.4; 95%CI=0.2-0.7) and the need to know about food hygiene factor (AOR=0.5; 95%CI= 0.3-0.8) were statistically significant and associated with the vendors' practice of personal hygiene and environmental sanitation as p-value <0.05 (Table 3.26). At the same time the training on food hygiene factor (AOR=2.3; 95% CI=1.1-4.6), main occupation of vendor factor (AOR=0.5; 95% CI=0.3-0.8), regulated and licensed by local government factor (AOR=2.3; 95% CI=1.2-4.6) and knowledge about cause of food contamination factor (AOR=0.4 95% CI=0.2-0.8) were also statistically significant and associated with the vendors' practices of food pre-processing, processing and preservation (p-value <0.05) (Table 3.27).

Chapter 4

DISCUSSION

4.1. General information of study subjects

This study assessed the knowledge, practices and related factors on food hygiene among street food vendors in VTE. The subjects of the study were 196 street food vendors from four urban districts, namely, Chanthabouly, Sikhottabong, Saysettha and Sisattanak. The study used a questionnaire with 79 questions in face to face interviews and observation, with five parts for the interview and one part for the observation. For analysis, we included relevant characteristics that might influence the knowledge, practices and their related factors of food hygiene. The statistical method in this study ensured that the sample size studied was enough to be a representation of the entire population.

4.2. Factors related to practices of hygiene

When looking at the predictive factors, the correlational analysis showed that two factors among vendors that were significantly associated with their practices of personal hygiene and environmental sanitation, namely, having a health certificate and needing more knowledge on food hygiene and four factors among vendors significantly associated with their practices of pre-processing, processing and preservation, namely, their training in food hygiene, main occupation, whether they were regulated or licensed by the local government and their needing to know food information. These related factors to hygiene practices among street food vendors are discussed as follows:

❖ Socio-demographic characteristics

There were no significant correlations between the individual socio-demographic factors of the vendors and their hygiene practices, but it can be observed that there were street food vendors in all the age groups with the over 40 years group having a large number of vendors, thus suggesting that food selling is essentially a business run by people in the older age range. This shows similarity to studies in the Tamales Metropolis of Thailand (Danikuu, Baguo, & Azipala, 2015).

There were more females (81.6%) than males involved as food vendors in this study, which conforms largely to the well acclaimed general trend, that cooking and the food trade are predominantly jobs for women. This agrees with the findings from other studies where the street food enterprises in Brazil, Gauteng in South Africa and Bangkok in Thailand are dominated by females (Monney, Agyei, & Owusu, 2013).

Regarding marital status, the majority of street food vendors (65.3%) were married, which agreed with the finding in Eliku's study of 57.2% of vendors being married but disagreed with the findings of P. T. Akonor and M. A. Akonor in their study on food safety knowledge in Accra in which 38.2% of the respondents were married whilst 61.8% were single (Akonor & Akonor, 2013b).

The largest proportion of the street food vendors were those with primary school education as their highest educational attainment (47.4%). This may reflect that the street food vendors may be able to understand the basics of food hygiene if they were trained. This finding agrees with the studies done by the Open University of Tanzania (Ntomola, 2014) and other studies in Kenya, which found that 62% of respondents had primary education and below, while 38% had secondary education (O. Muinde & Kuria, 2005). However, a study done by Kenyatta University found that the majority of the respondents had college and post-secondary education (44% and 26% respectively), whereas only 4% had primary education (Kisembi, 2010).

Over half of the respondents had not attended food cooking training. Nevertheless, they were familiar with common food cooking in their homes. This is similar to the findings by Muinde et al as 60% of respondents were not trained in food production (R. Muinde, Kiinyukia, Rombo, & Muoki, 2012).

For the factor of training in hygiene, this study found that 32.6% of respondents had attended such training as well as a significant association of this factor with the practice of pre-processing, processing and preservation of food (COR=1.9; 95% CI=1.1-4.6; p=0.01). It seems possible that training in hygiene influenced hygienic practices, which agrees with the study done in primary schools in Jos, Plateau State, North Central Nigeria, in which the majority of respondents

did not attend hygiene training and similar studies done in Malaysian, Thailand and Ethiopia, where a large number of respondents had not attended hygiene training (Afolaranmi et al., 2015).

As for years of experience in food selling, the finding was that the majority of street food vendors had more than three years' experience, similar to the study done in Kolkata, India, in which respondents had more than five years' experience in food vending (Mukherjee, Mondal, De, & Misra, 2018). But this differs with the study done by B. Prabakaran et al in which the food vendors had fewer than five years (Prabakaran[1], Felix, & Govindarajan).

Regarding vending type, more than half the vendors interviewed were stationary while the others maintained posts, as also reported by Odonkor et al (Odonkor, Adom, Boatin, Bansa, & Odonkor, 2011) and the study done by Nurudeen et al (Nurudeen, Lawal, & Ajayi, 2014), which found that a large number were stationary.

❖ **Personal information**

For the factor of their main occupation, the study revealed a statistically significant relationship for vendors who were government employees with their practices of pre-processing, processing and preservation of food. This may be due to their having easier access to food information than workers and street vendors who did not work in any organization. Therefore, street food vendors who were state employees had a statistically significant relationship to hygiene practices ($p=0.01$).

Regarding the sale time of the year, the majority of respondents were continuously selling but this factor showed no significant relationship with practices on hygiene. Likewise, the factor of vendors' income was not significantly related with their practices of hygiene. However, the majority of the respondents had earned more than 2,000,000 LAK.

❖ **Social environmental and other factors**

Being regulated and licensed by the local government to run a business was statistically significant in association with hygiene practices ($p<0.05$), which agrees

with the study done in Alexandria in which 68% had no support or licensing from the local government (Koraish & El-Lassy, 2014).

Regarding the regularity of inspection by the authorities, (40.8%) were inspected once in over six months, (32.1%) once in every three to six months, (10.7%) once in less than three months and (16.3%) were not inspected. This factor showed no significant relationship with practices on hygiene.

The majority (65.1%) of street food vendors were not health checked in the year and were without a health certificate, a factor which showed a statistically significant correlation with practices of personal hygiene and environmental sanitation ($p=0.007$). One of the common ways of regulating street food vendors in the developing countries is through a medical examination of food vendors, similar to a study done in Accra-Ghana (Ackah et al., 2011). In this study, more than half of the respondents did not do the required medical examination. This may probably be due to the lack of awareness, additional costs or associated inconveniences, especially when the vendors feel healthy.

- **Accessibility of food hygiene information**

This study of 196 street food vendors found that the most common source of information about food hygiene was television: Over half of the respondents obtained information from TV, a factor which was significantly associated with the vendors' practices of pre-processing, processing and preservation of food (p-value<0.05). The others received their information from radio, newspapers, friends, parents, health staff and loudspeakers in the community. Some studies suggested that vendors have used less traditional avenues of education, which can also provide useful information on food hygiene (Kumie & Zeru, 2007). In addition, the need of the street food vendors to know about food hygiene was significantly associated with their practices of personal hygiene and environmental sanitation ($p=0.03$).

4.3. Street food vendors' knowledge

The knowledge of street food vendors has a highly significant role in their practices of food hygiene. Such knowledge can directly or indirectly transmit values to hygiene practices. A good knowledge of street food vendors would help improve

and develop the quality of food hygiene practices. In general, practices refer to the ways in which people demonstrate their knowledge through their actions. In the present study, all of the knowledge groups of the street food vendors were poor in relation to hygiene practices, which was similar to the other studies done in some countries such as Thailand, where only 15.2% of food handlers had good food hygiene practices (Cuprasitrut, Srisorrachatr, & Malai, 2011) . In Bangladesh, most of the food vendors had poor knowledge and practices in food safety (Faruque, Haque, Shekhar, Begum, & IMS, 2010), and in Turkey, the results were that the majority of food vendors had a poor level of food hygiene knowledge (Baş, Ersun, & Kıvanç, 2006). In contrast, a study done in Nigeria showed that the street food vendors displayed good knowledge with regard to food hygiene (Afolaranmi et al., 2015) and (Okojie & Isah, 2014).

4.4. Street food vendors' practice of hygiene

From the data obtained in our survey, Mean=5.7, SD±1.7, Min=1, Max=10 were derived for practices of personal hygiene and environmental sanitation and Mean=13.1, SD±1.3, Min=9, Max=16 were derived for practices of pre-processing, processing and preservation of food. The results revealed that the level of hygiene practices was poor and less than sufficient on the hygiene practices index. The harmful practices have the potential to transfer pathogenic organisms to food and merit attention. In spite of the street food vendors being aware and having a positive attitude towards food hygiene practices, the reported lack of safe practices highlights a gap between knowledge and actual food hygiene practice.

Despite the low level of food hygiene practice observed in the present study, more than (50%) of the street food vendor respondents did not wear jewelry, left their fingernails short, kept their hands clean, properly covered wounds on their skin, did not use their hands directly to scoop food and collected and disposed of waste during the day. These supposedly, should give an indication of the willingness of the food vendors to provide service in a hygienic manner. According to the World Health Organization (WHO), on the other hand, these practices of the

Laos vendors had more to do with aesthetics and consumer assurance than food safety (World Health Organization, 1996).

This was consistent with a number of studies in Nigeria by S Out (Out, 2014), which reported that attitude was not significantly associated with practice and also a study in Ghana by Rheinländer et al (Rheinländer et al., 2008), which reported that knowledge was not closely related to practice. On the other hand, a study in Malaysia (Rahman et al., 2016) showed that knowledge, attitude and training were significantly associated with practice, as did a study in Nigeria by Afolaranmi et al. (Afolaranmi et al., 2015). In Ethiopia and Thailand, studies have reported that knowledge was significantly associated with practice (Tessema, Gelaye, & Chercos, 2014).

In the present study, the poor level of hygienic practices are therefore similar with some other studies (Martins, 2006) and (Von Holy & Makhoane, 2006), whose authors have argued that, due to the food vendor's necessity to depend on the customer's repeated patronage in order to maintain and sustain their livelihood, the vendors are more likely to produce relatively safe food by maintaining the minimum required level of hygiene standards, even though a serious gap still exists for the improvement of proper hygienic conditions and access to basic sanitary facilities for the food vendors.

CONCLUSION

This study was a cross-sectional, analytical study, which collected data from interviews with and observations of 196 outlets of street food vendors. In general, knowledge was reflected in practice. The main result of this study demonstrates that most street food vendors in the six knowledge groups in the study demonstrated poor levels of knowledge as their scores were lower than the mean value. However, their knowledge about the causes of food contamination was one factor which was significantly related to their hygiene practices. The low scores imply there are problems which should not be overlooked and would require the appropriate public health intervention. Therefore, policy makers in this country should build policies and programs to address the knowledge and practices of its street food vendors, especially regular training, supervision and monitoring.

In their practices of hygiene, the street food vendors also scored poorly and below the mean value. The results of the study of their practices again illustrated that their inadequate knowledge was reflected in their practices.

In the other factors, this study also found as its main outcome the positive associations between the factors and practices of hygiene including the health certificates of respondents, their need to know more about hygiene, their training in hygiene, their main occupations and their being regulated and licensed by the local government. In conclusion, the benefits from improving the knowledge and practices of street food vendors are likely to have a positive impact on food hygiene. However, there were also many variables of the other factors that were not significantly associated with hygiene practices ($p>0.05$).

RECOMMENDATIONS

Based on the results of the study, the following recommendations can be made to address the knowledge, practices and their related factors on hygiene among street food vendors in Vientiane capital, Laos.

There is a need to enhance the knowledge and practices of street food vendors on hygiene. Seminars should be arranged by local authorities for street food vendors and proper knowledge should be provided on how to preserve food hygienically.

The health sector should be regular in providing training on food hygiene to street food vendors and should maintain regular inspection and supervision.

Personal hygiene of street food vendors should be strictly monitored to prevent food contamination. Their nails should be properly trimmed and their hands washed during food processing.

Street food vendors should ensure that their utensils and surroundings are neat and clean.

Uniforms and caps should be compulsory for all food vendors during food cooking and serving.

Future research might focus on a more extensive qualitative study on knowledge and practices on hygiene among street food vendors. Furthermore, policymakers should focus on training for street food vendors on a regular and ongoing basis. Officials should be constantly monitoring, inspecting and advising street food vendors.

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Annex 1: Questionnaires

This research work is aimed at understanding and evaluating the food hygiene practices of street food vendors in four urban districts in Vientiane capital. Your honest response to each question below is the key to the success of this study. All information obtained will be treated confidentially and will not be used for any purpose other than that stated above. Thanking you in advance for your kind cooperation.

Code of street food vendor ……

Full name of the interviewer……

Address (zone): ……District ……

Date: …….

Part 1: Socio-demographic factors

(Please fill in the blanks or tick (✓) one box per answer)

Code	Question	Answer	Note
g1	How old are you?	…….years	
g2	Sex (Observe)	☐ 1=Male ☐ 0=Female	
g3	Marital status	☐ 1. Single ☐ 2. Married ☐ 3. Widow/Widower ☐ 4. Divorced	
g4	What is your highest education level?	☐ 1. Illiterate ☐ 2. Primary school ☐ 3. Junior high school ☐ 4. High school ☐ 5. College, University and Postgraduate	
g5	Have you studied in any	☐ 1. Yes	

	cooking class?	☐ 2. No	
g6	Have you studied or been trained in food safety in class?	☐ 1. Yes ☐ 2. No	
g7	How long have you been involved in this type of business?	☐ 1. Less than 1 year ☐ 2. From 1 to 3 years ☐ 3. For 3 years or more	
g8	Type of vendor	☐ 1. Stationary ☐ 2. Mobile	

Part 2: Personal information about street food vendors

Code	Question	Answer	Note
s1	Main occupation	☐ 1. Street food vendor ☐ 2. Worker (factory, company, etc…) ☐ 3. Government staff	
s2	Sale time of the year	☐ 1. Continuous ☐ 2. Part-time	
s3	Income from food sale	……LAK/ Month	

Part 3: Social environmental factors and other factors

e1	Are you regulated and licensed by the local government in your business?	☐ 1. Yes ☐ 2. No	
e2	Has the District Health Center regularly organized training to improve food	☐ 1. Yes ☐ 2. No	

	hygiene knowledge for you?		
e3	How often do the authorities inspect and supervise your food selling?	☐ 1. Once in less than 3 months ☐ 2. Once every 3-6 months ☐ 3. Once in over 6 months ☐ 4. Not yet	
e4	Have you signed a food safety commitment with the local food and drug authorities?	☐ 1. Yes ☐ 2. No	
e5	Do you have a health certificate?	☐ 1. Yes ☐ 2. No	

Part 4: Accessibility to information on food hygiene

c1	Have you heard of food hygiene or food poisoning?	☐ 1. Yes ☐ 2. No	
c2	Where did you hear the most about food hygiene from?	☐ 1. TV ☐ 2. Radio ☐ 3. Newspaper ☐ 4. Internet ☐ 5. Friends, relatives ☐ 6. Parents ☐ 7. Training ☐ 8. Health staff ☐ 9. Loudspeakers of the community ☐ 10. Other……	

c3	Would you like to know more about food hygiene?	☐ 1. Yes ☐ 2. No	

Part 5: Knowledge of food hygiene

(Please tick (✓) one box per answer)

Code	Question	Yes	No	Don't know
	5.1. General knowledge about food hygiene			
K1	The basic practice for washing hands is to use soap and clean water	2☐	0☐	1☐
K2	The reason for drying your hands after washing is to avoid dripping onto or wetting food, utensils, ingredients, etc.	2☐	0☐	1☐
K3	During preparation of food, the best way to dry your hands after washing them is to wipe them with a damp cloth**	2☐	0☐	1☐
K4	The fingernails of the food vendor can be long**	2☐	0☐	1☐
K5	Food contaminated with microorganisms cannot be detected by scent or sight and cannot be consumed	2☐	0☐	1☐
K6	We should wash cooking utensils after use	2☐	0☐	1☐
K7	We need to wash cooking utensils with soap and clean water	2☐	0☐	1☐
K8	Unsafe food can cause food poisoning and disease	2☐	0☐	1☐
K9	Food poisoning is caused by contaminated and toxic food matter	2☐	0☐	1☐

K10	Fresh vegetables should be washed with warm water and soap**	2☐	0☐	1☐
5.2. Knowledge about food processing, preservation, distribution, preparation and transportation				
K11	The correct temperature for storing frozen food should be 0 ° C	2☐	0☐	1☐
K12	Raw meat should be stored in the top box of a refrigerator	2☐	0☐	1☐
K13	The key to preparing food safely is to prevent food poisoning	2☐	0☐	1☐
K14	Serving food to customers can be done with utensils that do not need to be cleaned**	2☐	0☐	1☐
K15	Residual food does not need to be warmed up to kill the disease**	2☐	0☐	1☐
K16	The length of storage of raw food before processing must be three weeks or more**	2☐	0☐	1☐
K17	We should use chemicals for food storage**	2☐	0☐	1☐
K18	We need to keep residual food for many days for resale**	2☐	0☐	1☐
K19	The food suppliers should have full particulars of their business and food quality certificates	2☐	0☐	1☐
K20	Food should be properly wrapped and stored at temperatures of <5 or >60 ℃	2☐	0☐	1☐
5.3. Knowledge about causes of food contamination				
K21	You can reheat residual food 2-3 times for sale**	2☐	0☐	1☐

K22	All kinds of microorganisms can cause food poisoning	2☐	0☐	1☐
K23	Food with a bad smell contain microorganisms that cause food poisoning	2☐	0☐	1☐
K24	Food poisoning is caused by unclean cooking equipment and improper processing	2☐	0☐	1☐
K25	When you have an infection such as diarrhea, hepatitis A and E, and yeast infections, you can cook**	2☐	0☐	1☐
K26	You should always wash your hands while cooking	2☐	0☐	1☐
K27	Do you use the same cooking utensils for fresh and processed food? **	2☐	0☐	1☐
K28	Glass cabinets should be used when selling food to avoid insects and dust	2☐	0☐	1☐
	5.4. Knowledge about hygiene and food hygiene measures			
K29	The proper temperature for the growth of the germs is 37 ℃	2☐	0☐	1☐
K30	The proper temperature in your refrigerator should be 4-10 ℃	2☐	0☐	1☐
K31	Wearing of an apron, hat and mask while processing and serving food is to look nice**	2☐	0☐	1☐
K32	One symptom of food poisoning is convulsions***	2☐	0☐	1☐
K33	Food poisoning protection is from personal hygiene, food hygiene and clean water and environment	2☐	0☐	1☐
	5.5. Knowledge about the law on food hygiene and food safety			
K34	Microbes need warming to grow and multiply	2☐	0☐	1☐
K35	Water for cooking can be from wells or other natural	2☐	0☐	1☐

	sources			
K36	In order to prevent the risk of contamination from bacteria, we should remove rubbish every month**	2☐	0☐	1☐
K37	Food vendors can wear jewelry such as rings, bracelets and watches**	2☐	0☐	1☐
K38	Table for cooking and sale of food should be at least 60 cm from the ground	2☐	0☐	1☐
K39	Cooked food for sale should be kept for not more than two hours	2☐	0☐	1☐
5.6. Knowledge of reporting and handling of food (handling victims, handling food, food hygiene declaration) in the event of food poisoning				
K40	When food poisoning occurs, you must report it to the nearest health facilities.	2☐	0☐	1☐
K41	When there is food poisoning in your premises, you should help the victim(s), inform the nearby health care authority, stop using the food and store the suspicious food item(s)	2☐	0☐	1☐

Annex 2: Questionnaires

(Observational checklist)

Part 6: Food hygiene practices

(Please tick (✓) one box per answer)

No	Observation content	Yes	No
1. Personal hygiene and environmental sanitation			
p1	Wearing aprons	☐1	☐2
p2	Wearing a mask	☐1	☐2
p3	Wearing a hat	☐1	☐2
p4	Not wearing rings, bracelets, watches when handling cooked food.	☐1	☐2
p5	Not leaving fingernails long and keeping your hands clean.	☐1	☐2
p6	Keeping personal outfits clean, neat.	☐1	☐2
p7	When there is a wound on the skin, sealing the wound with water resistant gauze bandages.	☐1	☐2
p8	Washing hands often when processing or serving food	☐1	☐2
p9	Not using hands directly to scoop or distribute food to be eaten immediately.	☐1	☐2
p10	Not coughing, sneezing, blowing nose, spitting, spewing saliva through careless talking, smoking or chewing gum in food storage and selling areas	☐1	☐2
p11	Having a sealed bin with a lid or plastic bag for containing waste	☐1	☐2
p12	Garbage is collected and disposed of during the day.	☐1	☐2
2. Pre-processing, processing and preservation of food			
h1	Appropriate area found, located away from sources of pollution.	☐1	☐2

h2	Clean water provided, in accordance with national technical regulations, and regular water tests done once a year (tap water or drinking water)	□1	□2
h3	Equipment or containers used separated from other dirty equipment, used gloves disposed of	□1	□2
h4	Table at least 60 cm above the ground	□1	□2
h5	Glass cabinets used for displaying food	□1	□2
h6	Food not mixed with dirty equipment	□1	□2
h7	Clean utensils not mixed with dirty utensils.	□1	□2
h8	Food kept away from dust and flies and outside danger zone (5-60 m)	□1	□2
h9	Food packaging made of safe materials	□1	□2

Annex 3: Concepts/Definitions of the terms

Code	Research variable	Concept/definition	Classification	Method of collection
1. Personal and demographic factors				
g1	Age	Years since birth of vendor	Continuous	Interview
g2	Sex	Gender of vendor	Binary	Observe
g3	Marital status	Whether vendor is married or otherwise.	Categorised	Interview
g4	Education level	Highest level of schooling that vendor has completed	Categorised	Interview
g5	Training in cooking	Whether vendor has attended classes on cooking	Binary	Interview
g6	Training in food safety	Whether vendor has attended classes on food safety	Binary	Interview
g7	Experience in food business	Years of work of vendor related to food processing and trading	Continuous	Interview
g8	Type of vendor	Whether vendor's food outlet is stationary or mobile	Binary	Interview
2. Personal information about street food vendors				
s1	Main occupation	Main employment of vendor	Categorised	Interview
s2	Sale time of the	Whether vendor sells	Binary	Interview

	year	food throughout the year or seasonally (part-time)		
s3	Income of vendors	Amount earned from selling food each month	Continuous	Interview
3. Social environmental and other factors				
e1	Regulation by local government	Whether business of vendor is regulated and licensed by the local government	Binary	Interview
e2	Training on food safety or food poisoning	Whether vendor has had training about food safety or food poisoning from local food and drug authorities	Binary	Interviews
e3	Frequency of inspection and supervision	How often there have been inspections and supervision by local food and drug authorities	Categorised	Interview
e4	Signed food safety commitment	Whether vendor has signed a food safety commitment with local food and drug authorities	Binary	Interview + Observation
e5	Health certificate	Whether vendor has had an annual health	Binary	Interview

		checkup and obtained a health certificate		
4. Accessibility to information on food (hygiene)				
c1	Heard of food hygiene	Whether vendor has heard or seen information on food hygiene	Binary	Interview
c2	Source of information on food hygiene	Most common source of information on food hygiene for vendor	Categorized	Interview
c3	Need for more information on food hygiene	Whether vendor needs to learn more about food hygiene	Binary	Interview
5. Knowledge of food hygiene				
5.1. General knowledge about food hygiene				
K1	Knowledge of washing hands	Whether vendor knows the basics of hand washing before processing food	Binary	Interview
K2	Knowledge of reason for drying hands	Whether vendor knows reason for drying of hands after washing	Binary	Interview
K3	Knowledge of method of drying hands	Whether vendor understands best way for drying hands after washing of wiping with clean dry cloth	Binary	Interview
K4	Knowledge regarding	Whether vendor knows to keep fingernails	Binary	Interview

	fingernail length	short		
K5	Knowledge of Food contamination	Whether vendor understands food contaminated with microorganisms cannot be detected by scent or sight and cannot be consumed	Binary	Interview
K6	Knowledge of washing equipment	Whether vendor knows to wash cooking utensils after use	Binary	Interview
K7	Knowledge of basics of washing the cooking equipment	Whether vendor knows to wash cooking utensils with soap and water after use	Binary	Interview
K8	Knowledge of food poisoning	Whether vendor understands that food poisoning is caused by contaminated and toxic food matter	Binary	Interview
K9	Knowledge of causes of food poisoning	Whether vendor understands that unsafe food from unclean cooking equipment and improper processing can cause food poisoning and risk of disease	Binary	Interview

K10	Knowledge of washing fresh vegetables	Whether vendor understands how vegetables should be washed (not with warm water and soap)	Binary	Interview
5.2. Knowledge about food processing, preservation, distribution, preparation and transportation				
K11	Knowledge of correct temperature for frozen food	Whether vendor understands about keeping foods in the freezer at °Cor below to maintain the quality of frozen foods	Binary	Interview
K12	Knowledge of raw storage	Whether vendor understands about storing of raw meat in the freezer compartment of a refrigerator	Binary	Interview
K13	Knowledge of key to preparing food safely	Whether vendor understands about personal hygiene practices to prevent food contamination	Binary	Interview
K14	Knowledge of food serving to customers	Whether vendor understands that food should be served using clean utensils	Binary	Interview
K15	Knowledge of	Whether vendor	Binary	Interview

	residual foods	understands about reheating food to kill disease		
K16	Knowledge of duration for keeping raw food	Whether vendor understands about the length of time for raw meat storage before processing	Binary	Interview
K17	Knowledge of chemicals for food storage	Whether vendor understands that food should not be stored using chemicals	Binary	Interview
K18	Knowledge of keeping of residual food	Whether vendor understands that residual food for resale should not be stored for several days	Binary	Interview
K19	Knowledge of food suppliers	Whether vendor understands that food suppliers should specify their addresses and be in possession of food quality certificates	Binary	Interview
K20	Knowledge of proper temperature for keeping foods	Whether vendor understands that food should be properly wrapped and stored at temperatures of <5 or >60 ℃	Binary	Interview

5.3. Knowledge about causes of food contamination				
K21	Knowledge of residual food reheating	Whether vendor understands that residual food for sale should not be reheated too many times	Binary	Interview
K22	Knowledge of food poisoning by microorganisms	Whether vendor understands that food poisoning can be caused by all kinds of microorganisms	Binary	Interview
K23	Knowledge of bad smell of food	Whether vendor understands that foods that smell contain microorganisms that cause food poisoning	Binary	Interview
K24	Knowledge of causes of food poisoning	Whether vendor understands that food poisoning is caused by unclean cooking equipment and improper processes	Binary	Interview
K25	Knowledge of disease infection	Whether vendor knows not to cook when they have an infection such as diarrhea, hepatitis A and E, and yeast infections.	Binary	Interview
K26	Knowledge of	Whether vendor knows	Binary	Interview

	hands washing	to wash their hands often while processing food		
K27	Knowledge of using the same food utensils	Whether vendor uses the same utensils for fresh and processed food (and knows to separate them)	Binary	Interview
K28	Knowledge of selling food in glass cabinets	Whether vendor understands about keeping foods for sale in glass cabinets to avoid insects and dust	Binary	Interview
5.4. Knowledge about hygiene and hygiene measures				
K29	Knowledge of temperature for the growth of germs	Whether vendor knows the temperature for the growth of germs	Binary	Interview
K30	Knowledge of proper temperature of refrigerator	Whether vendor knows that the proper temperature in their refrigerator is 4-10 ℃	Binary	Interview
K31	Knowledge of protection suits	Whether vendor knows that wearing an apron, a hat, gloves and a mask is to protect from contamination (and not just to look nice)	Binary	Interview
K32	Knowledge of food poisoning	Whether vendor knows that convulsions is not	Binary	Interview

	symptoms	a symptom of food poisoning		
K33	Knowledge of Food poisoning protection	Whether vendor understands that food poisoning protection is from personal hygiene, food hygiene and clean water and environment	Binary	Interview
5.5. Knowledge about the law on food hygiene and food safety				
K34	Knowledge of temperature for growing microbes	Whether vendor understands that microbes need warmth to grow and multiply	Binary	Interview
K35	Knowledge of water used to cook	Whether vendor understands that water for cooking should be clean (and not be from wells or other natural sources)	Binary	Interview
K36	Knowledge of prevention of food contamination	Whether vendor understands that rubbish should be removed every day (and not once a month) to prevent contamination from bacteria.	Binary	Interview
K37	Knowledge of jewelry wearing	Whether vendor understands that rings,	Binary	Interview

		bracelets and watches should not be worn when processing food to prevent food contamination.		
K38	Knowledge of table height for cooking and food sale	Whether vendor understands that the table top for food cooking and selling should be 60 cm from the ground	Binary	Interview
K39	Knowledge of cooked foods for sale	Whether vendor understands that cooked food for sale should not be kept for more than two hours	Binary	Interview
5.6 Knowledge of reporting and handling (handling victims, handling food, food hygiene declaration) in event of food poisoning				
K40	Knowledge of report of food poisoning	Whether vendor knows to report food poisoning to the nearest health facilities	Binary	Interview
K41	Knowledge of food poisoning response	Whether vendor knows When there is food poisoning in their premises, to help the victim(s), inform the nearby health care authority, stop using	Binary	Interview

		the food and store the suspicious food item(s)		
6. Personal hygiene and environmental sanitation practices				
p1	Wearing aprons	Whether vendor wears an apron while processing, cooking or serving food	Binary	Observation
p2	Wearing masks	Whether vendor wears a mask while processing, cooking or serving food	Binary	Observation
p3	Wearing hats	Whether vendor wears a hat while processing, cooking or serving food	Binary	Observation
p4	Wearing rings, bracelets, watches	Whether vendor wears rings, bracelets and watches during food processing	Binary	Observation
p5	Keeping fingernails long, and not keeping hands clean.	Whether vendor keeps fingernails short and hands clean.	Binary	Observation
p6	Keeping personal outfits clean, neat.	Whether vendor keeps their personal outfits clean and neat	Binary	Observation
p7	Bandaging of wounds on skin	Whether vendor properly bandages and seals external wounds	Binary	Observation

		with water resistant gauze bandages.		
p8	Hands washing	Whether vendor washes their hands often during food processing	Binary	Observation
p9	Scooping and distributing food	Whether vendor uses their hands directly to scoop and distribute food	Binary	Observation
p10	Coughing, sneezing, blowing nose, smoking, chewing gum, spitting, spewing saliva from talking carelessly	Whether vendor avoids coughing, sneezing, blowing their nose, spitting, spewing saliva through careless talking, smoking or chewing gum in food storage and selling areas	Binary	Observation
p11	Having a garbage bin with a lid	Whether vendor has a sealed bin with a lid or plastic bag for containing waste	Binary	Observation
p12	Ensuring daily disposal of rubbish	Whether vendor collects and disposes of rubbish every day	Binary	Observation
7. **Food hygiene practices**				
h1	Appropriate area chosen for selling	Whether vendor's food sale location is away	Binary	Observation

	food	from sources of pollution		
h2	Provision of clean water	Whether vendor uses water in accordance with national technical regulations and has regular water tests done once a year	Binary	Observation
h3	Separation of equipment	Whether vendor separates clean equipment from dirty containers and disposes of used gloves immediately	Binary	Observation
h4	Height of table for food sale	Whether vendor's table surface for food sale is at least 60 cm above the ground	Binary	Observation
h5	Use of glass cabinets	Whether vendor uses glass cabinets for displaying or selling food to protect from dust, insects, etc.	Binary	Observation
h6	Separation of cooked food	Whether vendor avoids mixing cooked food with dirty utensils	Binary	Observation
h7	Separation of utensils and ingredients	Whether vendors keeps clean utensils and ingredients apart from	Binary	Observation

		dirty ones		
h8	Keeping food	Whether vendor keeps food away from dust and flies	Binary	Observe
h9	Material for containing or packing food	Whether vendor uses safe and clean material to contain and pack food	Binary	Observation

Annex 4: Informed consent form

I have read or been informed about the rationale and objective of the research entitled "Knowledge, practices and related factors on food hygiene among street food vendors in Vientiane capital, Laos" and what my participation will entail as well as any possible risks or harm and benefits of this project. The researcher has explained the details to me and I clearly understand them to my satisfaction. I willingly agree to participate in this project and consent to the researcher to respond to the questionnaire until the interview is finished. I understand that I have the right to withdraw from this research project at any time as I wish with no need to give any reason. This withdrawal will not have any negative impact upon me. The researcher has guaranteed that procedures for my participation in the survey will be exactly the same as indicated in the information. All of my personal information will be kept confidential. Results of the study will be reported as an overall picture. Any personal information which could be able to identify me will not appear in the report. If there is any non-compliance with the information in the conduct of the research, I can report it to the Ethics Commission, the Institute of Science and Education, University of Health Sciences. Office address: Samsenthai Road, Ban Kaognot, Sisattanack District Vientiane Capital, Lao PDR. Tel: +856 21245820, Fax: +856 21 214055, Email contact@uhs.edu.la. I have also received a copy of the information sheet and the informed consent form

Researcher's Name: _____ *Researcher's Signature:* _____

Date: _____

Respondent's Signature: _____ *Date:* _____

Annex 5: Ethical Clearance

Lao's People Democratic Republic
Peace Independence Democracy Unity Prosperity

Ministry of Health
University of Health Sciences
Ethic Committee

No: 109 /19

Tel: 021 245820

Vientiane, Date

Ethical Clearance

- According to the Ethic Committee's declaration of the University of Health Sciences Number: 3809/UHS.15, dated 1 Sep, 2015.
- According to the letter of request for Ethical Clearance of Mr Khamphou CHANTHAPANY, Master of Public Health, faculty of Public Health, University of Health Sciences. for research entitled: **« Knowledge, Practices and its related factors on food hygiene among street food vendors in Vientiane Capital, Laos»**

The Ethic Committee of the University of Health Sciences approved the research proposal of this study before it is initiated. This study is committed in compliance with local requirements, to confirm that it is without the physical and psychological harm of the participants as well as the ethical issues for health research. However, we believed that this study/project will contribute to a great importance of health promotion; it will also be a direct and indirect participants' beneficial and to be a crucial database in the further research of the University of Health Sciences and Health sectors in the country.

Hence, the Ethic Committee of the University of Health Sciences sincerely agreed to approve in term of ethical clearance for this study/project.

President of the
University of Health Sciences

Dr. Phouthone VANGKONEVILAY

President of the
Ethical research committee

Dr. Bansa OUPATHANA

Annex 6: Vendor/ Participant Information Sheet

Title of research: Knowledge, practices and related factors on food hygiene among street food vendors in Vientiane capital, Laos

Researcher's name: Mr. Khamphou Chanthapany

Office address: Department of Public Health, Vientiane Capital

Cell phone: +856 20 55420464

E-mail: chkhamphou@yahoo.com

1. **Invitation to research**

You are being invited to take part in a research project because you are a street food vendor and are vending food in Vientiane capital, which is related to this study. Before you decide to participate, it is important for you to understand why the research is being done and what it will contain. Please take time to read the following information carefully and do not hesitate to ask if anything is unclear or if you would like more information.

2. **Objectives of the study**

- To describe the knowledge and practices of food hygiene among street food vendors in four urban districts, Vientiane Capital
- To identify what the related factors are affecting food hygiene practices of street food vendors in four urban districts, Vientiane Capital

3. **Study subjects**

This study is a cross-sectional, descriptive study. The subjects/participants will be street food vendors that can be identified in the main streets, close to fresh markets, and in other public places. They will be requested to respond to the questionnaire and observation by the investigators

4. **Procedure for participants**

The participants will have to answer all the questions on the forms, including questions on general information of street food vendors and their knowledge and

practices of food hygiene. They will also be observed in their practices of personal hygiene, food hygiene and environmental sanitation

5. Hazards or risks that may occur for research volunteers.

Your participation in this survey should bear no harm to yourself or your reputation, nor should it impose on your beliefs.

6. Benefits of the project.

This study will provide important information on food hygiene to the Ministry of Health and its Food and Drug Division as well as to other organizations concerned with the planning, management and control of food to improve and develop the quality of food sold and served by street food vendors in Vientiane capital in the future.

7. Keeping confidential information related directly to participant

Your information used in this study will be kept confidential by the researcher. All collected data will be destroyed after the report has been completed.

8. **Process of providing information to participants**

- You will be briefed about the risks and inconvenience that may occur during the research.
- You will have the opportunity to ask questions about the research or related procedures and you can withdraw from the research at any time without any impact on you.
- You will receive a copy of the descriptive document for the participant as well as a signed and dated consent form.
- You have the right to decide whether or not to participate in the research without intimidation or deception.

Finally, if the researcher does not conduct the survey with participants as indicated in the information, the participants can report it to the researcher or to the Ethics Commission, Institute of Science and Education, University of Health Sciences.

Samsenthai Road, Ban Kaognot, Sisattanack District, Vientiane Capital, Lao PDR. Tel: +856 21245820 Fax: +856 021 214055 Email
contact@uhs.edu.la

Annex 7: List of data collection team members

Group I

1. Mrs. Kongsone MANIBOT (Team leader)
2. Mrs. Khamkhong KEOMAHAVONG

Group 2

3. Mrs. Anback HONGSIVILAY (Team leader)
4. Mrs. Phicdavanh BOUADOKTHONG
5. Mr. Sisawath SOUKKHASING

Group 3

6. Mrs. Thakphin INTHAVONG (Team leader)
7. Mrs. Nonglak SAYYALATH
8. Mr. Phonethep PANYACHAK

Annex 8: Schedule of thesis writing

Activities	Month of year 2018-2019											
	7	8	9	10	11	12	1	2	3	4	5	6
Review of all documents												
Creation of a query form												
Training of the research team												
Pretesting and improvement of form												
Data collection												
Data entry and analysis												
Interpretation of data results												
Writing of thesis												
Final thesis submission												
Edited version submission												
Writing of manuscript												
Revision of thesis												
Submission of manuscript												

Activities	Month of year 2018-2019					
	7	8	9	10	11	12
Review of all documents						
Creation of a query form						
Training of the research team						
Pretesting and improvement of form						
Data collection						
Data entry and analysis						
Interpretation of data results						

Writing of thesis						
Final thesis submission						
Edited version submission						
Writing of manuscript						
Revision of thesis						
Submission of manuscript						

Annex 9: Curriculum Vitae

Insert Picture

Family name: Chanthapany

First name: Khamphou

Date and place of birth: 19/12/1969

Address: Saphangmor village, Saysetha district. Vientiane Capital

Country: Lao PDR

Nationality: Laotian

Telephone: +856 20 55420464

E-mail: chkhamphou@yahoo.com

Professional experience

Technical Staff, Food and Drug Section, Department of Public Health, from 1987 until now.

Education, training and courses

Bachelor of Pharmacy, 1996

HANOI UNIVERSITY OF PUBLIC HEALTH

THESIS COMMENT FORM OF MASTER PROGRAM

(For reviewer of thesis defence committee – Master Program)

Thesis topic:

KNOWLEDGE, PRACTICE AND ITS RELATED FACTOR ON FOOD HYGIENE AMONG STREET FOOD VENDERS IN VIENTIANE CAPITAL, LAOS

Thesis code: *(Written on the right corner of thesis cover page)*

June 17th, 2019

1. Thesis topic has correct orientation and specialized codes (Master of public health applied science orientation/ Master of public health applied research orientation):**Yes.**
2. **Thesis topic:**
3. **Research summary:**
   - Summary of research results need to provide clear evidence, meeting the two objectives, particularly factors related to K and P. For example: what are exact relationships between training on food hygiene and K and P?, etc. OR and P values should be presented, not only percentages.
   - Conclusions should be more concise and based on the study results. No need to discuss in the conclusions.
   - Recommendations must be based on the results, conclusions. What is differences between Education programme and Training on food hygiene?
4. **Introduction:**

   More information about Street Food Vendors' K and P of food hygiene in the Laos should be provided to have clear problem statement.

5. **Research Objectives:**

Objectives are clear.

6. **Literature review:**

   In summary: literature review should be revised, considering the followings:

   1. Key concept and definition
   2. K and P: what are K and P (details contents of K, P), based on Laos MOH and WHO.

3. Studies on K and P of food hygiene knowledge and practice: provide information of K, P of food hygiene knowledge and practice and related factors to practice. What are really K and P of food hygiene knowledge and practice have been assessed in the previous studies? How they have been assessed? And
4. What are related factors to practice? These information are basis for development of conceptual framework. Section 1.3 " Some measures against food poisoning" but not food hygiene. This section needs much revision.

7. Subjects and research methods:

Some suggestions for revision:

- Section 2.2: Study design should be analytical but not descriptive cross-sectional study.
- Section 2.3: should be "study subject", nots "study sample"
- Measurement, evaluation criteria should be explain clearly, e.g basis for measurement of K and P (based on what Agreement, Law, etc,.).
- Section 2.5, 2.7 and 2.10 should be combined or made consistent: It is not clear: wrong answer gets 0 point, but don't know/not sure answer gets 1? For negative questions, wrong answer gets 2, correct gets 1?
- Basis for "Good" or "Poor" knowledge/practice. What are cut off points (which points" and give references.
- What "the good practice considered when the mean score above the total mean,…"????? (section 2.5.2, p35)

8. Research results:

Structure of result chapter should be revised, followings the two objectives:

- Knowledge on food hygiene,
- Practice on food hygiene, and
- Relate factors for food hygiene practice

What is good/poor knowledge/practice?

- **In all tables,** just number and % of "yes" or "no", but nut "mean" as presented in Method chapter.
- **Analytical statistics** do not cover all related factors presented in the conceptual framework.

Summary under each table should be shortened, not repeated all information in a table.

9. Discussion:

Discussion chapter is too short and not clear. More discussion, including comparison this study results with others (references), explain results, etc, but not repeat study results.

Factors related to practice should include all four groups as presented in the conceptual framework.

10. Conclusion: too long!

- Conclusions must be clear and concise, providing with evidences from study results (present conclusions are very general and lack of evidences).
- Conclusion must be meet the two study objectives (review the study objectives)
- Factors related conclusion should be added.
- No more discussion, reference in conclusion.

11. Recommendations

- Rewrite accordingly to revised conclusion section.
- Recommendation must be based on the study results and provide clear and specific information about: what, who, how and when,…

12. FINAL CONCLUSION: (NEED TO BE CLEARLY STATE):

[x] Approval with some conditions

- This thesis needs an intensive revision.
- English should be edited.

Reviewer

Ha Van Nhu

HANOI UNIVERSITY OF PUBLIC HEALTH

THESIS COMMENT FORM OF MASTER PROGRAM
(For reviewer of thesis defence committee – Master Program)

Thesis topic: ..... Knowledge, practice and its related factors in food hygiene among street food Vendors in Vinhtuc capital. LABS .....

Thesis code: *(Written on the right corner of thesis cover page)*

....., Date.....Month.....year 2019

1. Thesis topic has correct orientation and specialized codes (Master of public health applied science orientation/ Master of public health applied research orientation)

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2. Thesis topic:

1. Comments .....
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2. Which part need to be edited, (if any): .....
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3. Research summary:

1. Comments: .....
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2. Which part need to be edited, (if any): .....
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4. Introduction:

1. Comments: .....

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2. Which part need to be edited, (if any): .....

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5. Research Objectives:

1. Comments.....

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2. Which part need to be edited, (if any): .....

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6. Literature review:

1. Comments: (structure and content of literature review are coherent with objectives and research topic, use updated reference and citation correctly, and other comments (if any):

.....
The are many references in the citation is not available in reference list.
.....

2. Which part need to be edited, (if any): .....
Please recheck your citation and reference list. Because there are many citation years not match with the reference list
.....

7. Subjects and research methods:

1. Comments: (i) Subjects are suitable to objectives; (ii) Sample size and sample selection are appropriate and feasible; (iii) Variables/contents are suitable to objectives, orientation and specialized codes; (iv) Data collection is clear, feasible and appropriate with research content; (v) Data analysis and research ethic are written clearly and appropriately; (vi) Other comments (if any):

.....
Measurement of Dependent variable you mention as 2 of items (But in the questionnaire, there are 21 items)

2. Which part need to be edited, (if any): .....
you should check the dependent variable to match with your tool. and also correct it if you have only 21 items in order to calculate for assessment

8. Research results:

1. Comments: (i) Research results are suitable with objectives, orientation and specialized codes; (ii) Research result is presented clearly and followed by objectives; (iii) Using data analysis appropriately and ensuring confidence of these methods; and other comments (if any): Some table need to describe the result especially the table of Multiple Logistic regression and check the value of 95% CI that you mentions about statistical significant

2. Which part need to be edited, (if any): .....
- Please Check table 3.12. on page 59
- And interprete the result.

9. Discussion:

1. Comments: (i) Structure/Content of this part are suitable to objective and research results; (ii) Reference citation is correct: .....
Check the reference in the citation and reference list.

2. Which part need to be edited, (if any): .....

10. Conclusion:

1. Comments: (The main research result are given in this part and suitable to objectives)
.....

2. Which part need to be edited, (if any): .....

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11. Recommendations

1. Comments: The recommendation is given appropriately and based on research results.

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2. Which part need to be edited, (if any): .....

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12. FINAL CONCLUSION: (NEED TO BE CLEARLY STATE):

[ ] Approval **[x] Approval with some conditions** **[ ] Reject**

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(Notes: Please do not WRITE your name because this is a hidden comment round)

Reviewer

MINISTRY OF HEALTH

HANOI UNIVERSITY OF PUBLIC HEALTH

FORM

MINUTES OF EXPLANATION

AFTER INDEPENDENT ASSESSMENT ROUND

Thesis title "Knowledge, practices and its related factors on food hygiene among street food vendors in Vientiane capital, Laos"

……..

Comments	**Student's explanations detail** *(Clearly state how, which part, page that student edits. if students disagree, reasons should be indicated*
Orientation and specialized codes	
……	
Thesis topic	
……	
Abstract	
-Summary of research results need to provide clear evidence, meeting the two objectives, particularly factors related to K and P. For example: what are exact relationships between training on food hygiene and K and P?, etc. -Conclusions are not clear and no conclusion of K and P is provided. Summery need to be review, definition of key word and some situation on Laos	-in summary of research result: I added some information to result and improved conclusion such as assessment of knowledge, practices and related factors on food hygiene (p X, IX). - I added more information in summary, definition and a little bit information of food situation in Laos
Introduction	
More information about K and P of food hygiene in the world and in Laos should be provided to	- For the introduction, I have adapted all part by filling new contents to suit the

have clear problem statement. Introduction for VTE need to put in. Geography of food hygiene and food vendors in Lao. VTE. Conceptual framework please put the main sentences of the figure and the key main sentences why draft it	knowledge and practice evaluation (p12). -I added more information of Lao
Objectives	
……..	
Review of Literature/Theoretical framework	
-**Section 1.1 and 1.2 could be combined** as they are about "key concepts and definitions". -**Key concepts and definitions:** references for all key concepts, definitions presented must be provided. There is no source of reference for all "definition of terms" in section 1.1 and "key definition" in section 1.2. -**All references must be quoted from original sources**. E.g. "food hygiene" concept (p.5) is quoted from Jenpanich 2015, not form the WHO. -**Section 1.3:** only one reference (Out, 2014) is provided. This is one of key sections of the thesis, therefor, what are included in "food hygiene knowledge and practice?" should be provided. They are basis for developing the contents of food hygiene knowledge and practice presented in the Conceptual framework. These contents (food hygiene knowledge and practice) should be based on official documents of Laos MOH/relevant organization (or form the WHO). -**Section 1.6** "measures to handle food poisoning" should be "Measurement/Assessment of food hygiene knowledge and practice" because this study is about "food hygiene knowledge and practice", but not only "Handling food poisoning" This section will include information (from references) on how food hygiene knowledge and practice have been assessed. -**Section 1.12:** it is not appropriate to separate studies on food hygiene knowledge from food	-Regarding literature review, I've modified and changed the new number completely because I've filled some new contents and cut out some of it: I added new contents to section 1.1 (1.1.2) to be knowledge on food hygiene of street food vendors; section (1.1.2) to be food hygiene practices of street food vendors and section 1.2 into socio-demographic characteristic. (p 15,16,17) - I edited reference from WHO into Jenpanich 2015 (p.21) -I combined together in old section 1.1 and 1.2 and edited references in section 1.1 , 1.2 -In section 1.3, I added a new contents to be proper with knowledge and practices of food hygiene (p.23,24,25) -Section 1.6, I changed all measure to handle food poisoning to be assessment of knowledge and practices on food hygiene, but I moved it to chapter methodology in section 2.5 (p.35) -Section 1.12, I changed to be section 1.5, for some studies was done by researchers, I combined together between knowledge and practices of food hygiene (p. 28)

hygiene practice, because knowledge and practice are mixed in the section 1.12.1 (studies on K). It will be clearer and better if this section provides what are the contents of K and P of food hygiene and how they are assessed (method) by referenced researchers. **-Factors related to food hygiene and practice** should be reviewed to provide basis for developing conceptual framework. In summary: literature review should be revised, considering the followings: 1.Key concept and definition 2.K and P: what are K and P (details contents of K, P), based on Laos MOH or WHO. 3. Studies on K and P of food hygiene knowledge and practice: provide information of K, P of food hygiene knowledge and practice and related factors. What are really K and P of food hygiene knowledge and practice have been assessed in the previous studies? How they have been assessed? And what are related factors? -There are many references in citation is not available in references list -Put the point literature in the right format	-Factors related to food hygiene practices, I added some contents in section 1.2 such as socio demographic characteristic (p25) -In literature review, I have added some information, edited and improve several points to be appropriated In literature review I added added some information, edited and improve several points to be appropriated, so that I developed new references I improve almost of literature review
Objects and research methods	
…….	
Study results	
-Section 3.4, Table 3.6 should be divided in 6 tables accordingly to present in the conceptual framework. What is “DK”?	-Section 3.4, Table 3.6. I divided to be six parts of knowledge with six table: 1. General knowledge on food hygiene 2. Knowledge of processing, preserving… 3. Knowledge about cause of contamination 4. knowledge of hygiene and hygiene measures 5. knowledge about law on food hygiene

-Section 3.6.2: no “Poor” and “Good” practices are presented? These need to be added. -Summary under each table should be shortened, not repeated all information in a table. -Terminology used in tables must be consistence (reach, failing or wrong, correct (table 3.9 and 3.10) (table 3.6) or no, yes (table 3.11, etc)). -Table 3.11 and 3.12 are not clear. What is “Hygiene”? it is “Food hygiene practice” perhaps???; what are “no” and “yes”? They are “Poor” and “Good” practice???. - The author needs check data presented in table 3.11 and 3.12 to ensure they are correct. For example, data on knowledge presented in Table 3.11 are different from that in Table 3.7. -Some table need to be rewrite the result especially the table of multiple logistic regression and check the value of 95% CI you mentioned about statistical significant -Please check on table 3.12, p.57 and interpret the result Not duplicate for each table and present the data based on the objective like: knowledge level in -each component good and bad -Influent factor: p 60-61:Explain more for multivariate analysis with model that used and explain p 63 -Objective need to clear compare with outcome	6. knowledge of reporting and handling food (p.47-57) -section 3.6.2, I added poor and good practice in table 3.20 (p.59) and I edited each tables to be shortened; I changed correct, reach, failing, wrong to be Yes and No. -Table 3.11 and 3.12 “What is hygiene?” It mean that “hygiene practice”. -What are No and Yes? The “No” mean that, the respondents answer “No” (n=122) and the “Yes” mean that the respondents answer “Yes” (n=75) (For example in the table 3.11, 3.12) -Aged “14-39 year” No=59; Yes=40 “40-60 year” No=62; Yes=35 Sump up: No=59+62=121 =(n=121) Yes=40+35=75= (n=75) - In some result, I rewrote and edited it -And reinterprets of result -The result, I have edited the contents in each tables - For multivariate, I revised and separated between 2 group of hygiene practices where was relationship with independent -I have edited
Discuss	
Discussion chapter is too short and not clear. More discussion, including comparison this study results with others (references), explains results, etc, but	-For discussion, I improved of discussion and I followed by comment, such as General information of study subjects, Knowledge of food hygiene, Practice of

not repeat study results. Structure of Discussion Chapter should be revised as follows: 1. General information of study subjects 2. Knowledge of food hygiene 3. Practice of food hygiene 4. Factors related to K and P (this can be combined with section 2 and 3 accordingly) -Check the references and citation list - Reliability and validity for measurement need to put in discussion part, no need to discuss for Demo, but discuss by group of related factors subheading Practice of food vendor	food hygiene and Factors related to knowledge and practices -For discussion, I improved of discussion and I followed by comment, such as General information of study subjects, Knowledge of food hygiene, Practice of food hygiene and Factors related to knowledge and practices and added new references -Regarding discussion, I revised and improved the contents related to factors
Conclusions	
-Conclusions must be clear and concise, providing with evidences from study results (present conclusions are very general and lack of evidences). -Conclusion must be meet the two study objectives (review the study objectives) -The first paragraphs and section 5.1 should be deleted. -Factors related conclusion should be added. No more discussion, reference in conclusion - Conclusion move to result. It is too long and bases on the objectives	-Conclusion, I improved and edited as General information of study subject, Street food vendors' knowledge on food hygiene, Practice on food hygiene and Socio-demographic characteristics and related factors on food hygiene. -I changed almost of conclusion
Recommendations	
-Rewrite accordingly to revised conclusion section. -Recommendation must be based on the study results and provide clear and specific information about: what, who, how and when,…	As also recommendation, I edited and developed it
References	

……	
Questionnaire	
……..	
Other comments	
……	

Notes:

- Use lines to separate each comments and explanations. Comments and equivalent explanations stay at the same row.
- Explanations should be written by following thesis structure (if any).

Day 16 Month 8, 2019

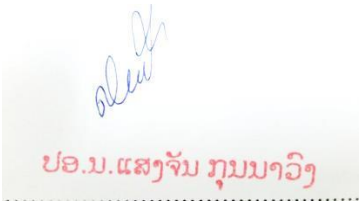
Student

(Sign and full name)

1st supervisor
(*Sign and full name)*

Prof. La Ngoc Quang

2nd supervisor
(Sign and full name)



Supporting lecture (if any)
(Sign and full name)

Examiners' comments *(if any)*:

……
……

Day month year

On behalf of the committee

(Sign and full name)

Nguyen Thanh Huong