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KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARD
Clostridium Botulinum OUTBREAK IN HOME-CANNED BAMBOO
SHOOTS AT PAKALUANG SUBDISTRICT,
BAN LUANG DISTRICT, NAN PROVINCE, THAILAND



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Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Public Health Program in Health Systems Development

College of Public Health Sciences

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Thesis Title KNOWLEDGE, ATTITUDE, AND PRACTICE
TOWARD *Clostridium Botulinum* OUTBREAK IN
HOME-CANNED BAMBOO SHOOTS AT
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By Mr. Thanusin Saleeon

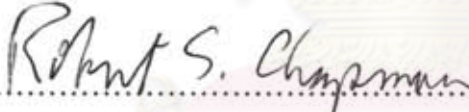
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วิทยานิพนธ์หลัก :อ.ดร.วัฒน์สิทธิ์ ศิริวงศ์ 77หน้า.

การศึกษานี้ มีวัตถุประสงค์เพื่อประเมินระดับความรู้ ทักษะ และ การปฏิบัติตนของประชาชนต่อการเกิดการระบาดของโรคโบทูลิซึม(เชื้อคลอสตริเดียม โบทูลินัม)ในหน่อไม้ปืบ ตำบลป่าคากหลวง อำเภอบ้านหลวง จังหวัดน่าน ประเทศไทย เป็นการศึกษาแบบภาคตัดขวางชนิดวิเคราะห์ กลุ่มตัวอย่างคือตัวแทนของครัวเรือน จำนวน 280 คน จากตำบลป่าคากหลวง อำเภอบ้านหลวง จังหวัดน่าน ประเทศไทย โดยวิธีการสุ่มตัวอย่างแบบมีระบบและเก็บข้อมูลด้วยวิธีการสัมภาษณ์แบบตัวต่อตัวตามแบบสอบถามที่สร้างขึ้น วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา และการทดสอบค่าไคว์-สแควร์ (Chi-square test) ผลการศึกษาพบว่า ความรู้อยู่ในระดับปานกลาง เท่ากับร้อยละ 57.90 และทัศนคติอยู่ในระดับเห็นด้วย ร้อยละ 48.20 ส่วนการปฏิบัติตนอยู่ในระดับดี ร้อยละ 89.60 นอกจากนี้พบว่า ความรู้มีความสัมพันธ์กับลักษณะทางประชากรและสังคมของประชากรที่ศึกษา ($p < 0.05$) ได้แก่ กลุ่มอายุ อาชีพ ระดับการศึกษา ($p < 0.001$) และ รายได้ของครัวเรือน ($p < 0.001$) ทักษะมีความสัมพันธ์กับอายุ ระดับการศึกษา ($p < 0.002$) อาชีพ ($p < 0.001$) และ รายได้ครัวเรือน($p < 0.001$) และพบว่าระดับการศึกษา($p < 0.05$) รายได้($p < 0.001$) และอาชีพ ($p < 0.001$) มีความสัมพันธ์ต่อระดับการปฏิบัติตน และความสัมพันธ์ระหว่างระดับความรู้ ทักษะ กับการปฏิบัติตนพบว่า ระดับความรู้ไม่มีความสัมพันธ์กับการปฏิบัติตน ($p = 0.201$) และระดับทัศนคติมีความสัมพันธ์กับการปฏิบัติตน ($p < 0.001$) ผลจากการศึกษานี้สามารถนำไปประยุกต์ใช้ในการป้องกันและควบคุมโรคโบทูลิซึม(เชื้อคลอสตริเดียม โบทูลินัม)ในหน่อไม้ปืบในพื้นที่อื่นๆที่มีลักษณะสภาพความเป็นอยู่ที่คล้ายคลึงกันได้

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THANUSIN SALEEON : KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARD *Clostridium Botulinum* OUTBREAK IN HOME-CANNED BAMBOO SHOOTS AT PAKALUANG SUBDISTRICT, BAN LUANG DISTRICT, NAN PROVINCE, THAILAND. THESIS ADVISOR: WATTASIT SIRIWONG, Ph.D., 77 pp.

The aim of this study was to assess the level of knowledge, attitude and practice toward *Clostridium botulinum* outbreak in home-canned bamboo shoots at Pakalung SubDistrict, Ban Luang District, Nan Province, Thailand. Using cross-sectional analytic study, 280 participants was selected by systematic random sampling from Pakalung SubDistrict, Ban Luang District, Nan Province, Thailand. Data collection was done by face to face interview using structure-questionnaire. The results indicated that the prevalence of knowledge and attitude of whom were at moderate level, 57.90% and positive level, 48.20% respectively. The prevalence of good practice level was 89.60%. Furthermore, the knowledge was associated with social-demographic characteristics ($p < 0.05$) such as age group, occupation, level of education ($p < 0.001$) and monthly income ($p < 0.001$). The attitude was associated with age group ($p < 0.05$), level of education ($p < 0.002$), monthly income and occupation ($p < 0.001$) respectively. Education level ($p < 0.05$), monthly income and occupation were associated with practice level ($p < 0.001$). There was a significant association between attitude and practice ($p < 0.001$). The knowledge was not statistically significant with the practice ($p = 0.201$). In conclusion, this study could be applied for prevention and control of *C. botulinum* in other area with similar context.

Field of Study : Heath Systems Development Student's Signature..... *Thanusia*.....

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ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

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LIST OF ABBREVIATIONS

CDC Centers for Disease Control and prevention

KAP Knowledge, Attitude, and Practice

WHO World Health Organization



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CHAPTER I

INTRODUCTION

1.1 Background & Rationale

Human botulism is found worldwide. Spores from *C. botulinum* strains that produce type A or B toxins are distributed widely in the soil and have been found throughout the world. Toxin type B is commonly found in Europe. Toxin G was originally isolated in Switzerland (MMWR 1999). From 1990 to 2000, home-canned foods remained a leading cause of food borne botulism in the United States. The canning and fermentation of foods are particularly conducive to creating anaerobic conditions that allow *C. botulinum* spores to germinate. Botulism was first described in consumers of sausages in Europe in the 18th century, and commercially canned foods caused outbreaks in the 19th and early 20th centuries before standard methods for inactivating *C. botulinum* spores in cans were perfected (Sobel *et al.*, 2004). Contaminated raw foods, inadequate cooking, and consumption of food from an unsafe source were the factors most commonly associated with reported outbreaks of food borne illness in homes (Mederios *et al.*, 2001).

Early in the 20th century, the proportion of botulism outbreaks caused by contaminated, commercially produced foods declined; however, improperly made home-canned foods have long constituted a major source of botulism in the continental United States. Traditional Alaska Native foods, especially fermented foods like fish and fish eggs, seal, beaver, and whale, also pose a risk and account for the high incidence of botulism in Alaska (Ryan *et al.*, 2009).

Since the 1970s, restaurant-associated botulism outbreaks have accounted for a large proportion of U.S. cases (MacDonald, Cohen, and Blake, 1986). In the United States, averages of 145 cases of *C. botulinum* poisoning are reported each year. Of these, approximately 15% are food borne, 65% are infant botulism, and 20% are wound. Incidence rate approx 1 in 1,766,233 or 0.00% or 153 people. Outbreaks of food borne botulism involving two or more persons occur most years and usually

caused by eating contaminated home-canned foods (United States Centers for Disease Control and Prevention, 2009).

There is strong statistical evidence that the incidence of food poisoning caused by caterers is greater than in any other food sector, accounting for 70% of all bacterial food poisoning outbreaks. 70% of these food poisoning outbreaks are due to the inadequate time and temperature control of food, while the remaining 30% are the result of cross-contamination (Wilson, Murray, Black, and McDowell, 1997).

Botulism is a rare but serious paralytic illness caused by a nerve toxin produced by the bacterium *C. botulinum*. There are three main kinds of botulism. Food borne botulism is caused by eating foods that contain the botulism toxin. Wound botulism is caused by toxin produced from a wound infected with *C. botulinum*. Infant botulism is caused by consuming the spores of the botulinum bacteria, which then grow in the intestines and release toxin. All forms of botulism can be fatal and are considered medical emergencies. Foodborne botulism is especially dangerous because many people can be poisoned by eating a contaminated food. Botulism causes death due to respiratory failure. However, in the past 50 years the proportion of patients with botulism who die has fallen from about 50% to 3-5%. A patient with severe botulism may require a breathing machine as well as intensive medical and nursing care for several months. Patients who survive may have fatigue and shortness of breath for years and long-term therapy is needed for recovery (United States Centers for Disease Control and Prevention, 2009).

In Thailand, epidemiological investigations found 2 outbreaks of food borne botulism following consumption of home-canned bamboo shoots in northern Thailand. The first outbreak affecting 4 female and 2 male cases occurred in Mae Sot District, Tak Province, in December 1997. All 6 cases were hospitalized, 4 of whom required mechanical ventilation. All cases experienced neurological features and 4 had gastrointestinal symptoms. One case died, giving a case-fatality rate of 16.7 per cent. A case-control study revealed a significant association ($p < 0.01$) between the disease and consumption of home-canned bamboo shoots purchased from the same foodshop in the village (Swaddiwudhipong and Wongwatcharapaiboon , 2000).

The second outbreak of a similar clinical syndrome occurred in Thawangpha District, Nan Province, in April 1998. A total of 13 cases were identified, 9 (69.2%)

of whom were female. Nine cases (69.2%) were hospitalized, 4 (30.8%) of whom required mechanical ventilation. Two early hospitalized cases died due to ventilatory failure, giving a case-fatality rate of 15.4 per cent. A case-control study indicated that home-canned bamboo shoots prepared by a local food shop served as the vehicle for the disease transmission. One bamboo shoot specimen from one affected house was positive for botulinum toxin type A by enzyme-linked immunosorbent assay and mouse antitoxin bioassay. Improper home-canning procedures for bamboo shoot preservation were similarly detected in both outbreaks although performed by different merchants. Prompt recognition and treatment of the disease are essential in reducing the fatality rate. Safe home-canning procedures should be widely distributed and instructed to persons who perform bamboo shoots preservation for sale (Swaddiwudhipong and Wongwatcharapaiboon, 2000). This investigation confirmed that the outbreak was caused by botulism type A intoxication and implicated home-canned bamboo shoots as the common source. A case-control study implicated bamboo shoots and all cases had consumed shoots from the same can. Type A toxin was identified from a sample of the bamboo shoots. This is the first laboratory confirmed outbreak of botulism in Thailand (United States Centers for Disease Control and Prevention, 1999).

On March 15, 2006, several patients sought treatment at Ban Luang district hospital with reports of gastroenteritis. An outbreak of botulism was suspected, and an investigation was begun when another 10 patients presented to the emergency unit, some with bulbar palsies and respiratory compromise (United States Centers for Disease Control and Prevention, 2006).

All patients had eaten home-canned bamboo shoots one day earlier, when approximately 330 villagers attended an annual religious rite in a small village in this district, during which home-canned bamboo shoots from two 20-litre cans were served without heating in small plastic bags for lunch. Over the following week, a total of 209 villagers had the onset of symptoms compatible with botulism. Among the affected villagers, 134 (64%) were hospitalized with paralysis ranging from minor bulbar palsies to quadraparesis; 42 (20%) of patients required mechanical ventilation for respiratory depression. There were no deaths. The epidemiological investigation of this outbreak has been reported previously (Thai Ministry of Public Health, 2006).

Of the 42 cases, 25 (59.5%) were transferred to another hospital. All 25 cases were successfully transferred with no mishaps. The duration of transfer was less than 3 hours. Preparedness of local capacity to cope with botulism outbreak of this scale is important. However, it is also necessary to develop a good system for medical referral of severe cases, to be started early in the course of medical care (Pantukosit S, 2007).

Wongtanate *et al.*,(2007). Conducted a clinical study of 137 patients with home-canned bamboo shoot botulism at Nan Hospital, northern Thailand. The median age of the patients was 44 years (range = 14-74 years) and 36.2% were male. The median incubation period was 2 days (range = 1-8 days). Forty-three patients (31.4%) developed respiratory failure, but there were no deaths. Patients who did not have either nausea or vomiting and did not have urinary retention that required Foley catheterization was less likely to develop respiratory failure. This clinical predictor rule had a sensitivity of 75.5% and a specificity of 90.7%. The clinical syndrome most predictive of respiratory failure was nausea or vomiting and any cranial neuropathy with urinary retention or difficulty swallowing. This clinical syndrome had a sensitivity of 69.8% and a specificity of 93.6%.

This study aims to investigate the knowledge, attitude, and practice (KAP) toward *C.botulinum* Outbreak in home-canned bamboo shoots at Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand and also recommendations local food preservation by home-canned bamboo shoots with safety method reducing adverse health effect of *C.botulinum*.

1.2 Research question of the study

What are knowledge, attitude and practice toward *C.botulinum* outbreak in home-canned bamboo shoots at Pakaluang SubDistrict, Ban Luang district, Nan Province, Thailand ?

1.3 Objective of the study

1.3.1 General objective:

To determine the current level of the knowledge, attitude, and practice toward *C.botulinum* outbreak in home-canned bamboo shoots at Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand.

1.3.2 Specific objective:

1.3.2.1 To determine the association between socio-demographic characteristics and the knowledge, attitude, practice toward *C.botulinum* outbreak in home-canned bamboo shoots.

1.3.2.2 To determine the association between the knowledge, attitude, of *C.botulinum* outbreak in home-canned bamboo shoots and their practice.

1.3.2.3 To determine the association between Botulism exposure of the respondents and knowledge, attitude, and their practice toward *C.botulinum* outbreak in home-canned bamboo shoots at Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand in 2006.

1.4 Study area

The study area was in Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand

1.5 Variables in the study

1.5.1 Independent variables

- **Socio demographic factors** : Gender, Age, Education, Income, Occupation

- **Botulism exposure**

1.5.2 Dependent variables

- **Knowledge:** Contamination of *C.botulinum* in home canned-bamboo shoots., Process of food preservation by home-canned bamboo shoots, Health effect resulting from foodborne botulism.

- **Attitude ;** Severity of foodborne botulism., Consumption behavior.

- **Practice :**Prevention practices of *C. botulinum* toxin in home – canned bamboo shoots.

1.6 Conceptual framework

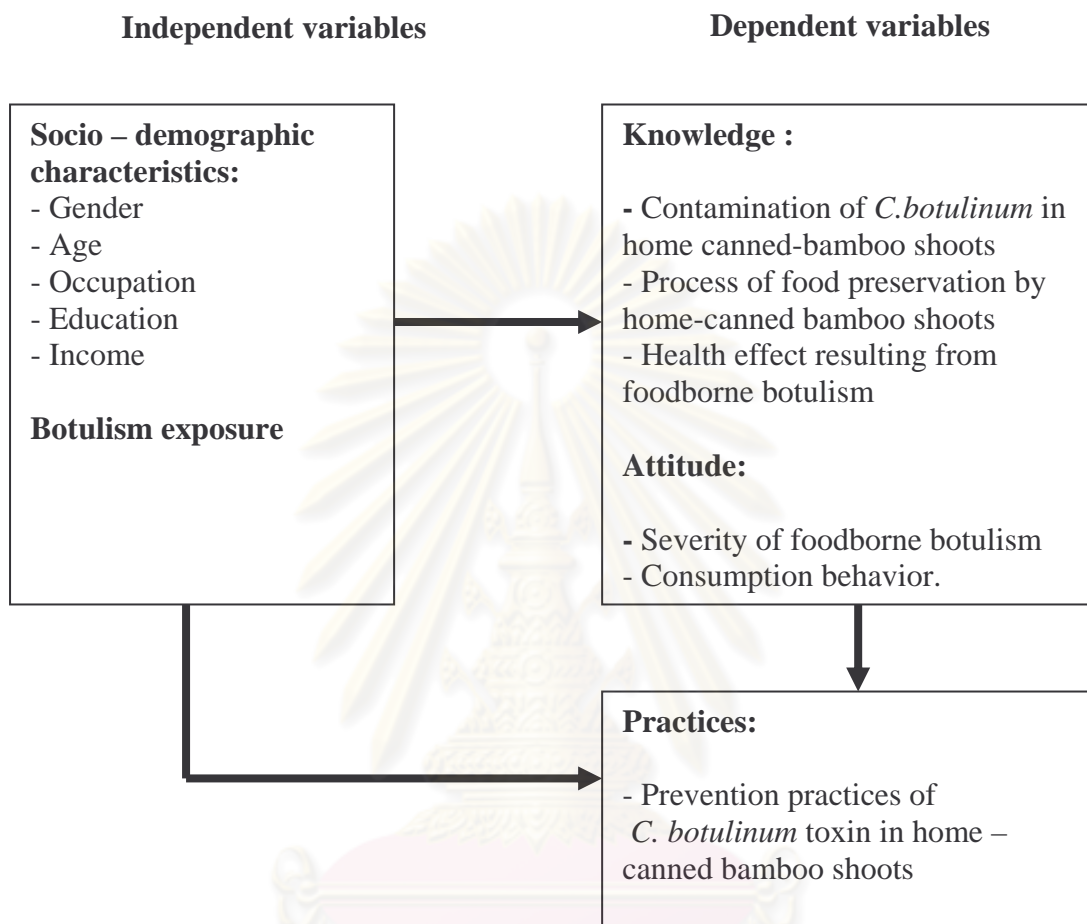


Figure 1 Conceptual framework

1.7 Operational Definitions

Knowledge and Attitude, Practice

Knowledge: Knowing and understanding towards health effect of *C.botulinum*, process of food preservation by home-canned bamboo shoots, and how to prevent themselves from foodborne botulism.

Attitude : It means the feeling, belief, intention act and the opinion of severity of foodborne botulism in food preservation process of home-canned bamboo shoots and local people consumption behavior. Is it attribute or practice.

Practice : It means that how people routine practice to prevent them from health effect of *C. botulinum* toxin from home -canned bamboo shoots.

Foodborne botulism:

Foodborne botulism is a serious paralytic illness caused by a nerve toxin produced by the bacterium *C.botulinum*. It is caused by eating foods that contain the botulism toxin. This toxin may not give a bad odor or taste to food. The disease most often develops after consuming improperly processed home-preserved foods that are inadequately cooked before consumption.

Home Canned –bamboo shoots

Primary process usually includes small steps such as bamboo shoots with tips and flesh trimmed to remove the outer surfaces and hard bases, washing, boiling or steaming, and packing in difference container. Home Canned bamboo shoots is the product:

(a) prepared from edible bamboo shoots in packing media with or without fermentation;

(b) processed by heat, in an appropriate manner, before or after being hermetically sealed in a container, so as to prevent spoilage.

Socio- demographic characteristics:

Characteristics which may influence towards *C.botulinum* outbreak in home-canned bamboo shoots: gender, age, occupation, education, and income of the respondents.

Education: What kind of school the respondents graduated from.

Occupation: is mean what kind of work the respondents does.

Income:is mean how much of money the respondents obtained by average per month.

Botulism exposure

The respondents who were concerned toward *C.botulinum* outbreak in home-canned bamboo shoots at Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand in 2006 and ever or not ever diagnosed by physician as Botulism disease. The respondents who were produced or not produced home -canned bamboo shoots for consumer and/or sold.



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CHAPTER II

LITERATURE REVIEW

Theories and previous studies concerning KAP and foodborne botulism were reviewed in 6 parts.

2.1 Socio-demographic characteristics

2.2 Knowledge

2.3 Attitude

2.4 Practice

2.5 Knowledge Attitude Practice (KAP)

2.6 The knowledge of *C.botulinum*

2.1 Socio-demographic characteristics

The population factors such as gender, age, occupation, education background, and income are factors create differences among people. These differences may affect the knowledge, attitude, and practice toward *C.botulinum* outbreak in home-canned bamboo shoots.

2.2 Knowledge

Knowledge is justified true belief. The relevant sense of justified is the one that is expressed by means of the term evident; knowledge is evident true belief. According to this conception of knowledge, three conditions must obtain if a person knows a proposition to be true. First , the proposition is true; secondly, the person accepts it; and, thirdly, the proposition is one that is evident for that person (Chisholm, 1989). Knowledge is associated with current practices, which in turn affects willingness to change current practices if it is learned that current practices are unsafe (McIntosh *et al.*, 1994).

Knowledge and judgement can also be affected by the habits and other perceptions that result from social, cultural, and economic influences (Rozin & Fallon, 1980).

Several studies in adults have indicated that food safety knowledge tends to increase with age and practice: females have higher scores than males, and younger

respondents have shown the greatest need for additional food safety education (Rimal *et al.*, 2001).

As regards the variables associated with knowledge there is evidence that, as expected, education level is an important indicator of both knowledge of pathogens and food vehicle of food borne diseases, and the association with higher income. The correlation between education level and knowledge of pathogens and related food vehicles has been reported in the survey conducted by one of us among food handlers (Angelillo *et al.*, 2000).

It is accepted that knowledge alone is insufficient to trigger preventive practices and that some mechanism is needed to motivate action and generate positive attitudes (Tones & Tilford, 1994). In an evaluation of food hygiene education. Rennie (1994) concluded that knowledge alone does not result in changes in food handling practices.

2.3 Attitude

Attitude towards health is an important component of health behavior. Mucchielli describe attitude as “a tendency of mind or of relatively constant feeling toward a certain category of objects, person or situation. Kirscht indicates that attitude represent a collection of beliefs that always include evaluative aspect. There are 3 main components (Moorhead and Griffin, 1995).

1. The affective components. This refers to feeling and emotion about someone or something.
2. The cognitive component. It comprise thoughts or belief about people and objects.
3. The behavioral component. Attitude are made up of people's action and behavior.

It is known that food borne illnesses are often not perceived as significant health problem by consumers, and even be considered a normal consequence. Mostly, consumers tended to ignore the role of food and food handling in the transmission of diarrhea disease and attributed their symptoms to other factors (i.e., indigestion) (Fein *et a.l.*, 1995).

Consumers' attitudes towards the safety of foods are strongly associated with how much they trust not only the food industry but also government agencies that are responsible for ensuring food safety. Unfortunately, public trust is often eroded by the hesitation and indolence of government agencies to adopt or enforce consumer protection strategies (Day, 1997).

Attitudes, which are relatively permanent and stable evaluative summaries about an item, are an important psychological construct because they have been found to influence and predict many behaviors (Kraus, 1995).

2.4 Practice

Improper practices responsible for microbial foodborne illnesses have been well documented (Bryan, 1988) and typically involve cross-contamination of raw and cooked foodstuffs, inadequate cooking and storage at inappropriate temperatures. Food handlers may also be asymptomatic carriers of food poisoning organisms (Cruickshank, 1990).

Educating consumers about preventive methods to reduce food safety threats will lead to reduced concerns and changes in food consumption habits. The literature clearly states that food safety should be a collaborative approach between the government, food industry, and the consumers (Knabel, 1995).

An individual's behaviour or practice (P) is dependent on their knowledge (K) and suggests that the mere provision of information will lead directly to a change in attitude (A) and consequently a change in behaviour (Ehiri, Morris, & McEwen, 1997).

Most cases of food borne illness are preventable if food protection principles are followed from production to consumption. Given that it is currently impossible for food producers to ensure a pathogen free food supply, the home food preparer is a critical link in the chain to prevent food borne illness. Thus home food preparers need to know how to minimize the presence of pathogens or their toxins in food. Food can be mishandled at any number of places during food preparation, handling and storage; and studies show that consumers have inadequate knowledge about measures needed to prevent food borne illness in the home (Medeiros *et al.*, 2001).

2.5 Knowledge Attitude Practice (KAP)

KAP survey (Truong Cong Dat, 2008).

A KAP survey is a representative study of a specific population to collect information on what is known, believed and done in relation to a particular topic (WHO, 2008). In most KAP surveys, data are collected orally by an interviewer using a structured, standardized questionnaire. These data then can be analyzed quantitatively or qualitatively depending on the objectives and design of the study. Besides, KAP survey data are essential to help plan, implement and evaluate the particular topic. It gathers information about what respondents know, what they think, and what they actually do with the particular topic. Moreover, KAP surveys can identify knowledge gaps, cultural beliefs, or behavioral patterns that may facilitate understanding and action, as well as pose problems. They can identify information that is commonly known and attitudes that are commonly held. To some extent, they can identify factors influencing behavior that are not known to most people, reasons for their attitudes, and how and why people practice certain health behaviors. KAP surveys may be used to identify needs, problems and barriers in program delivery, as well as solutions for improving quality and accessibility of services.

KAP survey even can be used to orient resource allocation and project design, and to establish a baseline for comparison with subsequent, post-intervention KAP surveys. A KAP survey will probably require internal human resources as well as external experts with specialized skills. It may be necessary to hire individuals or agencies to lead tasks such as determining the number of people to be surveyed (sample size) designing the survey questionnaires, conducting the survey interviews in the local languages, entering data from the survey into a computer, or analyzing data. If a consultant's scope of work is expected to be most beneficial at a later phase, such as data analysis, it is important to involve the consultant from the initial design phase. This ensures that consultants are aware of the survey's purpose, design and implementation plan, and can contribute in valuable ways when their skills are needed.

KAP steps:

There are 6 steps to have a KAP survey (WHO, 2008). They are as followings:

Step 1: Define the survey objectives contains information about how to access existing information, determine the purpose of the survey and main areas of enquiry, and identify the survey population and sampling plan.

Step 2: Develop the survey protocol outlines elements to include in the survey protocol and suggestions to help identify the key research questions. Determining whether the survey needs ethical review is critical to this step, as well as creating a work-plan and budget.

Step 3: Design the survey questionnaire proposes important steps for developing, pre-testing and finalizing the questionnaire, and for making a data analysis plan.

Step 4: Implement the KAP survey includes considerations for choosing survey dates, recruiting and training survey supervisors and interviewers, and managing survey implementation.

Step 5: Analyze the data consists of entering and checking the quality of the survey data, and implementing the data analysis plan created in Step 3.

Step 6: Use the data highlights ideas on how to translate the survey findings into action, elements to include in the study report, and how to disseminate the survey findings.

Part 2.6 The knowledge of *C.botulinum*

1. Name of the Organism: *Clostridium botulinum* (United States Food and Drug Administrative, 2009).

C.botulinum is an anaerobic, Gram-positive, spore-forming rod that produces a potent neurotoxin. The spores are heat-resistant and can survive in foods that are incorrectly or minimally processed. Seven types (A, B, C, D, E, F and G) of botulism are recognized, based on the antigenic specificity of the toxin produced by each strain. Types A, B, E and F cause human botulism. Types C and D cause most cases of botulism in animals. Animals most commonly affected are wild fowl and poultry, cattle, horses and some species of fish. Although type G has been isolated from soil in Argentina, no outbreaks involving it have been recognized.

Foodborne botulism (as distinct from wound botulism and infant botulism) is a severe type of food poisoning caused by the ingestion of foods containing the potent neurotoxin formed during growth of the organism.

The toxin is heat labile and can be destroyed if heated at 80°C for 10 minutes or longer. The incidence of the disease is low, but the disease is of considerable concern because of its high mortality rate if not treated immediately and properly. Most of the 10 to 30 outbreaks that are reported annually in the United States are associated with inadequately processed, home-canned foods, but occasionally commercially produced foods have been involved in outbreaks. Sausages, meat products, canned vegetables and seafood products have been the most frequent vehicles for human botulism.

The organism and its spores are widely distributed in nature. They occur in both cultivated and forest soils, bottom sediments of streams, lakes, and coastal waters, and in the intestinal tracts of fish and mammals, and in the gills and viscera of crabs and other shellfish.

2. Nature of the Disease: (United States Food and Drug Administrative ,2009).

Four types of botulism are recognized: foodborne, infant, wound, and a form of botulism whose classification is as yet undetermined. Certain foods have been reported as sources of spores in cases of infant botulism and the undetermined category; wound botulism is not related to foods.

Foodborne botulism is the name of the disease (actually a foodborne intoxication) caused by the consumption of foods containing the neurotoxin produced by *C. botulinum*.

Infant botulism, first recognized in 1976, affects infants under 12 months of age. This type of botulism is caused by the ingestion of *C. botulinum* spores which colonize and produce toxin in the intestinal tract of infants (intestinal toxemia botulism). Of the various potential environmental sources such as soil, cistern water, dust and foods, honey is the one dietary reservoir of *C. botulinum* spores thus far definitively linked to infant botulism by both laboratory and epidemiologic studies. The number of confirmed infant botulism cases has increased significantly as a result

of greater awareness by health officials since its recognition in 1976. It is now internationally recognized, with cases being reported in more countries.

Wound botulism is the rarest form of botulism. The illness results when *C. botulinum* by itself or with other microorganisms infects a wound and produces toxins which reach other parts of the body via the blood stream. Foods are not involved in this type of botulism.

Undetermined category of botulism involves adult cases in which a specific food or wound source cannot be identified. It has been suggested that some cases of botulism assigned to this category might result from intestinal colonization in adults, with in vivo production of toxin. Reports in the medical literature suggest the existence of a form of botulism similar to infant botulism, but occurring in adults. In these cases, the patients had surgical alterations of the gastrointestinal tract and/or antibiotic therapy. It is proposed that these procedures may have altered the normal gut flora and allowed *C. botulinum* to colonize the intestinal tract.

3.Nature of the Disease:(United States Food and Drug Administrative,2009).

Infective dose, a very small amount (a few nanograms) of toxin can cause illness. Onset of symptoms in foodborne botulism is usually 18 to 36 hours after ingestion of the food containing the toxin, although cases have varied from 4 hours to 8 days. Early signs of intoxication consist of marked lassitude, weakness and vertigo, usually followed by double vision and progressive difficulty in speaking and swallowing. Difficulty in breathing, weakness of other muscles, abdominal distention, and constipation may also be common symptoms.

Clinical symptoms of infant botulism consist of constipation that occurs after a period of normal development. This is followed by poor feeding, lethargy, weakness, pooled oral secretions, and wail or altered cry. Loss of head control is striking. Recommended treatment is primarily supportive care. Antimicrobial therapy is not recommended. Infant botulism is diagnosed by demonstrating botulinical toxins and the organism in the infants' stools.

4. Diagnosis of Human Illness:(United States Food and Drug Administrative,2009).

Although botulism can be diagnosed by clinical symptoms alone, differentiation from other diseases may be difficult. The most direct and effective way to confirm the clinical diagnosis of botulism in the laboratory is to demonstrate the presence of toxin in the serum or feces of the patient or in the food which the patient consumed. Currently, the most sensitive and widely used method for detecting toxin is the mouse neutralization test. This test takes 48 hours. Culturing of specimens takes 5-7 days.

5. Associated Foods:(United States Food and Drug Administrative,2009).

The types of foods involved in botulism vary according to food preservation and eating habits in different regions. Any food that is conducive to outgrowth and toxin production, that when processed allows spore survival, and is not subsequently heated before consumption can be associated with botulism. Almost any type of food that is not very acidic (pH above 4.6) can support growth and toxin production by *C. botulinum*. Botulinal toxin has been demonstrated in a considerable variety of foods, such as canned corn, peppers, green beans, soups, beets, asparagus, mushrooms, ripe olives, spinach, tuna fish, chicken and chicken livers and liver pate, and luncheon meats, ham, sausage, stuffed eggplant, lobster, and smoked and salted fish.

6. Frequency: (United States Food and Drug Administrative,2009).

The incidence of the disease is low, but the mortality rate is high if not treated immediately and properly. There are generally between 10 to 30 outbreaks a year in the United States. Some cases of botulism may go undiagnosed because symptoms are transient or mild, or misdiagnosed as Guillain-Barre syndrome.

7. The Usual Course of Disease and Complications: (United States Food and Drug Administrative,2009).

Botulinum toxin causes flaccid paralysis by blocking motor nerve terminals at the myoneural junction. The flaccid paralysis progresses symmetrically downward, usually starting with the eyes and face, to the throat, chest and extremities. When the diaphragm and chest muscles become fully involved, respiration is inhibited and death

from asphyxia results. Recommended treatment for foodborne botulism includes early administration of botulinal antitoxin (available from CDC) and intensive supportive care (including mechanical breathing assistance).

8. Target Populations:(United States Food and Drug Administrative,2009).

All people are believed to be susceptible to the food borne intoxication.

9. Food Analysis: (United States Food and Drug Administrative,2009).

Since botulism is foodborne and results from ingestion of the toxin of *C.botulinum*, determination of the source of an outbreak is based on detection and identification of toxin in the food involved. The most widely accepted method is the injection of extracts of the food into passively immunized mice (mouse neutralization test). The test takes 48 hours. This analysis is followed by culturing all suspect food in an enrichment medium for the detection and isolation of the causative organism. This test takes 7 days.



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CHAPTER III

RESEARCH METHODOLOGY

3.1 Research design

This study was a cross sectional study regarding Knowledge, Attitude, and Practice toward *C.botulinum* outbreak in home-canned bamboo shoots on people at Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand.

3.2 Study population

The study population of this study was people who were 20 years up and living at lease five years in *an* outbreak of foodborne botulism area in Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand.

3.3 Sample size calculation

The sample size estimation was calculated by using the following formula: (Yamane, Taro, 1967:886)

$$n = \frac{N}{1 + N(e)^2}$$

Where,

n = The estimate sample size

N = The population size

e = The level of precision require ,the value of 5% was selected

Then, we calculated sample size when N=651 and e = 0.05 as

$$n = \frac{651}{1 + 651(0.05)^2} = 247.53 \sim 248$$

With estimate 10% of 248 (or 25) participants will not participate. Therefore, approximately 280 participants were required for this study.

3.4 Sampling method

Participants are selected based on the purpose of using systematic random sampling method. Sampling technique process for screening was conducted by the steps below:

1. Created a list of all households in Pakaluang SubDistrict (651 households) in five villages.

2. Selected a systematic sample from a random start using the sampling interval following;

2.1 Divided the total households' size (651) by the number of sample size ($n=280$) to obtain the sampling interval $I=N/n$ ($I=2$).

2.2 Choose a random number between one and the sampling interval (1 to 2).

2.3 Selected the first household by choosing randomly one number ($R=1$) in the selected number line.

2.4 Choose subsequent people by adding the sampling interval to the random number, then to the result of this number and so on. (1, 3, 5...275, 277, 279); $R, R+I, R+2I, R+3I, \dots R+(n-1)I$

2.5 Each household choose one main people or leader to interview.

3.5 Research instruments and measurements

A data collection instrument is structure-questionnaire and the method of collection is face to face interview. The Questionnaire was modified based on How to conduct KAP survey (WHO, 2008).

Instruments

Structured questionnaire were used to collect data (Appendix). It was consists of four parts with most of the questions being closed ended.

1. Socio-demographic characteristics and Botulism exposure.
2. Knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.
3. Attitude regarding perceived severity of *C.botulinum* and consumption behavior.
4. Prevention practice to prevent health effect of *C. botulinum* toxin Practice.

Part1: Questionnaires for socio-demographic characteristics and Botulism exposure.

There are 12 questions in this part. The questions will be asked about gender, age, education levels, and monthly income, marital status and Botulism exposure.

Part 2: Questionnaires for Knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.

There are 15 questions in this part. The questions will focus on about the knowledge of foodborne botulism in home-canned bamboo shoots, home-canned bamboo shoots preservation process, and prevention of health effect from *C.botulinum* toxin .

Score to the correct answer was 1 and score for incorrect answer was 0. The total was 15. Classify into 3 levels as follows:

High levels: score obtained equal to or higher than the 13.

Moderate levels: score obtained equal 10 to the12.

Low levels: score obtained equal to or lower than the 9.

High levels (81-100%) 13-15 scores

Moderate level (60-80%) 10-12 scores

Low levels (Less than 59%) 00-09 scores

Part 3: Questionnaires for Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

In this part 15 questions were measured. It included the attitude of the people toward severity of foodborne botulism in food preservation process of home-canned bamboo shoots and consumption behavior. It included both positive and negative views. The five rating scale was measured as follows:

Answer	Positive question	Negative question
Totally Strongly agree	5 score	1 score
Agree	4 score	2 score
Neutral	3 score	3 score
Disagree	2 score	4 score
Totally Strongly disagree	1 score	5 score

The total score were scaled in 3 groups:

Positive Attitude, for the total score was more than mean plus standard deviation.

Neutral Attitude, for the total score was equal to mean plus standard deviation.

Negative Attitude, for the total score was less than mean plus standard deviation.

Part 4: Questionnaires for Prevention practice to prevent health effect of *C. botulinum* toxin.

There are 15 questions about the correct proper practices to prevent themselves from health effect of *C. botulinum* toxin.

It included both positive and negative views. The four rating scale was measured as follows:

Answer	Positive question	Negative question
Always	4 score	1 score
Frequent	3 score	2 score
Few	2 score	3 score
Never	1 score	4 score

The total score were scaled in 3 groups:

Good practice, for the total score was more than mean plus standard deviation.

Fair practice, for the total score was equal to mean plus standard deviation.

Poor practice, for the total score was less than mean plus standard deviation.

3.6 Data collection

Data were collected by using structured interview questionnaire. The assistants were trained to be interviewers before data collection.

3.7 Data analysis

3.7.1. Data entry and editing

Collected data have been coded and entered twice used the licensed SPSS software version 17.

3.7.2. Statistical technique

Using the descriptive statistics the variables were assessed by scores. For description calculation of numbers, percentage, mean and standard deviation including minimum and maximum value were performed to explain the distribution of socio- demographic characteristics, knowledge, attitude, and practice.

For analytical statistics, Chi-square test was used to see if there was any association between socio-demographic characteristics and KAP and association between knowledge, attitude and practice. The significant level in this study set up at 0.05.

3.8 Ethical Considerations

- The questionnaire had been individual explained to each participants before interview.
- The data have been used for research's purpose only and be confidential.



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CHAPTER IV

RESEARCH RESULTS

Data collection was conducted at Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand. The data were collected by interviewing 280 of cases. The studied results were presented as follows:

4.1 Socio – demographic characteristics.

4.2 Botulism exposure of the respondents.

4.2.1 Level of knowledge, attitude, and practice on the respondents who had diagnosed for botulism disease in this outbreak

4.2.2 Level of knowledge, attitude, and practice on the respondents who produced home-canned bamboo shoots for consumer and/or sold.

4.3 Knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.

4.4 Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

4.5 Prevention practice to prevent health effect of *C. botulinum* toxin.

4.6 The association between Socio-demographic characteristics and KAP.

4.7 The association between knowledge, attitude and practice.

4.1 Socio – demographic characteristics.

The socio-demographic information included gender, age, education level, monthly incomes, marital status, role status in family, occupation, were shown in Table 1 .The results of each variable mentioned above were as follow:

Gender and Age

The majority of the participants in this study were male (54.6%). The age ranged from 22 to 69 years. The average age of the participants was 49.4 years with a standard deviation of 9.61. Table 1 shown that the majority (54.6%) were within the age group of 49 years and below, and the group of 49 years and above were 45.4%.

Marital status

The majority of the respondents in marital status were married (76.4%). The respondents were single, widowed or separated 6.8%, 16.8% respectively.

Education level

Most of them were educated at primary level (76.4%), 16.4% were at high school or upper and only 7.1% were at lower secondary school.

Occupation

The majority of the respondents were agriculturist (77.5%). The non agriculturist group were 22.5%.

Monthly incomes

The majority had income less than or equal to five thousands baht (~152 USD) per month(58.2%), 41.8% had income more than five thousands baht. The average monthly income were 6,964.64 baht with a standard deviation of 8.73.

Table1: Number and Percentage distribution of socio – demographic characteristics.

Characteristics	Number (n=280)	Percentage (%)
Gender		
Male	153	54.6
Female	127	45.4
Age group (years)		
≤ 49	153	54.6
> 49	127	45.4
Mean= 49.47, SD=9.61, Min = 22, Max=69		
Marital status		
Single	19	6.8
Married	214	76.4
Widowed/Divorce/Separate	47	16.8

Table1: Number and Percentage distribution of socio – demographic characteristics.
(Continued)(n=280)

Characteristics	Number (n=280)	Percentage (%)
Education level		
Primary school	214	76.5
Lower Secondary school	20	7.1
High school or upper	46	16.4
Occupation		
Agriculturist	217	77.5
Non Agriculturist	63	22.5
Income per month (Baht)*		
≤5,000	163	58.2
>5,000	117	41.8
Mean = 6,964.64, SD = 8.73, Min= 0, Max= 45,000		
* 1USD~33 Baht		

4.2 Botulism exposure of the respondents.

In this part, it was assessed according to the answers to statement about Botulism exposure of the respondents with this outbreak that are;

Have you ever diagnosed for Botulism disease in this outbreak , 2006?

The respondents were answered “Yes” (21.4%) and were answered “Never” (78.6%).

Is there any botulism patient in your family?

The respondents were answered “Yes” (11.4%) and were answered “No” (88.6%).

Have you ever attended an annual religious rite (Pra that mallet khov) in 2006?

The respondents were answered “Yes” (38.2%) and were answered “Never” (61.8%).

Do you produced home-canned bamboo shoot for consumed and/or sold?

The majority of the respondents were answered “not produced and sold” (56.8%). and were answered “produced for consumed in family” (43.2%).

Have you often had eating home-canned bamboo shoot?

The majority of the respondents were answered “uncertain up on occasion” (96.8%). and were answered 2-3 times per month (3.2%).

Table2: Distribution of the answers to statement about Botulism exposure of the respondents.

Characteristics	Number (n=280)	Percentage (%)
Have you ever diagnosed for Botulism disease in 2006?		
Yes	60	21.4
Never	220	78.6
Is there any botulism patient in your family in 2006?		
Yes	32	11.4
No	248	88.6
Have you ever attended an annual religious rite (Pra that ma let khov) in 2006?		
Yes	107	38.2
Never	173	61.8
Do you produced home-canned bamboo shoot for consumed and/or sold?		
not produced and sold	159	56.8
produced for consumed in family	121	43.2

Table 2: Distribution of the answers to statement about Botulism exposure of the respondents. (Continued)(n=280)

Characteristics	Number (n=280)	Percentage (%)
Have you often had eating home-canned bamboo shoots?		
Uncertain up on occasion	271	96.8
Often (2-3 times per month)	9	3.2

4.2.1 Level of knowledge, attitude, and practice on the respondents who had diagnosed for botulism disease in this outbreak.

The result from the summarized in Table 3 shows the level of knowledge, attitude, and practice on the respondents who had diagnosed for botulism disease in this outbreak. It was found that the respondents who had diagnosed for botulism disease had moderate knowledge, positive attitude and good practice were 19.1%, 10.4% and 21.5% respectively. The respondents who never had diagnosed for botulism disease had moderate knowledge, positive attitude and good practice were 80.9%, 89.6% and 78.5% respectively. The respondents who had diagnosed for botulism disease had moderate knowledge (19.1%) less than moderate level (80.9%) on the respondents who never had diagnosed for botulism disease. About 89.6% of the respondents never had diagnosed for botulism had positive attitude. It was found that only 10.4% of the respondents on botulism disease had moderate level of attitude. The analysis shows that highest proportion good practice (78.5%) of the respondents who never had diagnosed for botulism and 21.5% with good practice of the respondents had diagnosed for botulism.

Table3: level of knowledge, attitude, and practice on the respondents who had diagnosed for botulism disease in this outbreak. (N=280)

Variables	Diagnosed for Botulism disease	
	Yes No. (%)	Never No. (%)
Knowledge		
Low	29 (24.6)	89 (75.4)
Moderate	31 (19.1)	131 (80.9)

Table3: level of knowledge, attitude, and practice on the respondents who had diagnosed for botulism disease in this outbreak.(Continued) (N=280)

Variables	Diagnosed for Botulism disease	
	Yes No. (%)	Never No. (%)
Attitude		
Neutral	46 (31.7)	99 (68.3)
Positive	14 (10.4)	121 (89.6)
Practice		
Fair	6 (20.7)	23 (79.3)
Good	54 (21.5)	197 (78.5)

4.2.2 Level of knowledge, attitude, and practice on the respondents who produced home-canned bamboo shoots for consumer or sold.

The result from the summarized data in table 4 shows the level of knowledge, attitude, and practice on the respondents who had produced home- canned bamboo shoots. It was found that the respondents who had produced home- canned bamboo shoots had moderate knowledge, positive attitude and good practice were 51.9%, 74.1% and 39.8% respectively. The respondents who answer not produced home canned- bamboo shoots had moderate knowledge, positive attitude and good practice were 48.1%, 25.9% and 60.2% respectively.

Table 4: Level of knowledge, attitude, practice on the respondents who had produced home - canned bamboo shoots for consumer or sold. (N=280)

Variables	Produced	
	Yes No. (%)	No No. (%)
Knowledge		
Low	37 (31.4)	81 (68.6)
Moderate	84 (51.9)	78 (48.1)
Attitude		
Neutral	21 (14.5)	124 (85.5)
Positive	100 (74.1)	35 (25.9)
Practice		
Fair	21 (72.4)	8 (27.6)
Good	100 (39.8)	151 (60.2)

4.3 Knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.

Correct response regarding the knowledge of foodborne botulism in home-canned bamboo shoots, Process of food preservation by home-canned bamboo shoots, Health effect resulting from foodborne botulism. The average knowledge score of respondents was 9.04 (SD=2.62). The range was 0 of 14.

For the level of the knowledge on foodborne botulism in home-canned bamboo shoots of the respondents 57.9% of them had “Moderate Level” and 42.1% of subjects had “Low Level”, as shown in Table 5.

Table 5: Number and percentage of knowledge level regarding contamination of foodborne botulism in home-canned bamboo shoots.

Knowledge level	Number (n=280)	Percentage (%)
Moderate (8-12 score)	162	57.9
Low (0 -7 score)	118	42.1
Mean = 9, SD= 2.62, Min = 0, Max = 14		

As observed on Table 6 more than 90% of the respondents knew that Botulism disease can occurring in all gender, age and severity to died, that the outside of food canned with distorted be swollen and rust can't to take it and can occur to food poisoning.

More than 80% of the respondents knew selecting to buy a home-canned bamboo shoot with food safety guarantee symbol, and that before taken a home-canned bamboo shoot should boiling at least 30 minutes can killed *C.botulinum*.

Only 38.2% of the respondents knew *C.botulinum*'s toxin come from bacteria in soil and toxin is cause of food poisoning. 27.1% of them knew a cause of food poisoning are bacteria in air and water only. 6.1% of the respondents knew a changing of color and smell in home-canned bamboo shoots can't refer to contaminated with *C.botulinum*. Table 6 on the next page.

Table 6: Number and percentages of correct answer on knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.

Statement	Number (n=280)	Percentage (%)
1. Cause of food poisoning are bacteria in air and water only.*	76	27.1
2. <i>C.botulinum</i> 's toxin come from bacteria in soil and toxin is cause of food poisoning.	107	38.2
3. Heat boiling in food preparation can't be eliminate <i>C.botulinum</i> 's toxin.*	138	49.3
4. Intake of home-canned bamboo shoot not washing before have a high risk to sick from botulism disease.	218	77.9
5. A changing of color and smell in home-canned bamboo shoot refer to contaminated with <i>C.botulinum</i> .*	17	6.1
6. Not washing a raw bamboo shoot is a major cause of <i>C.botulinum</i>	150	53.6
7. <i>C.botulinum</i> can growing up in state of vacuum or limited of air, example in a can.	218	77.9
8. A technique "lemon acid adjusted" in step of home-canned bamboo shoot producing can preventive from <i>C.botulinum</i> .	157	56.1
9. Before taken a home-canned bamboo shoot should boiling at least 30 minutes can killed <i>C.botulinum</i> .	230	82.1
10. Selecting to buy a home-canned bamboo shoot with food safety guarantee symbol.(FDA. Thailand)	248	88.6
11. The outside of food canned with distorted, be swollen and rust can take it and can't occur to food poisoning.*	253	90.4
12. Rain water and water form stream in the forest may be have a <i>C.botulinum</i> .	147	52.5

* Negative statement

Table 6: Number and percentages of correct answer on knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots. (Continued) (280)

Statement	Number (n=280)	Percentage (%)
13. Stored a home-canned bamboo shoot in refrigerator with low temperature can killed a <i>C.botulinum</i> and can't have a poison.*	199	71.1
14. Botulism disease can occurring in all gender, age and severity to died.	265	94.6
15. Botulism disease can occurring in raining season only.*	160	57.1

* Negative statement

4.4 Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

The distribution of attitudes regarding perceived severity of *C.botulinum* and consumption behavior of respondents were shown in Table 7. There were 51.8% of them had “neutral attitude” and 48.2% of the respondents had “positive attitude”. The average attitude score for all respondents were 37.79 (SD=5.48).

Table7: Distribution of attitude level regarding perceived severity of *C.botulinum* and consumption behavior.

Level of attitude	Number (n=280)	Percentage (%)
Positive (43.28 -50.00 score)	135	48.2
Neutral (32.31- 43.27 score)	145	51.8
Mean = 37.79, SD= 5.48, Min = 20, Max =50		

Table 8 showed attitude towards perceived severity of *C.botulinum* and consumption behavior. It was found that 46.4 of the respondents strongly agreed with the opinion that “Clean raw bamboo shoots by water washing before producing home-

canned bamboo shoots can protect food poisoning disease”. Forty three point nine percent of the respondents strongly agreed with the opinion that “Produce home-canned bamboo shoots for sell must allowed from Ministry of Public Health”. Sixty one point one percent of the respondents agreed that “no have a risk for *C.botulinum* if boil a home-canned bamboo shoots for 30 minutes before eat”.

Sixty one pint eight percent of the respondents disagreed with the opinion that “test contaminate of food by trial to tasting”. Fifty four point six percent of the respondents disagreed with the feeling that “bamboo shoots had steamed and packed in plastic bag, stored by hanging in home have secure from *C.botulinum*”. Fifty six point eight percent of the respondents disagreed with the believed that “botulism disease can transmitted in human to human”. Forty three point nine percent of the respondents disagreed with the believed that “a boiled bamboo shoot packed in plastic bag safer from *C.botulinum* than packed in a can”. Fifty five percent of the respondents disagreed with the believed that “wash home-canned bamboo shoots with water many times can eliminate *C.botulinum*”. Thirty eight point eight percent of the respondents disagreed with the believed that “a food contaminated with *C.botulinum* toxin can’t show unusual texture when looking outside”.

Thirty six point four percent of the respondents strongly disagreed with the believed that “botulism disease can treatment and recovered to good health in everybody not dangerous”.

Fifty four point six percent, 51.4% and 49.6% of the respondents respectively neutral attitude with the opinion that “a canned food had enclosed the air can’t get into be secure from *C.botulinum*”, “boil bamboo shoots until done can eliminated all of *C.botulinum*” and “fresh bamboo shoots reap from forest safer from toxin more than purchase”.

Twenty seven point five percent of the respondents agreed with the opinion that “hand washing with soap before handling or provide food and before eating reduce risk to getting *C.botulinum*.” and 27.9% of them disagreed. Table 8 on the next page.

Table 8: Percentages distribution of attitude towards perceived severity of *C.botulinum* and consumption behavior. (n=280)

Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	(%)	(%)	(%)	(%)	(%)
1. Clean raw bamboo shoots by water washing before producing home-canned bamboo shoots can protect food poisoning disease.	46.4	24.3	10.4	18.2	0.7
2. A canned food had enclosed the air can't get into be secure from <i>C.botulinum</i> .*	1.8	12.1	54.6	28.6	2.9
3. Boiling bamboo shoots until done can eliminated <i>C.botulinum</i> used up.*	8.6	12.1	51.4	28.6	2.9
4. Rain water be safe from microorganism can bring it to produce home-canned bamboo shoots directly, not boiling before.*	1.4	2.9	17.5	70.7	7.5
5. Bamboo shoots had steamed and pack in plastic bag, stored by hanging in home have secure from <i>C.botulinum</i> .*	6.1	4.3	31.4	54.6	3.6
6. Botulism disease can treatment and be back to good health in everybody not dangerous.*	3.9	9.3	23.9	26.4	36.4
7. No have a risk for <i>C.botulinum</i> if boil a home-canned bamboo shoots 30 minutes before eat.	12.9	61.1	22.9	3.2	0.0

* Negative statement

Table 8: Percentages distribution of attitude towards perceived severity of *C.botulinum* and consumption behavior.(Continued) (n=280)

Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	(%)	(%)	(%)	(%)	(%)
8. Test a contaminate of food by trial to tasting.*	1.8	7.9	25.0	61.8	3.6
9. Hand washing with soap before handling or provide food and before eating reduce risk to getting <i>C.botulinum</i> .*	18.9	27.5	22.1	27.9	3.6
10. Botulism disease can transmit in human to human.*	2.5	1.1	16.1	56.8	23.6
11. A boiled bamboo shoot packed in plastic bag safer from <i>C.botulinum</i> than packed in a can.*	2.9	13.6	34.6	43.9	5.0
12. Washing home-canned bamboo shoots with water many times can eliminate <i>C.botulinum</i> .*	1.1	13.9	23.2	55.0	6.8
13. A food contaminated with toxin can't show unusual when looking outside.	13.9	29.3	11.4	38.9	6.4
14. Produce home-canned bamboo shoots for sell must allowed from Ministry of Public Health.	43.9	23.9	5.4	26.4	0.4
15. Fresh bamboo shoots reap from forest safer from toxin more than purchase.*	12.5	12.9	49.6	23.6	1.4

* Negative statement

4.5 Prevention practice to prevent health effect of *C. botulinum* toxin.

The distribution of practice to prevent health effect of *C. botulinum* toxin of respondents were shown in Table 9. There were 89.6% of the respondents who had “Good practice”, 10.4% of them had “Fair practice”.

Table 9: Distribution of practice level to prevent health effect of *C. botulinum* toxin. (N=280)

Level of practice	Number (n=280)	Percentage (%)
Good (43.62- 45.00 score)	251	89.6
Fair (37.21- 43.61 score)	29	10.4
Mean = 40.41, SD= 3.20, Min = 30, Max= 45		

Questions regarding to practice on prevention health effect of *C. botulinum* toxin were shown on Table 10. It was noted that 76.4% of the respondents never use rain water or stream water to prepare home-canned bamboo shoots. It was found that majority (71.8%) always boil home-canned bamboo shoots before cooking and 77.9% of them never eat home canned-bamboo shoots from unhygienic store. Eighty nine point three percent and 58.2% of the respondents never eat a raw bamboo shoots and try to taste a suspicious contaminated food before cooking or preparing respectively. Fifty point seven percent of the respondents always did not eat home-canned bamboo shoots with unusual texture, color or smell. It was found that only 37.1% of the respondents always eat home –canned bamboo shoots until terminate after open it. It was found that 46.1% and 43.6% of the respondents always wash home canned bamboo shoots before eat and check texture of home canned bamboo shoots before cooking respectively. Fifty point four percent and 42.1% of the respondents always wash hand by water with soap and water for reduce a risk and protect from *C. botulinum* respectively. Eighty eight point two percent and 63.6% of the respondents never take a part of home-canned bamboo shoots back in to a same can for keeping and keep home-canned bamboo shoots in refrigerator respectively.

It was found that 62.1% and 35.0% of the respondents always had health information from many resources such as radio television etc. and participation with community member for prevent themselves from Botulism disease and followed the recommendation of Ministry of Public Health in producing home-canned bamboo shoot with acidifier method respectively.

Table 10: Percentage distribution of prevention practice to prevent health effect of *C. botulinum* toxin. (n=280)

Statement	Always	frequent	Few	never
	(%)	(%)	(%)	(%)
1. Get health information from many resources such as radio television etc. and participation with community member for prevent themselves from Botulism disease?	62.1	8.6	27.9	1.4
2. Use rain water or stream water to prepare home-canned bamboo shoots?	5.0	10.7	7.9	76.4
3. Wash hand before preparing home-canned bamboo shoots.	42.1	34.6	3.9	19.3
4. Wash hand with soap before preparing food to reduce a risk and protect from <i>C. botulinum</i> .	55.4	13.9	28.6	2.1
5. Try to taste a suspicious contaminated food before cooking or preparing.	10.0	10.0	21.8	58.2
6. Do not eat home-canned bamboo shoot with unusual texture, color or smell.	50.7	6.4	6.8	36.1
7. Eat a raw bamboo shoots.	4.6	1.1	5.0	89.3

Table 10: Percentage distribution of prevention practice to prevent health effect of *C. botulinum* toxin.(Continued) (n=280)

Statement	Always	frequent	Few	never
	(%)	(%)	(%)	(%)
8. Eat a home-canned bamboo shoots from unhygienic store.	12.1	4.6	5.4	77.9
9. Wash home-canned bamboo shoots by water before eat.	46.1	8.2	2.9	42.9
10. Check or observing texture of home-canned bamboo shoot before cooking.	43.6	9.3	10.4	36.8
11. Boil home- canned bamboo shoots before cooking	71.8	14.3	7.1	6.8
12. Use or eat a home-canned bamboo shoots until terminate after open it.	37.1	29.6	20.4	12.9
13. Keep home-canned bamboo shoots in refrigerator.	15.7	5.4	15.4	63.6
14. Take a part of home-canned bamboo shoots back in to a same can for keeping.	1.1	3.9	6.8	88.2
15. Follow the recommendation of Ministry of Public Health in producing home-canned bamboo shoot with acidifier method.	35.0	25.4	14.3	25.4

4.6 Association between socio-demographic characteristics and KAP of the respondents towards *C.botulinum* outbreak in home-canned bamboo shoots.

4.6.1 Association between socio-demographic characteristics and level of knowledge.

Association between the various socio-demographic characteristics and knowledge on that were presented on Table 11. Cross tabulation of gender, age, education level, monthly income, occupation with level of knowledge were performed respectively. The percentage of moderate level of knowledge among the male, who had moderate knowledge was 61.4% and the female who had moderate knowledge was 53.5%. There were no significant association of gender with level of knowledge ($p=0.183$). The percentage of moderate knowledge among age group of less than or equal to 49 years was 63.4% and among age group of more than 49 years was 51.2%.

Chi- square test indicates significant association between age group and level of knowledge ($p=0.039$). The percentage of moderate knowledge among primary school level was 57.9%, lower secondary school level was 65.0% and high school level was 89.1%. The percentage of moderate knowledge among group who had monthly income of less than or equal to 5,000 baht was 45.4% and more than 5,000 baht was 75.2%. The percentage of moderate knowledge among group who had agriculturist occupation was 54.4% and non agriculturist occupation was 69.8%. There were significant association between age group, education level, monthly income, occupation and level of knowledge ($p=0.039$, < 0.001 , <0.001 and 0.029 respectively).

Table 11: Association between socio-demographic characteristics and level of knowledge. (n=280)

Demographic variables	Knowledge		χ^2	p-value
	Low No. (%)	Moderate No. (%)		
Gender			1.774	0.183
Male	59 (38.6)	94 (61.4)		
Female	59 (46.5)	68 (53.5)		
Age group			4.248	0.039*
≤ 49	56 (36.6)	97 (63.4)		
> 49	62 (48.8)	65 (51.2)		

Table 11: Association between socio-demographic characteristics and level of knowledge.(Continued) (n=280)

Demographic variables	Knowledge		χ^2	p-value
	Low No. (%)	Moderate No. (%)		
Education level			23.663	<0.001*
Primary school	106 (49.5)	108 (50.5)		
Lower secondary school	7 (35.0)	13 (65.0)		
High school and upper	5 (10.9)	41 (89.1)		
Income per month (Baht)			24.831	<0.001*
≤5,000	89 (54.6)	74 (45.4)		
>5,000	29 (24.8)	88 (75.2)		
Occupation			4.788	0.029*
Agriculturist	99 (45.6)	118 (54.4)		
Non agriculturist	19 (30.2)	44 (69.8)		

* Significant differences at p-value < 0.05

4.6.2 Association between socio-demographic characteristics and level of attitude.

Association between the various socio-demographic characteristics and level of attitude on that were presented on Table 12. Cross tabulation of gender, age, education level, monthly income, occupation with level of attitude were performed respectively. The percentage of positive attitude among the male, who had positive attitude was 51.6% and the female who had positive attitude was 44.1%. There were no significant association of gender with level of attitude (p=0.209). The percentage of positive attitude among age group of less than or equal to 49 years was 42.5% and among age group of more than 49 years was 55.1%. Chi- square test indicates significant association between age group and level of attitude (p<0.035). The percentage of positive attitude among primary school level was 46.7%, lower secondary school level was 85.0% and high school level was 39.1%. The percentage of positive attitude among group who had monthly income of less than or equal to 5,000 baht was 30.1% and more than 5,000 baht was 73.5%. The percentage of positive attitude among group who had agriculturist occupation was 42.9% and non agriculturist occupation was 66.7%. There were significant association between age group, education level, monthly income, occupation and level of knowledge (p<0.035, P<0.002, p<0.001 and p<0.001 respectively). Table 12 on next page.

Table 12: Association between socio-demographic characteristics and level of attitude (n=280).

Demographic variables	Attitude		χ^2	p-value
	Positive No. (%)	Neutral No. (%)		
Gender			1.580	0.209
Male	79 (51.6)	74 (48.4)		
Female	56 (44.1)	71 (55.9)		
Age group			4.437	0.035*
≤ 49	65 (42.5)	88 (57.5)		
> 49	70 (55.1)	57 (44.9)		
Education level			12.549	0.002*
Primary school	100 (46.7)	114 (53.3)		
Lower secondary school	17 (85.0)	3 (15.0)		
High school and upper	18 (39.1)	28 (60.9)		
Income per month (Baht)			51.483	< 0.001*
≤5,000	49 (30.1)	114 (69.9)		
>5,000	86 (73.5)	31 (26.5)		
Occupation			11.086	< 0.001*
Agriculturist	93 (42.9)	124 (57.1)		
Non agriculturist	42 (66.7)	21 (33.3)		

* Significant differences at p-value < 0.05

4.6.3 Association between socio-demographic characteristics and level of practice.

Cross tabulation of gender, age, education level, monthly income, occupation with level of practice were performed respectively on Table 13. The percentage of good level of practice among the male, who had good practice was 89.5% and the female who had good practice was 89.8%. The percentage of good practice among age group of less than or equal to 49 years was 87.6% and among age group of more than 49 years was 92.1%. There were no significant association of gender, age group with practice (p=0.952, 0.214 respectively). The percentage of good practice among primary school level was 92.1%, lower secondary school level was 75.0% and high school level was 84.8%. The percentage of good practice among education levels were 89.6%. The percentage of good practice among group who had monthly income

of less than or equal to 5,000 baht was 99.1% and more than 5,000 baht was 0.9%.

The percentage of good practice among group who had agriculturist occupation was 99.1% and non agriculturist occupation was 57.1%. There were significant association between education level, monthly income, occupation and practice ($p < 0.028$, $p < 0.001$ and $p < 0.001$ respectively).

Table 13: Association between socio-demographic characteristics and level of practice (n=280)

Demographic variables	Practice		χ^2	p-value
	Good No. (%)	Fair No. (%)		
Gender			0.004	0.952
Male	137 (89.5)	16 (10.5)		
Female	114 (89.8)	13 (10.2)		
Age group			1.544	0.214
≤ 49	134 (87.6)	19 (12.4)		
> 49	117 (92.1)	10 (7.9)		
Education level			7.131	0.028*
Primary school	197 (92.1)	17 (7.9)		
Lower secondary school	15 (75.0)	5 (25.0)		
High school and upper	39 (84.8)	7 (15.2)		
Income per month (Baht)			15.443	< 0.001*
≤5,000	156 (95.7)	7 (4.3)		
>5,000	95 (81.2)	22 (18.8)		
Occupation			92.480	< 0.001*
Agriculturist	215 (99.1)	2 (0.9)		
Non agriculturist	36 (57.1)	27 (42.9)		

* Significant differences at p-value < 0.05

4.7 Association between knowledge, attitude, and practice of the respondents towards *C.botulinum* outbreak in home-canned bamboo shoots.

Table 14 shows the association of knowledge, attitude, and practice of the respondents. It was found that the respondents who had low knowledge and good practice was 92.4% and the respondents who had moderate knowledge and

good practice was 87.7%. There was no a significant association between knowledge and practice ($p=0.201$).

Regarding the association between attitude and practice, it was found that the respondents who had neutral attitude and good practice was 96.6% and the respondent who had positive attitude and good practice was 82.2%. There was a significant association between attitude and practice ($p<0.001$).

Table 14: Association between knowledge, attitude and practice. (n=280)

Variables	Practice		χ^2	p-value
	Fair No. (%)	Good No. (%)		
Knowledge			1.637	0.201
Low	9 (7.6)	109 (92.4)		
Moderate	20 (12.3)	142 (87.7)		
Attitude			15.461	<0.001*
Neutral	5 (3.4)	140 (96.6)		
Positive	24 (17.8)	111 (82.2)		

* Significant differences at p-value < 0.05

CHAPTER V

DISCUSSIONS

The findings were discussed as follows.

5.1 Socio – demographic characteristics.

5.2 Botulism exposure of the respondents.

5.2.1 Level of knowledge, attitude, and practice on the respondents who had diagnosed for botulism disease in this outbreak

5.2.2 Level of knowledge, attitude, and practice on the respondents who produced home-canned bamboo shoots for consumer or sold.

5.3 Knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.

5.4 Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

5.5 Prevention practice to prevent health effect of *C. botulinum* toxin.

5.6 The association between Socio-demographic characteristics and KAP.

5.7 The association between knowledge, attitude and practice.

5.1 Socio- demographic characteristics

In this study, the socio-demographic variables such as gender, age group, education level, occupation, monthly incomes were assessed. Most of the respondents had income less than or equal to 5,000 baht (~152 USD) per month (58.2%). This result was aligned with previous study of as poverty likely drives more persons to conserve food; lack of reliable energy sources, clean water, and cooking supplies makes food preservation practices riskier; and food shortage compels persons to rely on preserved food for a larger proportion of their diet (Jay *et al.*, 2004).

Regarding the education levels and occupation of the respondents (76.5%) had primary school and 77.5% were agriculturist respectively. Thus as expected, there were not vast differences in social background among the subgroups (age, education, income and occupation).

5.2 Botulism exposure of the respondents.

5.2.1 Level of knowledge, attitude, and practice on the respondents who had diagnosed for botulism disease in this outbreak

The level of knowledge, attitude, and practice on the respondents who had diagnosed for botulism disease less than the respondents who never had diagnosed for botulism disease respectively. It may be due to their more or less regular attendance at health information about botulism disease. This finding was also in conformity with the findings of Fein *et al.* (1995) who reported that food borne illnesses are often not perceived as significant health problem by consumers, and even be considered a normal consequence. Mostly, consumers tended to ignore the role of food and food handling in the transmission of diarrhea disease and attributed their symptoms to other factors (i.e., indigestion).

5.2.2 Level of knowledge, attitude, and practice on the respondents who produced home-canned bamboo shoots for consumed or sold.

The moderate level of knowledge and attitude on the respondents who had produced home-canned bamboo shoots for consumed or sold were higher than the respondents who not produced home-canned bamboo shoots for consumed or sold respectively. The good practice of the respondents who produced home-canned bamboo shoots less than the respondents who not produced home-canned bamboo shoots. According with this study the correspondents were possessed knowledge and attitude more practiced themselves.

5.3 Knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.

Fifty seven point nine percent of the respondents had moderate knowledge. More than 90% knew that Botulism disease can occurring in all gender, age and

severity to died, that the outside of food canned with distorted be swollen and rust can't to take it and can occur to food poisoning.

Only 6.1% of the respondents knew a changing of color and smell in home-canned bamboo shoots can't refer to contaminated with *C.botulinum*. According with *C.botulinum* outbreak (2006) at this area, epidemiology investigation was reported a cause of outbreak come from the food provider for banquet don't known home-canned bamboo shoots it may be contaminated from *C.botulinum* they don't wash and boil before served(Thai Ministry of Public Health, 2006).

5.4 Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

There were forty eight point two percent of the respondents who had positive attitude level. Forty six point four percent of the respondents strongly agreed with the opinion that “Clean raw bamboo shoots by water washing before producing home-canned bamboo shoots can protect food poisoning disease”. This finding consistent with the finding of Howes *et al.* (1996) which state of the necessary link of positive behavior, attitudes and continued education of food handlers towards the sustainability of safe food handling practices has been highlighted.

Forty nine point six percent of the respondents had neutral attitude with the opinion that “a canned food had enclosed the air can't get into be secure from *C.botulinum*”, this finding was also in conformity with the finding of Bruhn (1997), Fein *et al.* (1995) which state that consumers misperceive the nature and source of food borne illness, it would imply that they misjudge the frequency and would be less motivated to change behaviours related to food safety. This obviously has implications for any food safety education effort developed. Similarly, in this study the question “A boiled bamboo shoot packed in plastic bag safer from *C.botulinum* than packed in a can?”, only 43.9% were answered ‘Disagreed’ .Should be given more and encourage to people who less educate.

5.5 Prevention practice to prevent health effect of *C. botulinum* toxin.

There were 89.6% of respondents who had “Good practice”. Eighty two point one percent knew before taken a home-canned bamboo shoot should boiling at least 30 minutes can killed *C.botulinum*. As regard with the absence of sterilization and pressure cooking, *C. botulinum* spores can survived and will elaborate toxin in solutions that are relatively neutral with low salt and sugar content. Failure to heat food before eating increases the risk further (Cherington , 1998). Although home and artisan production remain the principal causes of botulism outbreaks, the proportion of cases attributable to commercial products is increasing, especially in Europe where recent outbreaks have been linked to commercial foods (Boyer *et al.*, 2001)

Educating consumers about preventive methods to reduce food safety threats will lead to reduced concerns and changes in food consumption habits. The literature clearly states that food safety should be a collaborative approach between the government, food industry, and the consumers (Knabel, 1995) according with this study, thirty five percent followed in recommendation from Ministry of Public Health produced home-canned bamboo shoot with acidifier method.

5.6 The association between socio-demographic characteristics and KAP.

There was significant association found between the socio-demographic characteristics and knowledge i.e age ($p<0.039$), education level ($p<0.001$), monthly income ($p<0.001$) and occupation ($p<0.029$).

This finding is consistent with the finding of the study by Albert (1995), Bruhn and Schutz (1999), Rimal *et al.*(2001) which state that food safety knowledge tends to increase with age and practice: females have higher scores than males, and younger respondents have shown the greatest need for additional food safety education.

This finding was also in conformity with the finding of Angelillo *et al.* (2000) which state that the variables associated with knowledge there is evidence that, as expected, education level is an important indicator of both knowledge of pathogens and food vehicle of food borne diseases, and the association with higher income.

The association between education level and knowledge of pathogens and related food vehicles has been reported in the survey conducted by among food handlers.

Regarding the attitude, there was significant association between socio-demographic characteristics and attitude i.e age ($p < 0.05$), education level ($p < 0.01$), monthly income ($p < 0.001$) and occupation ($p < 0.001$). This finding consistent with the finding of Howes *et al.* (1996) which state of the necessary link of positive behavior, attitudes and continued education of food handlers towards the sustainability of safe food handling practices has been highlighted.

Significant association was found between socio-demographic characteristics and practice i.e education level ($p < 0.05$), monthly income ($p < 0.001$) and occupation ($p < 0.001$). This indicates that the finding of the study done by Assal *et al.* (1997) which state that education of patients make more knowledgeable about their disease and help them manage their treatment.

5.7 The association between knowledge, attitude and practice.

In this study, there was no significant association between knowledge and the prevention practice ($p = 0.201$). This finding is consistent with the finding of Tones & Tilford, (1994) which state that knowledge alone is insufficient to trigger preventive practices and that some mechanism is needed to motivate action and generate positive attitudes. According an evaluation of food hygiene education. Rennie (1994) concluded that knowledge alone does not result in changes in food handling practices but difference with the finding of Ehiri, Morris, and McEwen, (1997) which state that the individual's behaviour or practice (P) is dependent on their knowledge (K) and suggests that the mere provision of information will lead directly to a change in attitude (A) and consequently a change in behaviour.

This finding is consistent to the study of Mederios *et al.*, (2001) which state that most cases of food borne illness are preventable if food protection principles are followed from production to consumption. Given that it is currently impossible for food producers to ensure a pathogen free food supply, the home food preparer is a critical link in the chain to prevent food borne illness. Thus home food preparers need to know how to minimize the presence of pathogens or their toxins in food. Food can be mishandled at any number of places during food preparation, handling and storage.

According to this study show that consumers have inadequate knowledge about botulism disease and practice to prevent food borne botulism in the home.

Statistically significant association were found between the attitude and prevention practice towards *C.botulinum* outbreak in home-canned bamboo shoot ($p<001$). This finding was consistent with the study of Day (1997) who reported that consumers' attitudes towards the safety of foods are strongly associated with how much they trust not only the food industry but also government agencies that are responsible for ensuring food safety. Unfortunately, public trust is often eroded by the hesitation and indolence of government agencies to adopt or enforce consumer protection strategies.



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CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

This study was done to assessment of the knowledge, attitude and practice toward *C.botulinum* outbreak in home-canned bamboo shoots at Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand.

It was found that the prevalence of moderate knowledge and neutral attitude was 57.9% and 48.2% respectively. The prevalence of good practice was high equal 89.6%. From the result the socio-demographic characteristics was associated with the knowledge ($p<0.05$) such as age, occupation and education level, monthly income ($p<0.01$). The socio-demographic characteristics was associated with the attitude ($p<0.05$) such as age group, education level, monthly income and occupation. The socio-demographic characteristics was associated with the practice ($p<0.05$) such as education level and monthly income, occupation ($p<0.01$). Additionally, more than ninety four point six percent respondents knew that Botulism disease can occurred in all gender, age and severity to died and 82.1% knew before taken a home-canned bamboo shoots should boiling at least 30 minutes can killed *C.botulinum*. Many respondents (90.47%) knew the outside of food canned with distorted, be swollen and rust can't to take it and can occur to food poisoning. Eighty eight point six percent knew selecting to buy a home-canned bamboo shoot with food safety guarantee symbol but only few of them (6.1%) knew a changing of color and smell in home-canned bamboo shoot can't refer to contaminated with *C.botulinum*. According with botulism exposure, the respondents who had diagnosed as botulism had the knowledge, attitude and practice level less than group of the respondents who never had botulism disease. The respondents who had produced home-canned bamboo shoots for consumed in family or sold had the knowledge and attitude level higher than group of not produced home-canned bamboo shoots but level of practice in group produced had higher.

The respondent's attitudes (36.4%) strongly disagreed with the opinion that Botulism disease can treatment and be back to good health in everybody not dangerous. Sixty one point one percent agreed with the opinion that no have a risk for *C.botulinum* if boiling home-canned bamboo shoot at least 30 minutes before eating. Forty three point nine percent strongly agreed that idea produce home-canned bamboo shoot for sell must allowed from Ministry of Public Health.

The practice to prevent health effect of *C.botulinum* toxin of respondents were eighty nine point six percent who had good practice. Sixty two point one percent always had health information from many resources such as radio television etc. seventy one point eight percent always boiling home canned bamboo shoot before cooked or prepared food.

From the result the analysis significant association was found that attitude and practice, and no associated between knowledge and practice.

6.2 Recommendations and suggestions

One the basis of findings research experience gained from the study, recommendations are made in this chapter.

6.2.1 Theoretical Implications:

- It has been observed in the study that education and monthly income have a direct relation to the KAP of the respondents. Government and concerned agencies emphasize on education especially for the respondents who had diagnosed as Botulism disease in this outbreak.

- It was found that there was not an associated between knowledge and practice as well as attitude and practice of the respondents. Government and concerned agencies should emphasize on positive attitude and practice.

6.2.2 Policy Implications:

- The study pointed out that increasing the communication among the respondents who had produced home-canned bamboo shoots is necessary. It should decrease the misunderstanding of the respondents which lead to unwanted practice.

The finding also indicated that there were some differential view between knowledge and practice as well as attitude and practice among the respondents. Then the strategies to change attitude and practice of them. The strategy plan should not be the same for respondents who had produce and not produce home-canned bamboo shoots.

6.2.3 Community Implications:

- Local authority should operate to raise awareness and knowledge of the villager with producing home-canned bamboo shoots. Besides, basic knowledge of advantage from acidifier method.

- Prevention and control disease, advocate health education like a focal group as Health village volunteer are important as food inspector in village or in a banquet for crown should be encouraged.

6.2.4 Family Implications:

- Since the study shows that the respondents believe that hand washing with soap before handling or preparing food and before eat is not reduce risk to getting *C.botulinum*. These wrong concepts of prevention practice of contaminated in foodborne disease or home-canned bamboo shoots to neglect their health. Hence. The health hygiene should have to set up a complete programme for the prevention practice of *C.botulinum* of the respondents. Especially in family level including health education.

6.2.5 Individual Implications:

- The Health education should be given more to people who are less educate especially in the respondents who had diagnosed as Botulism disease.

6.3 Further study

Although, KAP and foodborne disease have been reported in many studies, however, this study is the first report on KAP of toward *C.botulinum* outbreak in home-canned bamboo shoots at Pakaluang SubDistrict, Ban Luang District, Nan Province, Thailand. Furthermore, future recommended that prior necessary precaution must be taken so as to avoid complicate questions which are of less significance to the research objective.

Open ended questionnaire or the study of the focus group discussion may be used for future study on the subject which will provide more informative data for research.



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APPENDICES

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Appendix A: Map Of Nan Province



Appendix B: Home –canned bamboo shoots

Small step of home-canned bamboo shoots



Figure 2 Bamboo shoots with tips and flesh trimmed



Figure 3 Bamboo shoots removed the outer surfaces and hard bases



Figure 4 Bamboo shoots was cleaned by water and salt water and contained in plastic bag



Figure 5 Boiling bamboo shoots contained in plastic bag until done.



Figure 6 Store cooked bamboo shoots bag by hanging on line and waiting for consume in drought season.

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Appendix C: Questionnaire

ID.Code.....

QUESTIONNAIRE (English Version)

KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARD *Clostridium Botulinum* OUTBREAK IN HOME-CANNED BAMBOO SHOOTS AT PAKALUANG SUBDISTRICT, BAN LUANG DISTRICT, NAN PROVINCE, THAILAND

Explanation

This questionnaire is prepared for study knowledge, attitude, and practice toward *Clostridium Botulinum* Outbreak in home-canned bamboo shoots at Pakaluang SubDistrict, BanLuang District, Nan Province. consists of four parts 4 parts

Part 1 General data and Socio demographic information

Part 2 Knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.

Part 3 Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

Part 4 Prevention practice to prevent health effect of *C.botulinum* toxin.

Please answer this Information to straight knowledge, attitude, practice we wish receive an actual information for this study and bring it to planning for support a suitable prevention of an *C.botulinum* outbreak in the future. Including apply for benefit in support knowledge in people to prevent themselves from *C.botulinum* in other area.

Name.....Surname.....

ID

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House number.....Village Name.....Village NO....

Pakaluang SubDistrict, Banluang District, Nan Province, Thailand.

Name.....Surname.....D/M/Y.....Interviewer

Your answers will not be released to anyone and will remain anonymous. Presentation a research result in overall image not refer into an individual in report.

Thank you for your assistance.

Part 2 Knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.

Interviewer: Place an X in the box of the selected answer(s).

Knowledge	True	False	Don't know	For Researcher
1. Cause of food poisoning are bacteria in air and water only.				
2. <i>C.botulinum</i> 's toxin come from bacteria in soil and toxin is cause of food poisoning.				
3. Heat boiling in food preparation can't be eliminate.				
4.Intake of home-canned bamboo shoot not washing before have a high risk to sick from botulism disease.				
5. A changing of color and smell in home-canned bamboo shoot refer to contaminated with <i>C.botulinum</i> .				
6. Not washing a raw bamboo shoot is a major cause of <i>C.botulinum</i>				
7. <i>C.botulinum</i> can growing up in state of vacuum or limited of air, example in a can.				
8. A technique "lemon acid adjusted" in step of home-canned bamboo shoot producing can preventive from <i>C.botulinum</i> .				
9. Before taken a home-canned bamboo shoot should boiling at least 30 minutes can killed <i>C.botulinum</i> .				
10. Selecting to buy a home-canned bamboo shoot with food safety guarantee symbol.(FDA. Thailand)				

Part 2 Knowledge regarding contamination of foodborne botulism in home-canned bamboo shoots.

Interviewer: Place an X in the box of the selected answer(s).

Knowledge	True	False	Don't know	For Researcher
11. The outside of food canned with distorted, be swollen and rust can take it and can't occur to food poisoning.				
12. Rain water and water form stream in the forest may be have a <i>C.botulinum</i> .				
13. Stored a home-canned bamboo shoot in refrigerator with low temperature can killed a <i>C.botulinum</i> and can't have a poison.				
14. Botulism disease can occurring in all gender, age and severity to died.				
15. Botulism disease can occurring in raining season only.				

Part 3 Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

Interviewer: Place an X in the box of the selected answer(s).

Attitude	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	For Researcher
1. Clean raw bamboo shoot by water washing before producing home-canned bamboo shoot can protect food poisoning disease.						

Part 3 Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

Interviewer: Place an X in the box of the selected answer(s).

Attitude	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	For Resear cher
2. A canned food had enclosed the air can't get into be secure from <i>C.botulinum</i> .						
3. Boiling bamboo shoots until done can eliminated <i>C.botulinum</i> used up.						
4. Rain water be safe from microorganism can bring it to produce home-canned bamboo shoot directly, not boiling before.						
5. Bamboo shoot had steamed and pack in plastic bag, stored by hanging in home have secure from <i>C.botulism</i> .						
6. Botulism disease can treatment and be back to good health in everybody not dangerous.						

Part 3 Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

Interviewer: Place an X in the box of the selected answer(s).

Attitude	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	For Researcher
7. No have a risk for <i>C.botulinum</i> if boiling home-canned bamboo shoot 30 minutes before eating.						
8. Can test a contaminate in food by tasting a bit.						
9. Hand washing with soap before handling or provide food and before eating reduce risk to getting <i>C.botulinum</i> .						
10. Botulism disease can transmit in human to human.						
11. A boiled bamboo shoot packing in plastic bag safer from <i>C.botulinum</i> than packing in a can.						
12. Washing home-canned bamboo shoot with water many times can eliminate <i>C.botulinum</i> .						

Part 3 Attitude regarding perceived severity of *C.botulinum* and consumption behavior.

Interviewer: Place an X in the box of the selected answer(s).

Attitude	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	For Researcher
13. A food contaminated with toxin can't show unusual when looking outside.						
14. Produce home-canned bamboo shoot for sell must allowed from Ministry of Public Health.						
15. Fresh bamboo shoot reap from forest safer from toxin more than purchase.						

Part 4 Prevention practice to prevent health effect of *C.botulinum* toxin.

Interviewer: Place an X in the box of the selected answer(s).

Practice	Always	frequent	Few	never	For Researcher
1. Having health information from many resources such as radio television etc. and participation with community member for prevent themselves from Botulism disease?					

Part 4 Prevention practice to prevent health effect of *C.botulinum* toxin.

Interviewer: Place an X in the box of the selected answer(s).

Practice	Always	frequent	Few	never	For Researcher
2. Have you use with rain water or stream in home-canned bamboo shoot?					
3. Washing your hand before prepare home-canned bamboo shoot.					
4. You wash your hand with soap before provide food that reduce a risk and protect from <i>C.botulinum</i> .					
5. You try to taste a food be suspicious with contaminated or unusual before prepare food.					
6. You not eat home-canned bamboo shoot with unusual outsider, color or smell.					
7. You eat a raw home-canned bamboo shoot.					
8. You eat home-canned bamboo shoot from unhygienic practice store.					
9. Wash home-canned bamboo shoot before eat.					
10. Checking or observing outsider of home-canned bamboo shoot before take it to prepare food.					
11. Boiling home canned bamboo shoot before cooking or prepare					

Part 4 Prevention practice to prevent health effect of *C.botulinum* toxin.

Interviewer: Place an X in the box of the selected answer(s).

Practice	Always	frequent	Few	never	For Researcher
12. when you open a canned of bamboo shoot, you will eat or use it until terminate.					
13. Keep a home-canned bamboo shoot in refrigerator when be abundant.					
14. Keep a home-canned bamboo shoot in a formerly can when be remain.					
15. Following in recommendation from Ministry of Public Health produce home-canned bamboo shoot with acid adjust method.					

QUESTIONNAIRE (Thai Version)

เลขที่แบบสอบถาม [][][]

แบบสอบถาม

**ความรู้ ทักษะ และ การปฏิบัติตนของประชาชน ต่อการเกิดการระบาดของโรคโบทูลิซึม
(เชื้อคลอสตริเดียม โบทูลินูม) ในหน่อไม้ปิ้ง ตำบลป่าคาหลวง อำเภอบ้านหลวง จังหวัดน่าน
ประเทศไทย**

คำชี้แจง

แบบสอบถามชุดนี้จัดทำขึ้นเพื่อศึกษา ความรู้ ทักษะ และ การปฏิบัติตนของประชาชนในพื้นที่ ที่เคยเกิดการระบาดใหญ่ของโรคโบทูลิซึม (เชื้อคลอสตริเดียม โบทูลินูม) ในหน่อไม้ปิ้ง ตำบลป่าคาหลวง อำเภอ บ้านหลวง จังหวัดน่าน โดยแบบสอบถามมีทั้งหมด 8 หน้า แบ่งออกเป็น

ส่วนที่ 1	ข้อมูลทั่วไปและลักษณะทางประชากร	จำนวน 12 ข้อ
ส่วนที่ 2	แบบสอบถามด้านความรู้ของโรคโบทูลิซึม	จำนวน 15 ข้อ
ส่วนที่ 3	แบบสอบถามเกี่ยวกับทัศนคติต่อการเกิดโรคโบทูลิซึม	จำนวน 15 ข้อ
ส่วนที่ 4	แบบสอบถามเกี่ยวกับการปฏิบัติตนต่อการเกิดโรคโบทูลิซึม	จำนวน 15 ข้อ

โปรดตอบแบบสอบถามนี้ให้ตรงกับความรู้ ทักษะ และความเป็นจริง เพื่อที่จะนำข้อมูลที่ได้ ไปใช้เป็นแนวทางในการศึกษาและหาข้อเสนอแนะ และใช้ในการวางแผนส่งเสริมความรู้ ทักษะ และ การปฏิบัติตน ที่ถูกต้องเหมาะสม เพื่อป้องกันไม่ให้เกิดการระบาดของโรคโบทูลิซึมในหน่อไม้ปิ้งอีก รวมทั้งปรับใช้ให้เกิดประโยชน์แก่ประชาชนในการที่จะส่งเสริมให้ความรู้ในการป้องกันโรคโบทูลิซึม แก่ประชาชนในพื้นที่อื่นๆต่อไป

ชื่อสกุล

.....ผู้ให้สัมภาษณ์

หมายเลขประจำตัวบัตรประชาชน

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บ้านเลขที่..... บ้าน..... หมู่ที่..... ตำบล ป่าคาหลวง อำเภอ บ้านหลวง จังหวัด น่าน

ชื่อ.....สกุล..... วัน/เดือน/ปี.....ผู้สัมภาษณ์

“ข้อมูลที่เกี่ยวข้องกับท่านจะเก็บเป็นความลับ หากมีการเสนอผลการวิจัยจะเสนอเป็นภาพรวม ข้อมูลใดที่สามารถระบุถึงตัวท่านได้ จะไม่ปรากฏในรายงาน”

ขอขอบพระคุณทุกท่านในการตอบแบบสอบถาม

จุฬาลงกรณ์มหาวิทยาลัย

ข้อมูลทั่วไป	สำหรับผู้วิจัย
9. บุคคลในครอบครัวของท่าน ป่วยเป็นโรคโบทูลิซึมหรือไม่ 1 () เคย 2 () ไม่เคย	
10. ท่านได้ร่วมงานบุญพระธาตุเมตต์ข้าว เมื่อเดือนมีนาคม 2549 หรือไม่ 1 () เคย 2 () ไม่เคย	
11. ในครัวเรือนท่านทำหน่อไม้ปิ้งเพื่อรับประทานเอง และ/หรือ จำหน่าย 1. () รับประทานในครัวเรือน 2. () รับประทานในครัวเรือนและจำหน่าย 3. () จำหน่ายเท่านั้น 4. () ไม่ได้ทำและจำหน่าย	
12. ท่านรับประทานหน่อไม้ปิ้ง 1. () เป็นประจำ (2-3 ครั้งต่อสัปดาห์) 2. () บ่อยครั้ง (2-3 ครั้งต่อเดือน) 3. () ไม่แน่นอนแล้วแต่โอกาส	

ส่วนที่ 2 แบบสอบถามเกี่ยวกับความรู้เรื่องโรคโบทูลิซึมของประชาชน ตำบลปากาหลวง อำเภอบ้านหลวง จังหวัดน่าน

คำชี้แจง : คำถามมี 3 ตัวเลือก ให้ทำเครื่องหมาย / ลงในช่อง หน้าข้อความที่เหมาะสม

(ตอบได้ 1 ข้อ ที่ตรงกับความคิดเห็นของท่านที่สุด)

ความรู้เรื่องโรคโบทูลิซึม	ถูก (3)	ผิด (2)	ไม่ทราบ (1)	สำหรับผู้วิจัย
1. อาหารเป็นพิษเกิดจากเชื้อจุลินทรีย์ที่อยู่ในอากาศและน้ำเท่านั้น				
2. พิษโบทูลิซึมเกิดจากเชื้อแบคทีเรียที่อยู่ในดิน สารพิษจากเชื้อจุลินทรีย์เป็นสาเหตุของโรคอาหารเป็นพิษ การใช้ความร้อนในการปรุงอาหารไม่สามารถทำลายได้				
3. การใช้ความร้อนในการปรุงอาหารไม่สามารถทำลายพิษโบทูลิซึมได้				
4. การกินหน่อไม้ปิ้งโดยไม่ได้ล้าง มีความเสี่ยงสูงต่อการเป็นโรคโบทูลิซึม				
5. สี และ กลิ่นของหน่อไม้ปิ้งที่เปลี่ยนไป สามารถบอกได้ว่าการปนเปื้อนของเชื้อโบทูลิซึม				
6. การใช้หน่อไม้สดโดยไม่ได้ล้างในการผลิตหน่อไม้ปิ้งเป็นสาเหตุหลักของการเกิดโรคโบทูลิซึม				
7. เชื้อโรคโบทูลิซึมสามารถเจริญได้ดีในสภาวะที่มีอากาศน้อยหรือไร้อากาศ เช่น อาหารกระป๋อง				
8. ในการผลิตหน่อไม้ปิ้งแบบปรับด้วยกรรมจนาวสามารถป้องกันการเกิดโรคโบทูลิซึมได้				
9. การกินหน่อไม้ปิ้งควรปรุงสุกด้วยความร้อนจนเดือด นาน อย่างน้อย 30 นาที สามารถฆ่าเชื้อโรคโบทูลิซึมได้				
10. การเลือกซื้อหน่อไม้ปิ้งควรเลือกซื้อที่มีเครื่องหมาย อย.				

ความรู้เรื่องโรคโบทูลิซึม	ถูก (3)	ผิด (2)	ไม่ทราบ (1)	สำหรับ ผู้วิจัย
11.อาหารกระป๋องที่มี การบวม บวม หรือมีสนิม สามารถนำมารับประทานได้ ไม่ก่อให้เกิดโรคอาหารเป็นพิษ				
12.น้ำฝน หรือน้ำตามลำธารในป่า อาจจะมีเชื้อโบทูลิซึมปนเปื้อน				
13. การเก็บหน่อไม้ปิ้งไว้ในตู้เย็นอุณหภูมิต่ำ จะทำให้เชื้อโบทูลิซึมตาย และไม่ทำให้เกิดพิษ				
14. โรคโบทูลิซึม เกิดกับได้ผู้ป่วยทุกเพศ ทุกวัย และมีอันตรายถึงชีวิต				
15. โรคโบทูลิซึมสามารถเกิดขึ้นได้เฉพาะฤดูฝนเท่านั้น				

ส่วนที่ 3 แบบสอบถามเกี่ยวกับทัศนคติเรื่องโรคโบทูลิซึมของประชาชน ตำบลป่าคาหลวง อำเภอบ้านหลวง จังหวัดน่าน

คำชี้แจง: ให้ทำเครื่องหมาย / ลงในช่อง ที่เหมาะสม(ตอบได้ 1 ข้อ ที่ตรงกับความคิดเห็นของท่านที่สุด)

ทัศนคติต่อโรคโบทูลิซึม	เห็น ด้วย ที่สุด	เห็น ด้วย	ไม่ แน่ใจ	ไม่เห็น ด้วย	ไม่เห็น ด้วยที่สุด	สำหรับ ผู้วิจัย
1.การล้างหน่อไม้สดก่อนการทำหน่อไม้ปิ้งให้สะอาดทุกครั้ง เป็นการป้องกันโรคอาหารเป็นพิษได้						
2. อาหารกระป๋องที่ปิดสนิทไม่มีอากาศเข้าได้ มีความปลอดภัยจากโรคโบทูลิซึมที่สุด						
3. หน่อไม้ที่นำมาทำหน่อไม้ปิ้ง เมื่อต้มจนสุกแล้วสามารถทำลายเชื้อโรคโบทูลิซึมได้หมด						
4. น้ำฝนมีความปลอดภัยจากเชื้อโรคสามารถนำมาทำหน่อไม้ปิ้งได้เลยโดยไม่ต้องต้ม						
5. หน่อไม้ที่ต้มจนสุก บรรจุในถุงพลาสติกและแขวนไว้ตามบ้านเรือน มีความปลอดภัยจากเชื้อโรคโบทูลิซึม						
6. โรคโบทูลิซึมเป็นแล้วรักษาหายทุกรายจึงไม่อันตราย						
7. ไม่มีความเสี่ยงต่อการเกิดโรคโบทูลิซึมหากมีการต้มหน่อไม้ปิ้งก่อนรับประทานด้วยความร้อน 30 นาที						
8. วิธีการชิมเพียงเล็กน้อยสามารถทำได้เพื่อทดสอบอาหารที่มีการปนเปื้อน						
9. ล้างมือด้วยสบู่ ก่อนการหยิบจับหรือปรุงอาหารและ ก่อนการรับประทานอาหารเป็นการลดความเสี่ยงและการป้องกันโรคโบทูลิซึมได้						
10. โรคโบทูลิซึมเป็นโรคติดต่อจากคนสู่คนได้						
11. หน่อไม้ที่ต้มจนสุกและบรรจุในถุงพลาสติก มีความปลอดภัยจากเชื้อโบทูลิซึม มากกว่าหน่อไม้ที่บรรจุในปิ้ง						
12. หน่อไม้ปิ้งเมื่อล้างด้วยน้ำสะอาดหลายๆครั้งก็สามารถทำลายเชื้อโบทูลิซึมได้						

ทัศนคติต่อโรคโบทูลิซึม	เห็นด้วยที่สุด	เห็นด้วย	ไม่แน่ใจ	ไม่เห็นด้วย	ไม่เห็นด้วยที่สุด	สำหรับผู้วิจัย
13.อาหารที่มีการปนเปื้อนสารพิษอาจจะไม่แสดงความผิดปกติใดๆ เมื่อดูจากลักษณะภายนอก						
14. การทำหน่อไม้ปิ้งเพื่อจำหน่ายต้องได้รับการอนุญาตจากกระทรวงสาธารณสุข						
15.หน่อไม้ที่เก็บมาสดๆ จะปลอดภัยจากการปนเปื้อนสารพิษมากกว่าหน่อไม้ที่ซื้อ						

ส่วนที่ 4 แบบสอบถามเกี่ยวกับการปฏิบัติตนเอง เรื่องโรคโบทูลิซึมของประชาชน ตำบลปากหหลวง อำเภอบ้านหลวง จังหวัดน่าน คำชี้แจง : ให้ทำเครื่องหมาย / ลงในช่อง เพียงคำตอบเดียว

การปฏิบัติตนเองของประชาชนต่อการเกิดโรคโบทูลิซึม	ปฏิบัติเป็นประจำ	ปฏิบัติเป็นส่วนใหญ่	ปฏิบัติบางครั้ง	ไม่ปฏิบัติเลย	สำหรับผู้วิจัย
1. ท่านติดตามข้อมูลข่าวสารด้านสุขภาพจากแหล่งต่างๆ เช่น วิทยุ โทรทัศน์ ฯลฯ และ เข้าร่วมกิจกรรมต่างๆกับสมาชิกในชุมชน เพื่อป้องกันตนเองจาก โรคโบทูลิซึม					
2. ท่านใช้น้ำฝน หรือน้ำจากลำธารในการทำหน่อไม้ปิ้ง					
3. ท่านล้างมืออย่างสะอาดก่อนการเตรียมทำหน่อไม้ปิ้ง					
4.ท่านล้างมือด้วยสบู่ ก่อนการหยิบจับหรือปรุงอาหารและ ก่อนการรับประทานอาหารเป็นการลดความเสี่ยงและการป้องกันโรคโบทูลิซึมได้					
5.ท่านจะลองรับประทานอาหารที่สงสัยมีการปนเปื้อน หรือ มีลักษณะไม่แน่ใจว่าผิดปกติ ดูก่อนปรุงอาหาร					
6. ท่านไม่รับประทานหน่อไม้ปิ้งที่มีลักษณะภายนอกที่ผิดปกติ ได้แก่ สี กลิ่น ที่เปลี่ยนไป					
7. ท่านรับประทานหน่อไม้ปิ้งดิบ					
8.ท่านรับประทานหน่อไม้ปิ้งจากร้านที่ดูแล้วไม่สะอาด ถูกหลักอนามัย					
9. ท่านล้างหน่อไม้ปิ้งก่อนการรับประทาน					
10.ท่านตรวจสอบ และสังเกตลักษณะภายนอกของหน่อไม้ปิ้ง ก่อนนำไปประกอบอาหาร					
11.ท่านต้มหน่อไม้ปิ้งก่อนนำไปปรุง หรือประกอบอาหาร					
12.เมื่อเปิดปิ้งที่บรรจุหน่อไม้แล้ว ท่านจะใช้ในการประกอบอาหารหรือรับประทานจนหมด					
13.ท่านเก็บรักษาหน่อไม้ปิ้งที่รับประทานไม่หมดในตู้เย็น					
14.ท่านเก็บรักษาหน่อไม้ที่รับประทานไม่หมดในปิ้งใบเค็ม					
15.ท่านปฏิบัติตามข้อแนะนำของกระทรวงสาธารณสุขในการผลิตหน่อไม้ปิ้ง(แบบปรับกรด)					

Appendix D: Schedule activities

Research/Project Activities	Time Frame (Month)			
	Sep	Oct	Nov	Dec
1. Literature review	→			
2. Tool development for data collecting		→		
3. Field data collection			→	
4. Data analysis and interpretation			→	→
5. Report writing			→	→

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