A KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) STUDY OF HOUSEHOLD CHEMICAL PRODUCTS POISONING IN PULAU PINANG

INDAHAYU BINTI AB RAHMAN

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by

INDAHAYU BINTI AB RAHMAN

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HCP	Household chemical products
KAP	Knowledge, Attitude and Practice
NPC	National Poison Center
PRN	Pusat Racun Negara
SPU	Seberang Perai Utara
SPT	Seberang Perai Tengah
SPS	Seberang Perai Selatan
CRC	Child Resistance Closures
CDC	Center for Disease Control and Prevention
WHO	World Health Organization
MOE	Ministry of Education
MOHE	Ministry of Higher Education
DOSM	Department of Statistic Malaysia
GDP	Gross Domestic Products
JEPeM	The Human Research Ethics Committee of USM
USM	Universiti Sains Malaysia
HDA	Housing Development Act

LIST OF APPENDICES

KAJIAN PENGETAHUAN, SIKAP DAN PRAKTIK TENTANG KERACUNAN PRODUK BAHAN KIMIA ISI RUMAH DI PULAU PINANG

ABSTRAK

Penggunaan bahan kimia dalam kehidupan adalah satu realiti. Di Malaysia, kira-kira 96% pendedahan keracunan produk bahan kimia isi rumah telah dilaporkan kepada PRN. Walau bagaimanapun, di negara ini, tahap semasa keracunan KAP HCP belum dapat dijelaskan dengan baik. Jenis keracunan ini telah mencatatkan kadar kemalangan tertinggi (5.59) pada tahun 2011 dan produk pencuci kegunaan di dalam rumah telah mendominasinya sebagai agen peracun (53%). Tujuan kajian ini adalah untuk menentukan tahap kesedaran mengenai pengetahuan, sikap dan praktik terhadap keracunan produk bahan kimia isi rumah dalam kalangan 500 rakyat Malaysia (responden) daripada lima buah daerah di Pulau Pinang. Soal selidik berstruktur telah digunakan semasa aktiviti-aktiviti persampelan secara rawak (sampelan bersistematik) di lima buah pasaraya terpilih. Untuk domain kajian yang pertama (pengetahuan), kesemua daerah telah mencatat pada min skala "tinggi" (3.48) yang menunjukkan mereka sudah terbiasa dan cukup memahami mengenai produk bahan kimia isi rumah di dalam rumah mereka. Kajian ini mendapati didalam domain sikap, 44.2% responden menunjukkan sangat percaya yang racun serangga kegunaan di dalam rumah adalah produk yang paling berpotensi penyebab keracunan. Namun begitu, pembolehubah kepercayaan yang keracunan produk bahan kimia isi rumah sebenarnya telah terjadi dalam kalangan mereka hanya didapati pada skala min sederhana (2.87). Kajian ini telah mendapati didalam domain praktik, majoriti responden telah betukar penekanan pemilihan produk daripada berharga murah (3.33) kepada produk yang disahkan (4.25) dan berkualiti (4.17) ketika

membelinya. Tiga daripaa lima buah daerah (Timur-Laut, Barat-Daya, dan SPT) mungkin mengamalkan praktik yang salah dimana mereka tidak dapat mengawal jumlah kegunaan kandungan produk secukupnya. Berdasarkan analisa khi kuasa dua, kumpulan kaum bersama-sama dengan daerah kediaman dan latar belakang pendidikan adalah pembolehubah demografi yang paling berhubungkait dengan domain pengetahuan, sikap, dan amalan ($P<0.05$). Kesemua 12 pembolehubah pengetahuan, sikap, dan amalan telah didapati positif korelasi bersignifikan antara satu sama lain ($p<0.01$). Nilai korelasi yang tertinggi telah dilihat antara dua pembeolehubah sikap ($r=0.716$, $p<0.01$) yang menunjukkan responden mempunyai niat untuk berubah daripada berkelakuan buruk kepada tingkah laku yang lebih selamat. Penentuan status kesedaran populasi kajian boleh dianggap lengkap dimana tiada seorang pun responden didapati pada status "tiada kesedaran" untuk kesemua domain kajian (pengetahuan=70%, sikap=77%, dan praktik=77%). Kesimpulannya, kajian ini telah berjaya mengetengahkan penilaian masyarakat agar penyelesaian untuk mengurangkan risiko keracunan produk bahan kimia isi rumah dapat dilaksanakan.

A KNOWLEDGE, ATTITUDE, AND PRACTICE (KAP) STUDY OF HOUSEHOLD CHEMICAL PRODUCTS POISONING IN PULAU PINANG

ABSTRACT

Living with chemicals is a reality. In Malaysia, approximately 96% of HCP poisoning exposure cases were reported to NPC. However, the current level on KAP of HCP poisoning had not well described in this country. This poisoning was recorded as highly prevalent (incidence rate=5.59) in the year 2011 and the household cleaners had predominantly became the poison reagents (53%). The study aims to determine the level of awareness on KAP towards HCP poisoning among 500 Malaysian respondents from five districts of Pulau Pinang. A structured questionnaire was used during random sampling (systematic sampling) activities in five selected hypermarkets. For the first study domain (knowledge), all districts recorded at a high (3.48) mean scale indicating that they were familiar and fairly understood the HCP in their dwellers. Under the attitude domain, the study found that 44.2% of respondents strongly perceived household pesticides as the high potential product poisoning causes. However, only a modest mean scale (2.87) was obtained for the variable of belief (HCP poisoning actually happen in their surroundings). The study addressed under the practice domain that the majority of respondents had replaced the greatest emphasis from cheap price (3.33) to endorsement (4.25) and effectiveness (4.17) when purchasing the HCP. Three out of five districts (North-East, South-West, and SPT) might show improper practice as they could not control the amount needed when using the HCP. Based on the chi-square analysis, race groups, living districts, and education background are the most associated demographic variables with the KAP domains ($p<0.05$). All the 12 KAP

variables were found significantly correlated positively with each other ($p<0.01$). The highest correlation value was observed between two attitude variables ($r=0.716$, $p<0.01$) that reflecting the respondents had their intention to change from any bad habit to safer behaviour. The determination of the study population awareness status was considered completed as for the results; none of them were found at "no awareness" status for all study domains (K=70%, A=77%, and P=77%). Thus, the study managed to highlight the public appraisal so that the solutions to decrease the risk of HCP poisoning could be implemented.

CHAPTER 1

INTRODUCTION

This thesis comprises six chapters. In the beginning, the introduction part will cover the research background that explains the poisoning issues around the globe. The awareness level regarding the household chemical products (HCP) poisoning cases will be brief based on the literature reviews that have been done. Then, problem statements and research objectives are also stated in this chapter. Generally, the main body of the thesis is focusing on the current knowledge, attitude, and practice (KAP) of the selected population in Pulau Pinang regarding HCP poisoning. In the following chapters, a published constructed framework was presented in Chapter 2 associated with the conclusions and recommendations in the final chapter, Chapter 6.

1.1 Research Background

Poisoning is considered a global burden and has become a major factor for deaths in the human population especially from low-income and middle-income countries. Anything poison that enters the human body is capable of producing injury or dysfunction in the body as a result of a chemical reaction (Alzahrani et al., 2017; Z'gambo et al., 2016). World Health Organisation (WHO) (2017) estimated that 640 thousand people had died annually due to poisoning. This organization also added that poisoning incidences had surpassed motor vehicle crashes. There about 51% increments from 2000 as WHO reported that 315 thousand people died due to poisoning worldwide (Peden, 2002). Although it is considered a global burden, the nature of poisoning to happen may vary in different areas across the world (Parekh & Gupta, 2019) This is due to that not all cases of poisoning are reported to poison

centers. Therefore, poisoning data fell short of representing the actual occurrence of poisoning in respective countries (Awang et al., 2003; Rajasuriar et al., 2007).

According to the 2012 annual report by Mowry and colleagues (2013), approximately 2.3 million poison exposure were reported to poison control cent ers. Usually, the information about poisoning can be tracked by four sources which are poison control centers, emergency department records, hospital admission, and death certificates (CDC, 2011). Poison control centers become the key players in managing the poisoning statistics that can define the cause, incidence, and severity of poisoning occurring in the general population (Descotes & Testud, 2005). The concept of the toxicovigilance approach had been conducted by each poison center encompasses the active detection, validation, and follow-up of clinical adverse events (Descotes & Testud, 2005; Hauben & Zhou, 2003; Hughes et al., 2002) related to toxic exposures in human beings. But still, most of the poisoning cases collectively are not recorded the complete story as could not captures the actual incidents.

In other countries, poisoning may a common problem but in this developing country, Malaysia, poisoning is still a distinctive phenomenon. In Malaysia, National Poison Center (NPC) was first established in 1994 and functional as a toxicological information provider to healthcare providers and the general public (Tangiisuran et al., 2018). NPC is one of the governmental organizations that used rear-near time surveillance systems to improve situational awareness for chemical and poison exposures. Thus, the risk assessment through the toxicovigilance approach is a specifically helpful tool to assure the needed information can be structured accordingly.

Poisoning can occur almost from any substance in any form (liquid, solid, or gas) and any setting. Some substances can be very poisonous in small doses but the others usually harmless if encountered in large enough quantities. As we are known, chemical substances are extensively used in various fields and major causes of admission to emergency rooms and hospitalization in both developed and developing countries (Alzahrani et al., 2017; Kumar et al., 2010). These ingested hazardous substances may highly lower the quality of life. Exposure to some chemicals substances in small amounts can result in serious illness or death specifically for children. Adult poisonings usually result from intentional poisoning, poisoning from legal drugs taken in error, or at the wrong dose. In the previous year, deaths involving prescription medicines and chemical products have outnumbered the combined total of deaths involving the illegal drugs heroin and cocaine (CDC, 2011; Mowry et al., 2013).

1.2 Poisoning Categories happen at Home

Anything that kills or injuries through chemical actions is known as poison. The word poison itself comes from the Latin word- *potare*- which means to drink. However, poisons can enter the human body in many ways such as by breathing, absorption through the skin, IV injection, exposure to radiation, and venom from any potential hazardous animal like snake bite (Cunha & Stoppler, 2019). The type of poisoning categories and their pattern varies considerably throughout the world and depends on socioeconomic status, cultural practices, local industry, and as well as agricultural activities (Hassan & Siam, 2014; Lee et al., 2004). Hence, the present study explains briefly the categories of poisoning that happen at home.

Human-being built houses considered that are very safe for inhabitants. These days even all individuals cannot think of running homes without the use of chemicals. The home and its surroundings can be dangerous to its occupants, especially to children even if there is excessive usage of chemicals. All the chemical products like household chemical products pose a particular poisoning to the dwellers. Poisoning that happens at home can be divided into three categories, which are unintentional, intentional, and adverse reactions. Unintentional poisoning is particularly a poisoning category that happens in the houses and can be defined as exposure by any route where there is no intention to cause harm (Tangiisuran et al., 2018). Death from unintentional poisoning commonly occurs in low and middle-income groups (Adnan et al., 2013; Gorea, 2009; Tangiisuran et al., 2018). According to the WHO (2012) data, an estimated 193,460 people died worldwide from unintentional poisoning in 2012.

In addition, 76.7% of poison exposures reported to the poison centers in 2018 were unintentional (Gummin et al., 2020). Children become a vulnerable group when it's come to this kind of category as shown in figure 1. Gummin and his teammates (2020) also state that 37.7% of 1000 children at an age younger than 6 years old were exposed to poisoning. Over than 100,000 populations, 22% of the cases are incidence occurred in children aged below 6 years old. Children particularly have the possibility to the victim of this kind of poisoning as they are naturally curious, hand-to-mouth behavior, exploring in and around the house (Hoffman et al., 2017; Peden et al., 2008). As a result, each year more than 1 million children less than 5 years of age experience potentially toxic ingestions (Gutierrez, et al., 2011). Thousands number of children are admitted to emergency departments because they have

inadvertently consumed some type of household chemical products and the pesticide stored in the house (Peden et al., 2008).

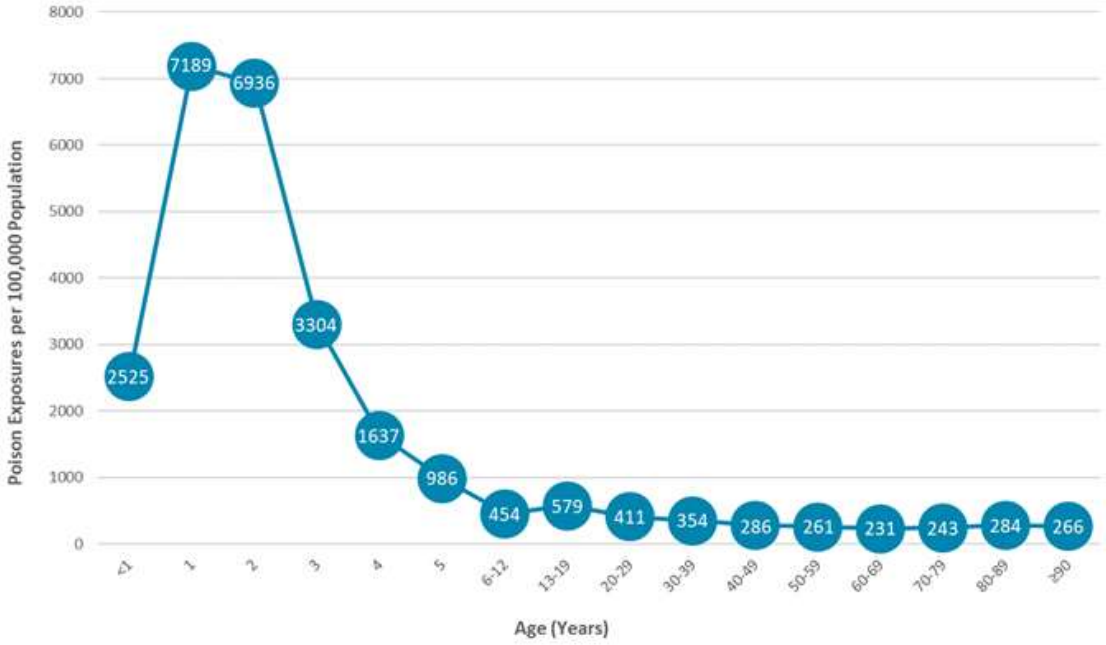

Figure 1.1 The number of poison exposures across all the ages (Sources: Gummin et al., 2019)

Intentional poisoning can be classified as suicidal cases or self-poisoning and involves the fatalities of nearly a million people each year (WHO, 2019). This poisoning incident category can be defined as exposure by any route where there is an intention to cause harm (Tangiisuran et al., 2018). This poisoning category incidence usually involves any chemical products or poisons that had caused an estimated 370,000 fatalities per year (WHO, 2012). Self-poisoning reagents may vary significantly by region. Pesticides like organophosphate and paraquat become major poisons used especially in rural areas while in urban areas, medicine is a common reagent and generally associated with low mortality (Eddleston et al., 2008). The high occurrence rates may be attributed to ethnicity, cultural and geographical factors (Azizpour et al., 2016). Generally, most intentional poisoning cases mainly resulted from people in the age group of 15-19 years old (Adnan et al.,

2013). In terms of gender, some of the previous studies reported males were significantly involved in intentional poisoning based on the high number of poisoning exposure calls recorded (Azizpour et al., 2016; Jesslin et al., 2010; Rajapakse et al., 2014). The victims that involve in the intentional poisoning particularly those who are self-inflicted (N. U. Khan et al., 2015), and it was estimated 23% of self-inflicted incidents globally involve the deliberate use of pesticides (Prüss-Ustün et al., 2011).

Next, the adverse reaction or effects (ADR) is usually caused by the intake of drugs or medicines and coded when the victim's symptoms are the result of medication administered or taken as prescribed (Sales et al., 2017). ADR reporting is a pharmacovigilance obligation that covers the complete product life-cycle from medicine development to the destruction of expired stock (Joubert & Naidoo, 2016; Mayne, 2018). The victim's symptoms can be delirium, tachycardia, vomiting, or may experience significant respiratory depression. This poisoning category is reported differently than the misuse of drugs. In all ages, there are only 2.5% of all three poisoning categories were adverse reaction which consists of a high number of adults age group and low in children aged below 6 years old (Gummin et al., 2020). However, adverse reaction incidences that are involving household chemical products as poisoning reagents is uncommon as most of these products are the non-food consumer. Among these three categories, intentional poisoning was significantly more serious and outweighed with a greater percentage of major or fatal effects compared to the others (Gummin et al., 2020; Tangiisuran et al., 2018). Eddleston et al., (2008) also supported the statement above as he said overall mortality due to self-poisoning is much higher (10-20%) due to toxicity of available poisoning agents and lack of emergency medical services.

In a developing country like Malaysia, approximately 96% of poisoning exposure cases (household products, pharmaceutical products, and pesticides were the common agents) were reported to occur at home (Tangiisuran et al., 2018). All the poisoning categories cases from the National Poison Centre (NPC) database can be further analyzed with extrapolation of demographic factors of the human population to prevent the incidents of poisoning from happening (Marks & Hoving, 2016). The most significant portion of these, poisoning cases happen involved common household chemical products (HCP) that can be found in almost every home. This study will be emphasized the HCP as poison reagents according to the generated knowledge, attitudes, and practices study (KAPs) framework.

1.3 Household Chemical Products as Poison Reagents

Stay clean and safe is essential for a continuous healthy life in our home. To keep it clean and safe, HCP easily can be found in the marketplace with various mixtures of chemicals. The number of HCP manufacturers is also getting larger over the year. According to the Chemical Abstracts Services (CAS) Registry, there are more than 83 million chemical substances are currently available and approximately 4000 new chemicals are introduced in the world every day (CAS Registry, 2014; Khan et al., 2015). However, there are a large number of HCP are being sold without undergoing any registration or law enforcement. Even these products are advertised as “green” or “natural”, they may contain ingredients that surprisingly can cause health problems.

Most HCP is a type of consumer goods, non-food chemical, and particularly to assist with cleaning, maintenance, and general hygiene purposes. Powder, liquids of various rheologies, pastes, and suspensions are the type of product forms that can

be found among HCP. Each home is estimated to accumulate as much as 45.4kg of HCP in the kitchen, bathroom, garage, and basement combined (Master Recycler Program, 2020). On the other hand, the ease of availability of HCP predisposes to all the poisoning categories could happen and rise day by day in developing countries. There are more than 4000 different chemical components in HCP that can give reactions to the human body and cause poisoning. These products can be produced from highly concentrated dishwashing to highly dilute-like window cleaners. All of these have their formulating challenges (Szewczyk & Wisniewski, 2007). A growing number of potentially harmful chemicals have been incorporated into domestic household products and are sold worldwide. Although tighter regulation has been proposed along with the growth of HCP, there are still potential effects through retailer and consumer knowledge, attitudes, and behaviours (Glegg & Richards, 2007). Since then, the chemical usage has been increased in houses, all the poisoning categories case numbers including accidental and intentional are also escalated.

Poisoning by accidental or unintentional ingestion, injection, or inhalation of household chemical poisons were the most commonly reported cases in medical emergency departments (Adnan et al., 2013; Flanagan & Rooney, 2002; Kassiri et al., 2012; Tangiisuran et al., 2018). HCP such as cleaning products and toiletries are commonly used items and can easily be found in all homes all over the world. The products such as bleach, cleaners, disinfectants, and detergents have become essential products as they are used for maintaining the cleanliness and hygiene of daily human life. Most people think the HCP is safe if them being sold widely without aware of the harmful contents. Since the chemical contents in these kinds of products are often harmful and poisonous, they can pose serious risks to people's health and the environment. Nearly all of the household solution contains

approximately 10 % of sodium hypochlorite (Riordan et al., 2002) which could promote a range of adverse side effects such as nausea, burning sensation, coughs, and sore throat. Therefore, this HCP must be used as per the instruction to ensure the safety of their users and surrounding.

Chemicals are part of our daily lives. Most poisoning incidences occur in the home, especially in the kitchen or the bathroom where a vast array of potentially toxic substances is being kept and most of the victims are involving vulnerable children and adolescents. On the whole, numbers of HCP poisoning involving children under 5 years old are commonly happening and may continue to occur. This study could be important for human well-being in order to prioritize efforts to protect all vulnerable family members from dangerous poisoning.

1.4 Problem Statements

HCP was considered as the basic necessity for each house but it was found that the lack of knowledge, neglected its potential hazard, and the easy access with unsafe storage of these products become the main reasons of the increasing trend in enquiries on poisoning exposure calls made to the NPC even the active evaluation and prevention strategies had been done to control the risk of poisoning exposure.

HCP poisoning is one of the leading injury mechanisms regardless of human age. The circumstances of HCP poisoning events can vary between each region but have same consequences that lead to long-term suffering, internal organ damage, traumas for young children and their families. Hence, HCP poisoning has been the target of prevention measures through this study's quantitative approach. In this country, Malaysia, about 53% of 55,000 poisoning cases received by NPC between 2006-2019 were caused by HCP and the state of Pulau Pinang was showing

increasing percentage of calls received by NPC (>5.8%) within these years (Tangiisuran et al., 2018). They also added that 96% of total poisoning exposure mostly occurred at home. This percentage may resulted from the rate continue growth of economical and consumptions.

Consumer's KAP regarding HCP poisoning are important to prevent debilitating and sometimes fatal reactions. The study was identified and reviewed that many previous studies emphasized the topic of knowledge, attitude and practice of HCP poisoning were the most influential prevention factor to curb the poisoning incidents in many countries in the Western and Eastern (Barghash et al., 2016; Justin & Shobha, 2014; Muleme et al., 2017; Rosenberg et al., 2011). However, in this region, Asian especially this country (Malaysia), there is rarely any discussion that focused on KAP of HCP poisoning as many researchers have more concern on the topic of KAP of food poisoning (FP) and its prevention (Mohd Yusof et al., 2018; Nur Afifah et al., 2020; Shafie & Azman, 2015). The lack of data sources about the knowledge, attitude and practice of HCP poisoning can lead to poisoning outbreaks. Mishandling and poor storage management may allow higher risk of HCP poisoning incident could happen (Zhan et al., 2019). It was clear from the previous studies that consumers' KAP level of awareness regarding to HCP poisoning are not currently documented well and believed to be low in Asian regions because there have been many cases are not reported to NPC.

Literature on the HCP poisoning exposure consists of only small samples report from a single state or national data that only exist for certain years (Abdul Alif et al., 2019; Alwan et al., 2020; Kamaruzaman et al., 2020; Rajasuriar et al., 2007). Besides, most of the poisoning cases are poorly recognizable of the risks globally especially in our country but the number of reported cases from different regions of

this country keeps increasing over the years. This could be proven by the NPC database whereas more than 16,000 cases had been referred to in 4 years period from 2016 until 2019. HCP are the common agents implicated in poisoning. 776 cases-fatalities mostly occurred in every age of human beings (Rajasuriar et al., 2007). The surveillance information on poisoning in the country remains very scattered.

The previous study has subject to limitations that cannot observe wholly reflective of those currently present in Malaysia (Tangiisuran et al., 2018). Without regular enforcement, the poisoning cases can be the true burden of the problem to this country. The actual number of poisoning cases may indeed have been higher and under-reported as reporting the poisoning exposure to NPC is not mandatory (Guyer et al., 2004; Tangiisuran et al., 2018; Wolkin et al., 2012) even though the centers provide a toll-free number for 24-hours professional assistance. Factors commonly identified from previous studies are unawareness of reporting system provided by NPC (Aziz et al., 2007), ignorance of reporting requirements, fear of involvement in litigation (Backstrom et al., 2000; Qing Li et al., 2004), and lack of information on how to report that make the number of calls reporting from public society is still low.

Moreover, there are arising of new challenges in the contribution of improved safety in the human population such as expanding variety of household, industrial and environmental toxicants (Descotes & Testud, 2005) that exacerbated the HCP poisoning events. Across the globe, many manufactures had being invented these products to have more commercialize values but fewer safety terms. Apparently, these products have been available in the marketplace since early 2012 (Valdez et al., 2014). The new intervention like brightly colored and candy-like designs frequently found in liquitabs, pods, or tables has caused a spike in HCP poisoning incidents (Bonney et al., 2013). This intervention is supposed to make household

chores easier, yet the outcomes have tempted the poisoning exposure involving households especially children gaining access to these chemical products.

Other additional factors that incidentally contribute to the increasing of HCP poisoning cases such as lack of information, and education levels exposure often result in individuals ignoring or inappropriate practice associated with insufficient technology of the HCP itself (Abhulimhen-Iyoha et al., 2018; Chien et al., 2003). So, the present study will become an effort to explore the epidemiology factors and level of the local population's KAP on HCP especially in Pulau Pinang that can reflect a nationwide burden. This study is proposed to observe, evaluate and describe the human population's level of knowledge, attitude, and practices regarding HCP poisoning in Pulau Pinang. Tracking human health is an important part of the public health surveillance network infrastructure. Therefore, this study can be a predictive factor tool for HCP poisoning in order to increase public health.

1.5 Research Objectives

Generally, the study aims to determine the level of awareness on knowledge, attitude, and practice towards HCP poisoning according to the developed KAP framework and validated tool (questionnaire) among Malaysians in Pulau Pinang. The sub-objectives are as follow;

i. To elucidate the profile of Malaysia Statistic on HCP poisoning.
ii. To describe the current KAP of HCP poisoning among the Malaysians in Pulau Pinang using descriptive analysis.
iii. To identify the associations between KAP of HCP poisoning and demographic results in the statistical study among Malaysians in Pulau Pinang.

iv. To analyze the relationship between the listed variables of KAP towards HCP poisoning among Malaysians in Pulau Pinang.

1.6 Conclusion

In conclusion, this chapter is important to understand and examine the problem of HCP poisoning that increase over the years. Besides, the perspective view and behavior of the human population especially in this state, Pulau Pinang could be provided. Through this study, findings can help any authorities, governments, health care, planners and researchers, to plan sustainable community engagement that has specific and matched with the target. These responsible parties can rely on the study's findings to alert the community about the HCP poisoning concerns.

CHAPTER 2

LITERATURE REVIEW

This chapter particularly reveals the background information regarding all the aspects of HCP like the importance of these products in our life and the causative lead to poisoning events. Then, a discussion about the epidemiology of this poisoning through findings of primary and secondary sources has been presented in a framework known as the KAP framework. There is a brief introduction about the KAPs conceptual framework which has been developed in this study and become the main referral method to conduct this study in order to complete the research's objectives.

2.1 Epidemiology of Household Chemical Products Poisoning

The environmental concerns about chemical contamination and its effect on human health have been highly deemed on the global agenda. The purpose of the current study is to provide an overview of the occurrence of HCP poisoning in Malaysia and to describe briefly the factors that contribute to the rising number of these cases in terms of various demographic characteristics, knowledge, attitude, and practice.

HCP can be defined as a heterogeneous group of products that are significantly used for domestic purposes comprised of various chemical compositions like household cleaners, paint thinner and pest control products that if misused or mishandled can potentially cause poisoning (Klepac et al., 2000; Peshin & Gupta, 2018). The term "chemical products" is considered to belong to many following types such as household, industrial, and institutional that highlighted to reduce the time and reliable products (Gani, 2004; Zhang et al., 2019). Among HCP,

cleaning products have existed in most houses due to their wide variety of uses as hygiene maintenance agents. All of these products are invented from a complex mixture of chemicals with an extensive range of toxic potentials (Barghash et al., 2016).

Most commercialized HCP, not all are labelled with a grade. The grade indicates how pure the chemical is whether the higher grade is with the lowest quantity of mixing chemical (metals, water, or other impurities) (Schieving, 2017). Every type of HCP needs to undergo some laboratory tests and regulations. However, only 3% of these chemicals have full data set, including chronic ecotoxicology and environmental degradation behaviour (Allanou et al., 1999; Glegg & Richards, 2007). Back in the 1940s, almost all the household cleaners were in powder form and had been packed in cardboard boxes or glass bottles which are heavy and easily breakable (Siwayanan, 2015). Then, with technological advancement, the first household hypochlorite bleach and the other household products were converted into plastic bottles which easier to use for the consumer.

There is no denying that over 30 years ago and nowadays, all these HCP significantly important in human life. Cleanliness has been an individual's important task in daily life. HCP becomes the responsible reagents to provide a healthy home environment. Currently, HCP represents one of the most rapidly developing branches of the manufacturing industry (Klimaszewska et al., 2016). Many manufacturers try to gain an advantage by constantly launching new products with the bits of help of new raw materials and innovative technologies in order to sustain a strong competitive. Hence, for this study, all the commercialized HCP that commonly used and become poison reagents can be categorized into several groups. This classification had been done based on poisoning cases inquired to NPC. First,

cleaning HCP like detergents, floor wash, and bleach are widely being sold in a variety of concentrations. They can pose toxic to our health if the consumers do not apply proper sanitization and disinfection of these products. This kind of product represents 50% of all available HCP in the market (Klimaszewska et al., 2016). Commonly, people disregarded the potential toxicity and the warnings on the labels provided by the manufacturers. Thus, the risk of unintentional poisoning is increasing. The next groups of HCP in this study are pesticides (household insecticides), solvents (kerosene oil, thinner, rusk remover, and turpentine), toiletries (shampoo, body wash, and toothpaste), medicines, and cosmetics/personal care. The details of these products would be frequently cited throughout this study report.

The toxicity content and widely used make the HCP the second most commonly involved substance in accidents after medicine and young children are at risk of hazard (Buchmüller et al., 2020). Klepac and others (2000) stated that most HCP are easily accessible to children and adults in their homes that are often involved in suspected poisoning incidents (accidental poisoning). According to figure 2.1 below, NPC has noted that exposure to poisoning shows gradually increasing in all categories, especially for unintentional poisoning categories. Despite this fluctuate trend in HCP poisoning cases reported, non-fatal poisoning especially involving children remains an important public health concern.

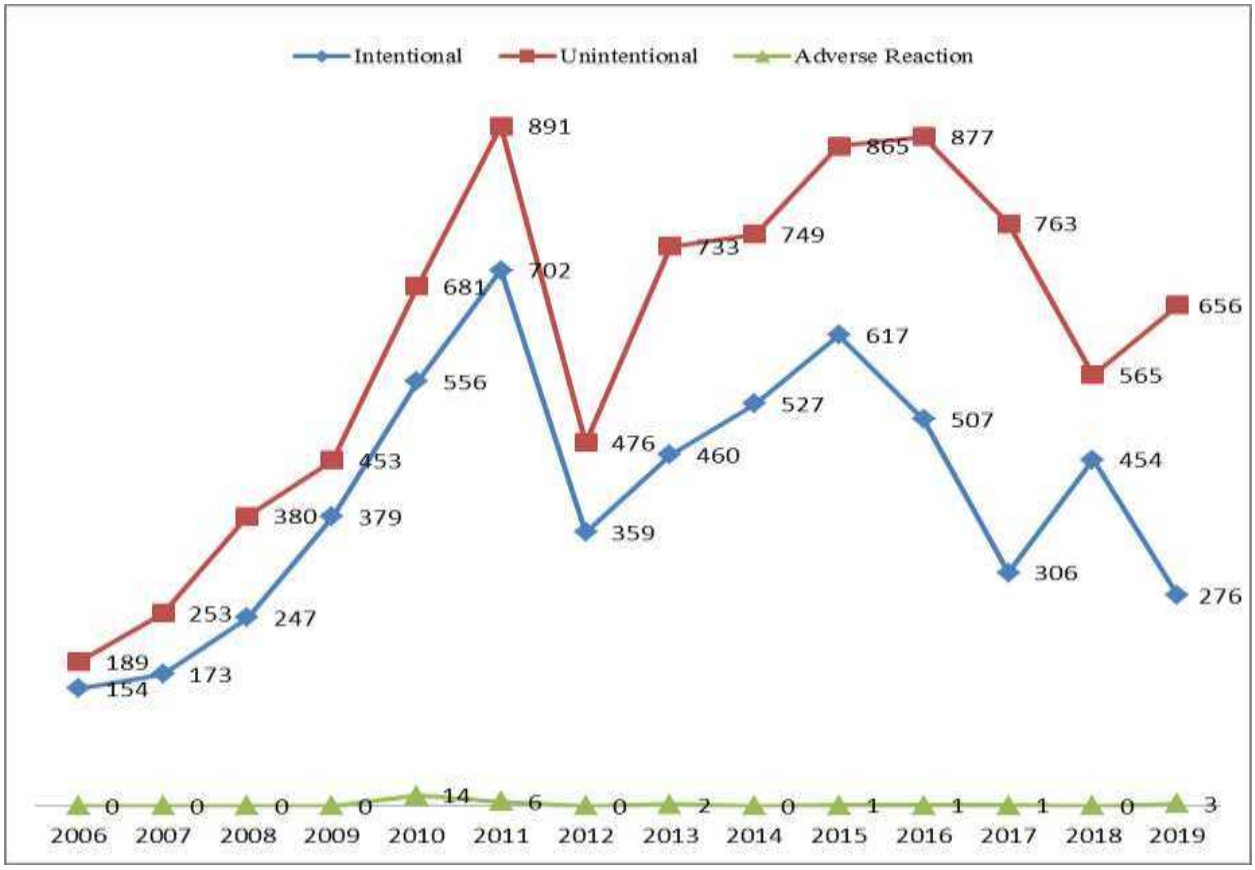

Figure 2.1 Total number of HCP for all three poisoning categories from 2006-2019

Acute poisoning is an important cause of preventable mortality and morbidity. People of any age can easily get ill if they come into contact with an excessive level of toxicity from the chemical contents of HCP. But, children in particular face a greater risk of unintentional poisoning death than adults. Mortality due to poisoning among children below 4 years of age varies from 0.3 to 7 per 100,000 people in different countries of the world (Dayasiri et al., 2017). The significance arising the number of unintentional poisoning because of predisposing factors like children tends to be curiosity and natural tendency to explore the environment (Dinis-Oliveira & Magalhães, 2013). In a recent report, this poisoning among children has been estimated at approximately 2.4 million disability-adjusted life years (Horton, 2012). As a way to scale down the number of this poisoning, a systematic investigation had been conducted by Achana and the others (2016)

showed home safety interventions including education, home safety inspections, and safe storage are effective in promoting poisoning events in families with children.

There are diverse potential factors that commit to this alarming feature of the study which relatable to both situational factors (geographic location, social and economic barriers, and culture) and person-related factors (personality, lifestyle, parenting style, and education level of parents). Some studies showed maternal employments and previous histories of poisoning become significant risk factors for unintentional poisoning could happen (Sivri & Ozpulat, 2015; Dayasiri et al., 2017; Mansori et al., 2016). Besides, for the environmental risk factors, some studies suggested that unsafe storage of HCP or inadequate space in the house can be the results the poisoning could happen at home (Manzar et al., 2010; Peshin & Gupta, 2018; Presgrave et al., 2008). In this study, figure 2.1 can be justifiable evidence of the increasing number from the last year 2019 after faced declining during 2018 which lead to this study to develop the knowledge, attitude, and practice (KAP) framework. KAP can be assumed as a chain of action that influenced one and another.

2.2 Fundamental of Knowledge, Attitude and Practice Study in Assessing the Awareness Level of HCP Poisoning in Pulau Pinang

The increasing recognition within the international aid community that helps improving the health of poor people across the world depends upon adequate understanding of the socio-cultural and economic aspects. Such variant of information has typically been gathered through various types of cross-sectional surveys. Knowledge, attitude and practice (KAP) or also known as knowledge, attitude, behaviour, and practice (KABP) survey/study is a popular method in social

health care because they can provides access to quantitative and qualitative information (Andrade et al., 2020; Monde, 2011). Any misunderstanding and misconceptions that represent obstacles to the activities that any responsible people would like to implement and potential barriers to behavior change can be revealed through KAP study. Originally, this instrument had been accepted since 1950s in the fields of family planning and population research (Andrade et al., 2020; Launiala, 2009). A KAP survey is now practically and widely accepted for the investigation of health-related behaviours and health-seeking practices.

KAP instrument is useful for this study as it's reasonably easy to design, conduct, analyse, and interpret. The result was obtained by this instrument mostly a concise and rational presentation model in health education (Launiala, 2009; Siltrakool, 2017). The self-administered questionnaire was developed following a review the literature relating to HCP poisoning using some KAP models and theories. The KAP model can be used to achieve the following study objectives by describing current population's knowledge, attitude, and practice, problem identification and intervention planning and assessing outcomes when designing a pre-test and post-test study (Vanndamme, 2009).

Besides knowing the practicalities of the development of a KAP instrument, the researcher has drawn some grounding theories from previous medical anthropology studies that can be applied in this study field. The first theory was stated by Ramsey & Rickson (1976) that in simplest form: increased knowledge leads to favourable attitudes toward any concerning topic which in turn lead to action promoting better environmental quality. They believed that there is circularity between attitudes and knowledge in that one does not solely cause or even precede the other, but some knowledge may lead to initial formation of attitudes which in

turn lead to further gains in knowledge and so on. However, their statement was contradicting with plausible statement of Kellner et al., (1974) that attitudes and values take time to nurture; environmental literacy is no short course. Hence, research on this proposition s extremely important because of the extent complexity of this relationship is basic to the nature of the present research problem.

Meanwhile, the study was agreeing with the theory applied by Siltrakool (2017) in his dissertation whereas the correlation among K-A-P was developed based on cognitive, affective, and behavior theory by Schwartz to study relation of knowledge, attitude and practice of diet (Bano et al., 2013). Based on the figure 2.2, a KAP model was constructed by Bano et al., (2013) and become the baseline in constructing the conceptual framework of this study.

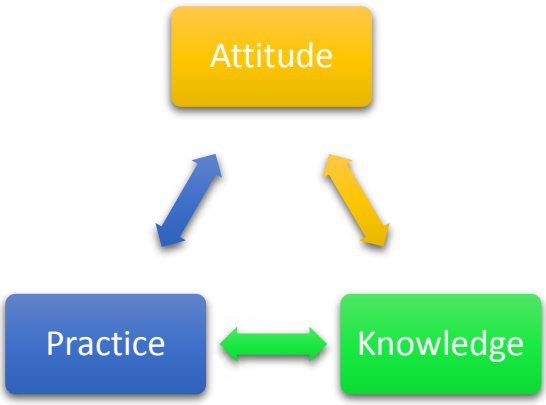

Figure 2.2 The Knowledge-Attitude-Practice Model (Bano et al., 2013)

This model frequently used by many studies to structure interviews and questionnaire (Fan et al., 2018; C. Liu et al., 2019; Siltrakool, 2017). From the model, knowledge can be refer to acquire, retain and use information; a mixture of comprehension, experience, discernment and skill. Besides, attitudes indicate the result of making reactions via some ways in some situation and practice indicates what knowledge and habit work together (Badran, 1995). In this study, the KAP

model can help the researcher to understand the investigated population's behaviour in general as it can describe current community status of KAP and determine the relationship of each factor. As a feature of conceptual framework that was developed based on the KAP model, it is useful for the identification of problems in order to create effective interventions. This model can address the gap clearly on the understand how knowledge relates to attitude, practice towards HCP poisoning among the citizens of Pulau Pinang (Siltrakool, 2017). In short, this model can be favourable to this study with the limited financial and time frames.

2.3 Narrative to the Knowledge, Attitude, and Practice of Household Chemical Products Poisoning: Conceptual Framework

As clearly stated in the title of this study, the study was conducting a cross-sectional survey that focused on KAP as the study to assess the status and influence factors regarding the current awareness level of HCP poisoning in Pulau Pinang by conducting. This survey has an important function to measure the level of KAP of the community and can serve as an educational diagnosis (Kaliyaperumal, 2004). Many studies used this method in order to generate data on what is known, believed, and done concerning a particular topic (Agbedia, 2013; Jarrah et al., 2018; Wang et al., 2015; Zahedi et al., 2014).

It is necessary to determine the environment before creating the process of awareness in any given community. In Egypt, many of the children in rural areas are affected by home injuries especially poisoning, and the associated factors of these incidents are their parents' knowledge, attitude, and practices (Eldosoky, 2012). For the short definition, knowledge can be possessed as community understanding of any given topic about HCP and high risk for poisoning to happen, an attitude refers to

their feelings and preconceived ideas toward this subject while practice refers to the way they demonstrate their knowledge and attitude through their actions (Kaliyaperumal, 2004; Titiati, 2019). A detailed discussion of these three domains will be laid out further in this chapter. This study believes the KAP survey can provide a suitable format to evaluate the existing health status of the selected population about HCP poisoning. Such gathered information could be vitally important for the local government especially for the development of more impactful policies and effective measurements to control any form of HCP poisoning that may happen in the future.

In constructing the framework of KAP study on HCP poisoning, the NPC database became the primary data source and a retrospective review of the database was conducted from 1995- 2019. Recently, this center had noted an annual increase in the number of poisoning cases referred. Also, cleaning products were recorded as the highest poison reagent that caused poisoning incidents followed by solvents (thinner and turpentine) and other household products.

Following the initial study on the NPC database, a comprehensive electronic-based search was performed on the frequent and common keywords to identify scientific reports related to this study topic. Selected publications from the past 12 years were reviewed. Other relevant review articles and older publications were also considered and there was no language restriction in any publications. Many previous studies were identified through manual searching in Science Direct, PubMed, Springer-Link, and open public reports like DOSM and CDC as the electronic database with Google Scholar as search engines. The search terms included the words “household chemical products”, “children”, “poisoning”, “unintentional and intentional”, “KAP study in poisoning” and the most common one is “household

cleaning products". All of the journals which were referred to in this study were ranked using Scimago Journal and Country Rank.

Figure 2.3 depicts the conceptual framework of the KAP from all inputs and information gathered during data searching and sourcing. The framework was aimed to identify the indicators that can help researchers to perform any improvement of development and implementation of poisoning awareness. The developed KAP framework contains four main sections, which are demographic variables, knowledge, attitude, and practices. Demographic variables and the KAPs can be indicators of the risk of poisoning (Presgrave et al., 2008). The variable patterns of poisoning cases mostly depend on the demographic variables of the individual itself (Peshin & Gupta, 2018). .

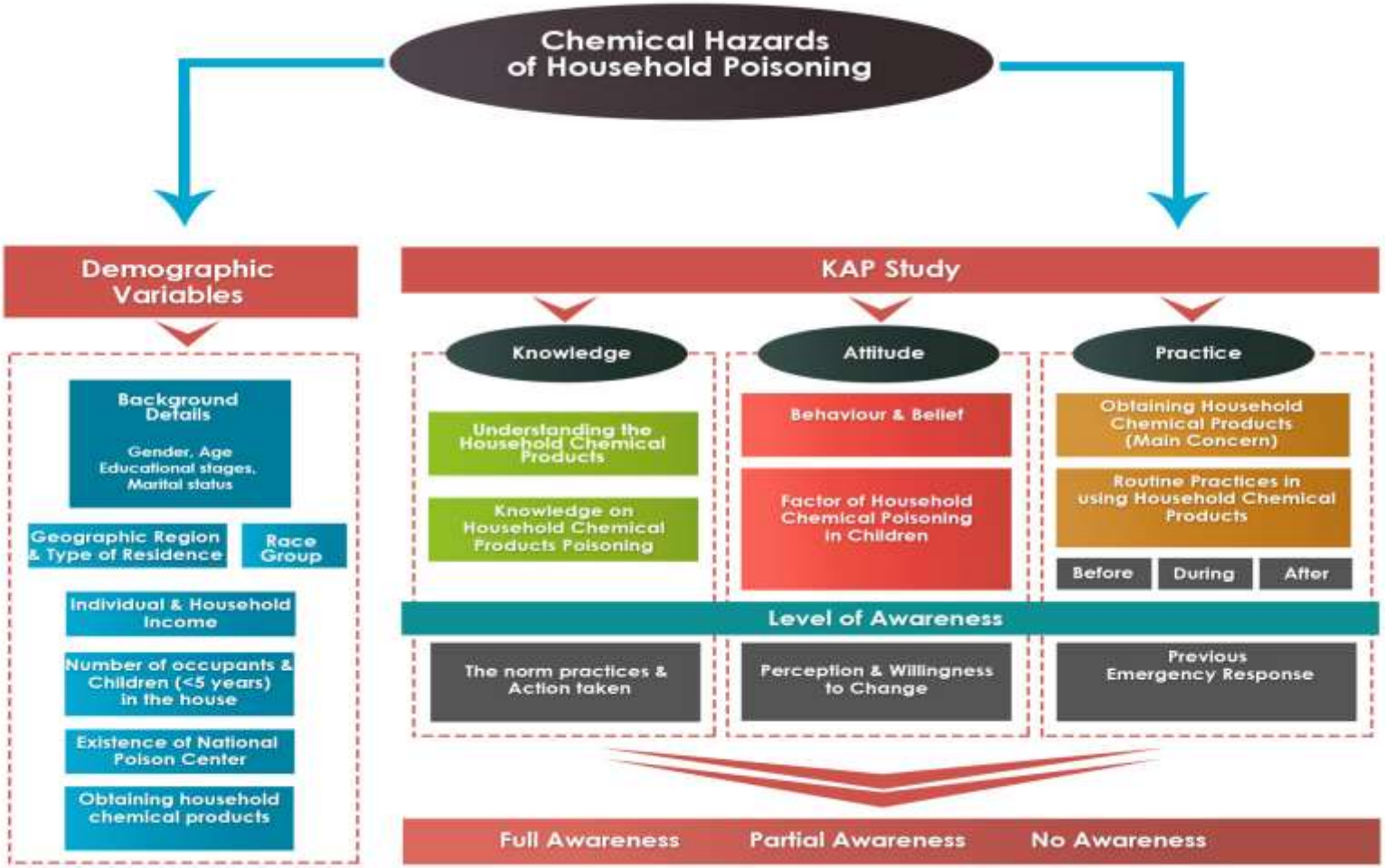

Figure 2.3 Conceptual framework of KAP study on HCP poisoning