

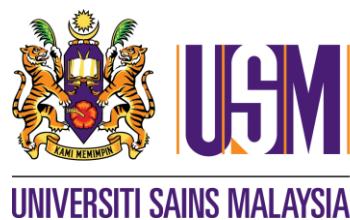
**A STUDY ON ACUTE CHEMICAL POISONING AMONG  
PATIENTS IN EMERGENCY DEPARTMENT HOSPITAL  
TENGKU AMPUAN RAHIMAH KLANG AND ITS  
COMPLICATIONS**

**BY**

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**LIST OF SYMBOLS, ABBREVIATIONS OR NOMENCLATURE**

ED HTAR : Emergency Department Hospital Tengku Ampuan Rahimah

WHO : World Health Organization

GCS : Glasgow Coma Scale

SBP : Systolic Blood Pressure

HR : Heart rate

ICU : Intensive care unit

## **ABSTRAK**

### **Pengenalan**

Keracunan akut adalah salah satu sebab utama lawatan pesakit ke jabatan kecemasan di seluruh dunia. Sosiodemografi dan corak kedatangan mereka mungkin berbeza mengikut kawasan. Kajian ini bertujuan untuk mengetahui sosiodemografi dan corak kedatangan pesakit dan faktor-faktor yang berkaitan dengan komplikasi pada pesakit keracunan kimia akut.

### **Objektif**

Untuk mengkaji ciri sosiodemografi, gambaran klinikal, agen kimia yang terlibat, komplikasi dan hasil pesakit keracunan kimia akut yang hadir ke ED HTAR dan untuk menentukan faktor-faktor yang berkaitan dengan komplikasi tersebut.

### **Kaedah kajian**

Kajian retrospektif ini menggunakan data dari pesakit yang mengalami keracunan kimia akut di Hospital Jabatan Kecemasan Tengku Ampuan Rahimah Klang dari Januari 2016 hingga Disember 2018. Sebanyak 260 pesakit direkrut dan sosiodemografi, keadaan klinikal, komplikasi dan hasilnya direkodkan. Dari data yang dikumpulkan, faktor-faktor yang berkaitan dengan komplikasi ditentukan menggunakan regresi logistik berganda.

### **Keputusan**

260 data pesakit dianalisis. 168 (64.6%) pesakit sengaja mengambil pelbagai agen kimia dan 92 (35.4%) pesakit secara tidak sengaja terdedah kepada bahan kimia yang berbeza. Insiden ini lebih tinggi di kalangan pesakit berbangsa India (n=149,57.3%), lelaki (n=152,58.5%), dan bujang (n=158,60.8%). Ejen yang paling biasa terlibat adalah racun perosak. Antara komplikasi yang biasa dialami oleh pesakit adalah kegagalan pernafasan (n=30,11.5%), hilang kesedaran (n=14, 5.4%) dan kegagalan

buah pinggang (n=17, 6.5%). Faktor risiko yang berkait dengan komplikasi adalah usia (AOR 1.05, 95% CI 1.02 hingga 1.09, p=0.005), berbangsa Cina (AOR 12.27, 95% CI 1.03 hingga 146.63, p=0.048) dan bangsa lain-lain (AOR 30.35, 95% CI 2.77 to 332.94, p=0.005), kadar nadi tinggi (AOR 39.7, 95% CI 11.31 to 139.27, p=0.004), waktu pendedahan dari pukul 0800-1600 (AOR 22.15, 95% CI 1.95 to 252.04, p=0.013) dan selang masa mendapatkan rawatan 2 hingga 12 jam (AOR 3.43, 95% CI 1.28 to 9.21, p=0.015).

### **Kesimpulan**

Keracunan kimia akut biasa berlaku di kalangan lelaki bujang dengan keracunan yang sengaja. Selain faktor usia dan kadar nadi tinggi, faktor lain yang berkait dengan komplikasi di kalangan pesakit adalah berbangsa Cina dan bangsa lain-lain, waktu pendedahan dan selang masa mendapatkan rawatan.

**Kata kunci:** Toksikologi, keracunan kimia akut, komplikasi

## **ABSTRACT**

### **Introduction**

Acute poisoning is one of the most common reasons of patient visits to the emergency department (ED). The sociodemographic and presentations vary from one region to another. This study purpose is to determine the sociodemographics, presentations and factors associated with complications in patients with acute chemical poisoning.

### **Methodology**

This retrospective study involved all patients presented with acute chemical poisoning to the emergency department of a government hospital in Malaysia from January 2016 until December 2018. A total of 260 patients were included and their sociodemographic, clinical presentation, complications and outcomes were recorded. Multiple logistic regression analysis was used to determine factors associated with complications.

### **Result**

From 260 patients, 168 (64.6%) patients had intentional poisoning while 92 (35.4%) patients accidentally exposed to different chemical substances. Majority were single (n=158,60.8%), male (n=152,58.5%), and Indian (n=149,57.3%). The most common agent involved was pesticide. Complication rate was 14.2% with mortality rate of 4.6%. Common complications included respiratory insufficiency (n=30,11.5%), altered consciousness (n=14, 5.4%) and renal failure (n=17, 6.5%). Factors significantly associated with complications were age (AOR 1.05, 95% CI 1.02 to 1.09, p=0.005), other race (AOR 30.35, 95% CI 2.77 to 332.94, p=0.005), Chinese (AOR 12.27, 95% CI 1.03 to 146.63, p=0.048), tachycardia (AOR 39.7, 95% CI 11.31 to 139.27, p=0.004), time of exposure from 0800-1600 (AOR 22.15, 95% CI 1.95 to 252.04, p=0.013) and latency time from presentation of 2 to 12 hours (AOR 3.43, 95% CI 1.28 to 9.21, p=0.015)

**Conclusion**

Acute chemical poisoning is common among single, male patients with intentional circumstance. Apart from that, other factors associated with complications were age, tachycardia, Chinese ethnicity and other races, time of exposure and latency time from presentation to ED.

**Keywords:** Toxicology, acute chemical poisoning, complications, outcome

## **CHAPTER 1.0 INTRODUCTION**

### **1.1 OVERVIEW OF ACUTE CHEMICAL POISONING AND FACTORS THAT AFFECTING DEVELOPMENT OF THEIR COMPLICATIONS**

Poisoning is one of the burden in healthcare system globally. There is increasing number of visits to Emergency Department worldwide due to poisoning. It is defined as exposure to drugs or harmful substance leading to patient seeking treatment in Emergency Department.<sup>1</sup>

WHO recorded 315 000 fatalities attributed to poisoning worldwide in the year 2000<sup>2</sup> but the actual number might be higher because they are usually unreported especially in underdeveloped countries. The numbers will keep on increasing as more new substances being developed and it is getting easier to gain access to such substances in our daily life.

It is important for the Emergency Physician to have adequate knowledge on epidemiology and clinical presentation of poisoning so diagnosis can be made early and prompt treatment can be delivered to the patients. These also will facilitate the treating physician to anticipate possible outcome for the patients and prevent development of complications. Other than that, it will help to shorten length of stay and reduce mortality rate among patients with poisoning. Most importantly, all of these will contribute to reduction in burden and resource utilization in the healthcare facilities.

However different regions around the world have variations in terms of sociodemographic and clinical presentations of acute chemical poisoning. These will lead to different predictive factors in anticipating development of complications among such patients.

## **CHAPTER 2.0 STUDY PROTOCOL**

### **2.1 INTRODUCTION**

Poisoning is a significant public health problem worldwide and is one of the most common reasons for visiting Emergency Department (ED). Poisoning is defined as exposure to drugs or any environmental substances resulting in ED visit, even the patient is considered symptom-free by ED staff.<sup>1</sup>

In 2000, WHO reported that there were 315 000 fatalities due to poisoning worldwide but the exact number can be higher because most cases of the poisoning actually go unreported.<sup>2</sup> The wide availability and accessibility of chemicals and their extensive use in medicine, industry, agriculture and in normal daily life contribute to the increase risk of poisoning. The problem is getting worse with time as newer drugs and chemicals are developing and they become easily accessible to the community.

Acute poisoning is defined as a single exposure, continuous exposure lasting less than 8 hours or repeated exposures over a period of no longer than one week.<sup>1</sup> Acute poisoning is considered a major health problem worldwide and is a frequent cause of hospital admission.

Poisoning agents can be categorized as either chemicals or pharmaceuticals. Chemicals include household products, pesticides, alcohol, hydrocarbons and gases while Pharmaceuticals include over the counter (OTC) items and therapeutic (prescribed) medications.<sup>3</sup>

Knowledge and epidemiology of poisoning and factors that determine the outcome of patients presenting with acute chemical poisoning is important to Emergency Physician in order to ensure early diagnosis and correct treatment can be given to patients.<sup>1</sup> These are also important in order to prevent development of complications, shorten the length of stay in the hospital and reduce mortality among patients with acute

poisoning. At the same time, they will help to reduce the burden and resource utilization of the hospital. There are a lot of studies done on acute poisoning worldwide and the results vary between different regions and countries. However, in Malaysia studies and data on acute poisoning are still scarce and inadequate.<sup>4</sup>

This study will be conducted in Emergency Department Hospital Tengku Ampuan Rahimah (HTAR) Klang. It is one of the busiest public hospitals in Klang Valley with total visits of patients to Emergency Department in 2016 was recorded as 174383.<sup>5</sup> Among them, there is quite a large number of patients visiting to Emergency Department for acute poisoning. However, there is still no study done on acute chemical poisoning and factors that are associated with development of complications in this center.

Acute poisoning is chosen as most patients presented with history of acute exposure while for chronic exposure, it is usually due to unintentional cause and patients might not realize that they are being exposed to a toxic substance until they develop symptoms which can be vague. Furthermore, a diagnosis of acute poisoning is more confidently can be established due to the short interval of exposure. Chemical substance will be the agent of choice as based on previous study done, it constitutes 61.6% of total poisoning cases in Qatar<sup>3</sup>, 50.1% in Taiwan.<sup>1</sup> Besides, chemical substances are more readily and easily available in our daily life e.g. household products hence the higher incidence of chemical poisoning compared to pharmaceutical agents.

## **2.2 LITERATURE REVIEW**

Poisoning is a substantial global public health concern and it is one of the most common reasons for Emergency Department visits and hospital admissions in many countries. In recent years, there has been an increase in poisoning-related Emergency

Department visits worldwide. In different countries and regions, there are variations in the extent of the problem, the situation of exposure and types of poisons involved.<sup>3</sup>

According to Paracelsus, the father of modern toxicology, all things are poisons and nothing is without poison, the right dose differentiates a poison from a remedy. It is estimated that some forms of poisons are directly or indirectly responsible for more than 1 million illnesses worldwide annually. The problem is getting worse with time as newer drugs and chemicals are being developed.<sup>6</sup>

There are a few definitions for the poisoning term itself. Poisoning is defined as an exposure to any substance, either natural or synthetic, which results in structural damage or functional disturbance to the body.<sup>7</sup> Poisoning can also be defined as exposure to drugs or any environmental substance resulting in ED visit, even if the patient was considered symptom-free by the ED staff.<sup>1</sup>

Poisoning can be divided into acute and chronic poisoning. Acute poisoning is defined as a single exposure, continuous exposure lasting less than 8 hours, or repeated or repeated exposure over a period no longer than one week. Chronic exposure is defined as continuous exposure lasting for 8 hours or more, or repeated exposure over a period longer than one week.<sup>8</sup> A study done in Taiwan revealed that almost all of the cases (98%) resulted from acute exposure.<sup>1</sup> Assessing exposure and dose-response relationship for acute toxicity is generally more easily accomplished than that for chronic toxicity due to its definition itself which is restricted to a short time interval so estimate of exposure can be made more confidently.<sup>9</sup> Furthermore, acute poisoning is considered a major health problem worldwide and is a frequent cause of hospital admission and at the same time it carries significant risk of morbidity and mortality in all age groups across the world.<sup>10,11</sup>

Poisoning agents can be divided into 2 major categories, either chemicals or pharmaceuticals. Chemicals include household products, pesticides, alcohol,

hydrocarbons and gases while Pharmaceuticals include over the counter (OTC) items and therapeutic (prescribed) medications.<sup>3</sup> Few studies have shown that chemical substance is the more common agents of poisoning, 61.6% of total poisoning cases in Qatar, 50.1% in Taiwan.<sup>1,3</sup> In developing countries, acute pesticide poisoning is very frequent and about 60% of death is due to organophosphate poisoning.<sup>12</sup> According to a study done in Penang General Hospital, pesticides and household products are the most frequent agents involved in chemical poisoning.<sup>13</sup>

There are multiple routes of exposure of poisoning but the major ones are via ingestion and inhalation.<sup>3,1</sup> The exposure to a poisoning substance can be divided into intentional and unintentional. Intentional poisoning includes any deliberate self-harm or suicide attempt by taking any substance that is known to be toxic in nature or a large amount of medication that exceeds the normal therapeutic dose.<sup>3</sup> Unintentional exposure might occur due to occupational or accident event. Most of the studies done have showed that self-poisoning i.e. suicidal attempt is the most common cause of exposure or circumstance of poisoning.<sup>6</sup>

A study on demographic, presentation and outcome of poisoning done by analyzed 1512 cases of poisoning who presented to Emergency Department.<sup>14</sup> From these, most of them are women with majority of them from the age group of 19-50 years old. Suicidal intention was the major cause of poisoning. About 53.5% was discharged and 21.4% admitted to hospital. From the total admission, 15.1% admitted to general ward and 6.3% required ICU admission. Fatality rate was recorded as 4.2%. Fatality was defined as death during hospitalization or that was attributable to the poisoning episode. Among the poisoning agents, pesticides caused the highest fatality rate and factors associated with the fatality rate are male gender, suicidal intention, older age patients,

abnormal vital signs (decreased Glasgow Coma Scale, abnormal body temperature, shock status, abnormal heart rate and respiratory insufficiency) and history of chronic illness.

A study done in an Emergency Department of a teaching hospital in Qatar by involving 599 patients with chemical poisoning as the main agent (61.6%).<sup>3</sup> From the study, male is the predominant group of gender with higher fatality rate for chemical poisoning. However, female patients who are single suffered more from intentional poisoning compared to male who is more prone to unintentional poisoning. This study also showed that younger group of people from age 20-39 is the largest group in the poisoning cases. The case fatality rate was 1.2 % with chemical poisoning as the main contributing agent but no further study done on factors that associated with higher fatality rate. This study also looks on the length of stay in the hospital which is classified as normal (2days or less) and prolonged (3days or more) and they found that patients with drug poisoning have longer length of stay in hospital. However, more patients with chemical poisoning required admission to Intensive Care Unit (ICU).

Heyerdahl did a study on acute poisoning and clinical outcome which is complications.<sup>15</sup> Their multi-center study that register acutely poisoned patients in contact with all parts of the emergency health care system in Oslo during 1 year. From the total of 947 admissions, complications were observed in 18% of total admission. The complications listed are altered consciousness, respiratory insufficiency, hypotension, cardiac arrhythmias, cardiac arrest, hypothermia, hypoglycaemia and renal failure. The study involved 947 admissions and from that, 173 developed complications and most common were respiratory insufficiency, hypotension, and arrhythmias. However, factors associated with development of complications in the poisoning patients was not studied.

According to Collins Dictionary of Medicine complication is defined as an additional disorder, or a new feature, arising in the course of, or as a result of, a disease,

injury or abnormality.<sup>16</sup> Farlex Partner Medical Dictionary defined complication as a morbid process or event that occurs during the course of a disease that is not an essential part of that disease, although it may result from it or from independent course.<sup>17</sup>

In Malaysia, a few studies have been done on pattern and demographic features of poisoning.<sup>4,7,18</sup> Most of the studies showed that female gender has the higher incidence of poisoning and highest fatality was recorded due to pesticide.<sup>7</sup> However, similar to other studies conducted worldwide, not much study has been done to determine the factors that associated with outcome of the poisoning itself i.e. complications and mortality.

### **2.3 PROBLEM STATEMENTS**

Acute chemical poisoning is one of the most common causes of visit to Emergency Department. Early diagnosis and treatment based on the knowledge of Emergency Physician on acute chemical poisoning is the essential key in managing such cases as it will determine the outcome of the poisoned patients.

Emergency Department Hospital Tengku Ampuan Rahimah (ED HTAR) Klang is one of the busiest hospitals in Malaysia with highest number of poisoning related cases. However, there is still no study done on sociodemographic characteristics, patients' presentation, common agents for acute chemical poisoning and factors that predict the development of complication among patients presented to EDHTAR and their outcomes.

There are a few studies done worldwide regarding acute poisoning but different centers have different population and limitation that may yields different results from the previous study. Hence a study on acute chemical poisoning and factors associated with development of complication and their outcomes among patients presented to ED HTAR should be done.

## **2.4 STUDY JUSTIFICATION AND BENEFIT OF THIS STUDY**

Result from this study can be used as a guide for the treating doctors in ED to anticipate and detect the factors that may predict the outcome of patients presenting with acute chemical poisoning so early diagnosis can be made and accurate treatment can be carried out for the benefit of the patient.

## **2.5 RESEARCH QUESTIONS**

- 1) What is the sociodemographic characteristic, presentation of acute chemical poisoning and common agents used in patients presenting to Emergency Department HTAR?
- 2) What are the proportion of acute chemical poisoning patients presenting to Emergency Department HTAR who develop complications?
- 3) What are the factors predicting the complication of acute chemical poisoning in patients presenting to Emergency Department HTAR?
- 4) What are the outcomes of patients with acute chemical poisoning in Emergency Department HTAR?

## **2.6 RESEARCH OBJECTIVES**

### **2.6.1 General objective**

To study on acute chemical poisoning in patients presenting to Emergency Department HTAR and its complications

### **2.6.2 Specific objectives**

1. To describe the sociodemographic characteristic, presentation of acute chemical poisoning and common agents used in patients presenting to Emergency Department HTAR
2. To identify common agents for acute chemical poisoning in Emergency Department HTAR
3. To determine the proportion of acute chemical poisoning patients who develop complications in Emergency Department HTAR
4. To determine the factors predicting the development of complication in acute chemical poisoning in patients presenting to Emergency Department HTAR
5. To determine the outcome of patients with acute chemical poisoning in Emergency Department HTAR

## **2.7 METHODOLOGY**

### **2.7.1 Study Design**

- Cross sectional observational study, using retrospective data from medical record.

### **2.7.2 Study Duration**

- May 2019-May 2020

### **2.7.3 Study Location**

- Emergency Department, Hospital Tengku Ampuan Rahimah, Klang, Selangor.

### **2.7.4 Study Population**

- Reference population: All patients who presented with acute poisoning in emergency departments in Malaysia.

- Study population: Patients presenting with acute chemical poisoning to Emergency Department HTAR
- Study participants: Patients who are treated for poisoning in Emergency Department HTAR during the study period who fulfill the inclusion and exclusion criteria

### 2.7.5 Inclusion Criteria

- Patients of all ages who presented with acute chemical poisoning to Emergency Department, HTAR

### Exclusion Criteria

- Patient presented with pharmaceuticals or food poisoning
- Patient complicated with trauma
- Patient presented with poisoning of unknown agent

### 2.7.6 Sample Size Calculation

**Sample size is calculated using the single proportion formula**

The formula:

$$n = \left( \frac{Z_{\alpha}}{\Delta} \right)^2 * P (1 - P)$$

$Z_{\alpha}$  = statistic for level of confidence

$P$  = expected prevalence

$d$  = precision

Taking the P (expected prevalence of complication) as 18% <sup>15</sup>, Z as 1.96 with CI of 95% and d = 0.05,

Calculated sample size = 227 ~ 230

Considering drop-out rate of 10%, total sample required, N, was calculated:

$$\begin{aligned} N &= 230 + 10\% \text{ of dropout rate} \\ &= 253 \sim 260 \end{aligned}$$

Therefore, the total sample required is 260.

### 2.7.7 Operational Definition

- **Acute poisoning:** defined as a single exposure, continuous exposure lasting less than 8 hours, or repeated exposure over a period no longer than one week.<sup>8</sup>
- **Chemical poisoning:** include household products, pesticides, alcohol, Hydrocarbon and gases<sup>3</sup>
  - Types of chemical agents:<sup>3</sup>
    - a. **Disinfectants/ detergents** (include Chlorox/Dettol/naphthalene/shampoo)
    - b. **Hydrocarbons** (includes thinner/paint/kerosene/paraffin/acetone/glue)
    - c. **Gases** (includes carbon monoxide/cooking gas/smoke)
    - d. **Pesticides** (includes Organophosphate)
    - e. **Herbicides** (paraquat)
    - f. **Others** (includes cosmetics/mineral acids/ rodent poison)

- **Complication:** defined as an additional disorder, or a new feature, arising in the course of, or as a result of, a disease, injury or abnormality.<sup>16</sup> It is also defined as a morbid process or event that occurs during the course of a disease that is not an essential part of that disease, although it may result from it for from independent course.<sup>17</sup>

➤ **Complications of poisoning (as listed)** <sup>15</sup>

- a. Altered consciousness (GCS <15)
- b. Respiratory insufficiency (partial pressure oxygen <60 mmHg or requiring mechanical ventilation)
- c. Circulatory shock (requiring inotrope support)
- d. Cardiac arrhythmias (other than tachycardia)
- e. Cardiac arrest
- f. Hypothermia ( Temperature < 36°C)
- g. Hypoglycemia (Capillary blood glucose <4 mmol/L)
- h. Renal failure (elevated urea/creatinine from normal level)
- i. Liver failure (elevated liver enzymes 3 times than normal level)

## 2.8 DATA COLLECTION METHOD

Sample will be selected using convenience sampling method until sample size achieved. Patients list of acute chemical poisoning in Emergency Department HTAR will be extracted from the Poisoning Registration Record of ED HTAR from January 2016 until December 2018. Each patient will be assigned a study identification number. Medical record will be retrieved from the record office by the investigator. If the patient fulfils the inclusion and exclusion criteria, data will be extracted from the medical record by using the data collection form attached in appendix A.

### 2.8.1 Data Entry

Data will be entered and analyzed using Statistical Packages for Social Science (SPSS) version 26.0.

### 2.8.2 Variables

#### A) Independent variables

##### a. Sociodemographic

- Gender: Male

Female

- Age

- Race: Malay

Chinese

Indian

Others

- Marital status: Single

Married

Widowed/divorced

- Employment status: Employed

Unemployed

Student

##### b. Circumstances of poisoning: Intentional

Unintentional

##### c. Route of exposure: Ingestion

Inhalation

## Others

d. Time of exposure: 0800-1600

(1<sup>st</sup> exposure) 1600-2400

0000-0800

Unknown

e. Latency time : < 2hour

(Duration between exposure to ED visit) 2-12 hours

>12 hours

Unknown

f. Number of agents: Single

Multiple

g. Underlying medical illness: Yes

No

h. Underlying psychiatric illness: Yes

No

i. Clinical presentation:

- Level of consciousness: Awake (GCS 15)

Drowsy (GCS 9-14)

Comatose (GCS<8)

- Heart rate (HR): Tachycardia (>100)

Bradycardia (<60)

Heart rate 60-100

- Systolic Blood Pressure (SBP): SBP>90

SBP<90(hypotension)

- Temperature: Normothermia (36-37.5°C)
  - Hyperthermia (>37.5°C)
  - Hypothermia (<36°C)
- Respiratory status: Normal (Respiratory rate 10 -24/minute)
  - Respiratory distress (RR<10/>24/minute or requiring intubation)
- Gastrointestinal manifestation (vomiting/diarrhea/abdominal pain): Yes
  - No
- Neurological manifestation (Seizure/fasciculation/neuromuscular weakness/paralysis/pupil abnormality): Yes
  - No
- j. Types of chemical agents: <sup>3</sup>
  - Disinfectants/ detergents (include Chlorox/Dettol/naphthalene/shampoo)
  - Hydrocarbons (includes thinner/paint/kerosene/paraffin/acetone/glue)
  - Gases (includes carbon monoxide/cooking gas/smoke)
  - Pesticides (includes Organophosphate)
  - Herbicides
  - Others (includes cosmetics/mineral acids)

## **B) Dependent variables**

### **Complications** (as listed) <sup>15</sup>

- a. Altered consciousness
- b. Respiratory insufficiency
- c. Circulatory shock
- d. Cardiac arrhythmias

- e. Cardiac arrest
- f. Hypothermia
- g. Hypoglycemia
- h. Renal failure
- i. Liver failure

**Outcomes:**

Discharged: Medical discharge

Discharge against medical advice (DAMA)

Admitted: General Ward

Intensive Care Unit (ICU)

Length of stay in days (mean + SD)

Death

**2.8.3 Statistical Analysis**

- For objective 1,2,3 and 5, descriptive statistic will be used.
- For objective 4, multiple logistic regression will be used.
- Statistical significance is defined as P-value <0.05.

### 2.8.4 DUMMY TABLE

**Table 1: Sociodemographic and clinical presentation according to accidental and intentional type of acute chemical poisoning**

Variables	Accidental poisoning n (%)*	Intentional poisoning n (%)*	Total n (%)*
Age (years), mean $\pm$ SD			
Gender			
Male			
Female			
Race			
Malay			
Chinese			
Indian			
Others			
Marital status			
Single			
Married			
Widowed/divorced			
Employment			
Employed			
Unemployed			
Student			
Route of exposure			
Ingestion			
Inhalation			
Others^			
Time of presentation			
0800-1600			
1601-2400			
0001-0759			
Unknown			
Number of agents exposed			
Single			
Multiple			
Underlying medical illness			
Yes			
No			

Underlying psychiatric condition Yes No			
Latency time to presentation < 2 hours 2-12 hours >12 hours Unknown			
Systolic blood pressure < 90 mmHg ≥ 90 mmHg			
Heart rate Normal (60-100) Tachycardia (>100) Bradycardia (<60)			
Temperature Normothermia (36-37.5) Hyperthermia (>37.5) Hypothermia (<36)			
Gastrointestinal symptoms Yes No			

\* n (%) for categorical variables, mean ± SD for continuous variables

**Table 2: Type of agents involved in accidental and intentional type of acute chemical poisoning**

Type of agents	Accidental poisoning n (%)	Intentional poisoning n (%)	Total n (%)
Acids <sup>a</sup>			
Alkali <sup>b</sup>			

Hydrocarbons <sup>c</sup>			
Gases <sup>d</sup>			
Insecticide/Repellant <sup>e</sup>			
Herbicide <sup>f</sup>			
Rhodenticides <sup>g</sup>			
Miscellaneous <sup>h</sup>			
Metal <sup>i</sup>			

<sup>a</sup> Includes fertilizer, disinfectant (Dettol, flavin, iodine solution), cleaning agent, anti-rustic agent, metal cleaner, toilet bowl cleaner, bleach (Clorox)

<sup>b</sup> Includes glass cleaner, fertilizer, detergent, hair product, drain opener, battery

<sup>c</sup> Includes thinner, paint, gasoline, diesel, kerosene, paraffin, acetone, glue, degreaser, toluene, cosmetic, shampoo, soap, moth ball (naphthalene)

<sup>d</sup> Includes carbon monoxide, cooking gas, smoke

<sup>e</sup> Includes organophosphosphate (malathion, chlorpyrifos, acephate), carbamate, pyrethrin/pyrethroid/neonicotinoids, amitraz, DEET

<sup>f</sup> Includes paraquat, glyphosate

<sup>g</sup> Includes non-anticoagulant (zinc phosphide) and anticoagulant (warfarin/super-warfarin)

<sup>h</sup> Includes rose water prayer, calamine lotion

<sup>i</sup> Includes mercury

**Table 3: Outcome of patients with acute chemical poisoning**

Variables	Accidental poisoning n (%)	Intentional poisoning n (%)	Total n (%)
Complications			
Respiratory insufficiency			
Pneumonitis			
Cardiac arrhythmia/arrest			
Renal failure			
Altered consciousness			
Liver failure			
Circulatory shock			
Intermediate syndrome			
Coagulopathy			
Admitted			
General ward			
Intensive care unit (ICU)			
Not admitted			
Length of stay (days) (mean SD)			
Final outcome			
Survival			
Death			

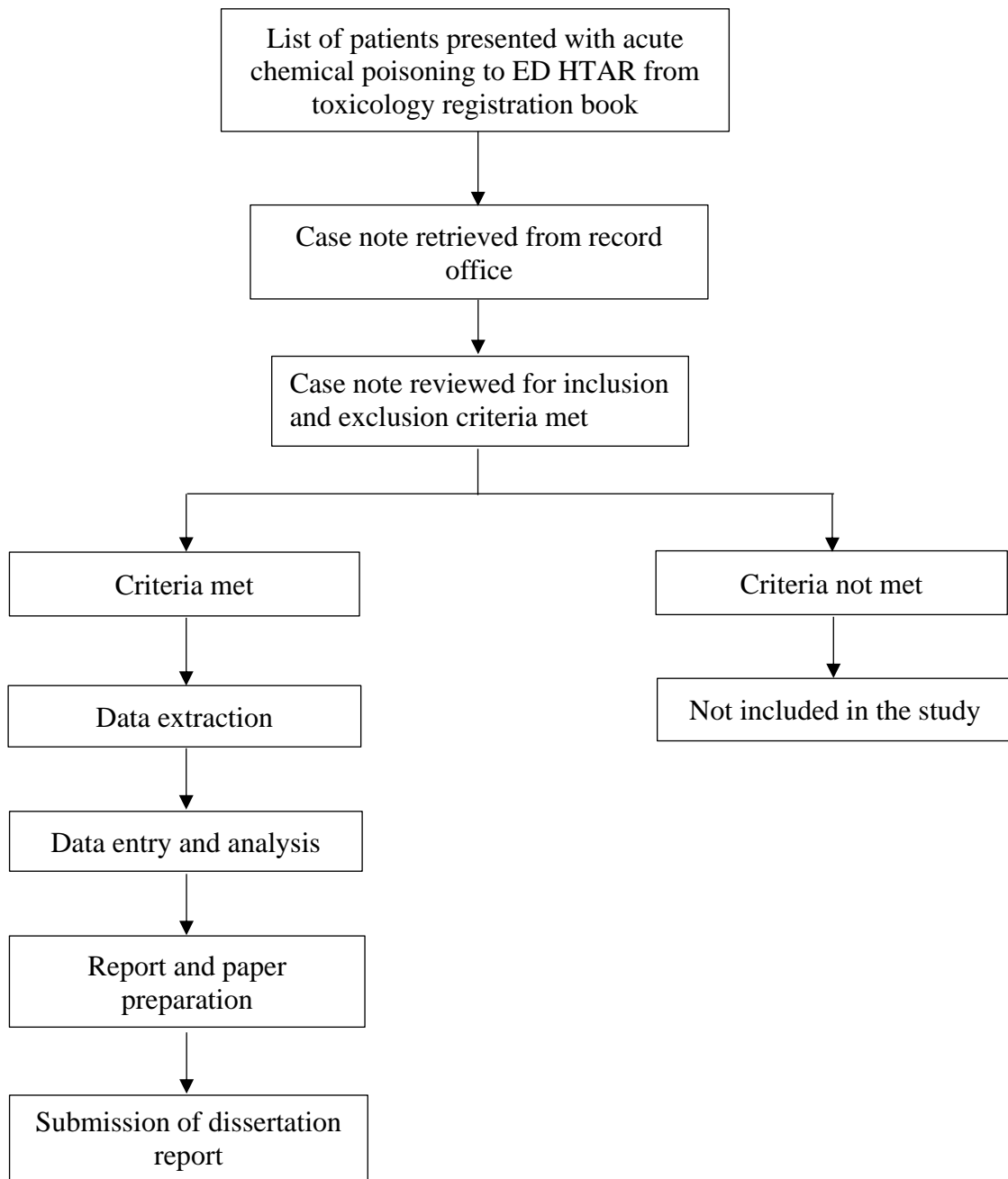
**Table 4: Factors associated with development of complications in acute chemical poisoning**

Variables	Category	OR (95%CI)	p-value
Age (mean + SD)			
Gender	Male Female		
Race	Malay Chinese Indian Others		
Marital status	Single Married Widowed/divorced		

Employment	Employed Unemployed Student		
Circumstances	Intentional Unintentional		
Route of exposure	Ingestion Inhalation Others		
Time of exposure	0800-1600 1601-2400 0000-0759 unknown		
No of agent exposed	Single Multiple		
Underlying medical illness	Yes No		
Underlying psychiatric illness	Yes No		
Latency time	< 2 hours 2-12 hours >12 hours unknown		
Clinical presentation			
1) Level of consciousness	Awake ( GCS 15) Drowsy (GCS 9-14) Comatose (GCS 3-8)		
2) Systolic blood pressure (SBP)	SBP > 90mm Hg SBP < 90mm Hg		
3) Heart rate (HR)	Tachycardia ( HR>100) Bradycardia ( HR<60)		

4) Temperature (°C)	HR 60-100 Normothermia ( 36-37.5 ) Hyperthermia ( >37.5 ) Hypothermia ( < 36 )		
5) Respiratory status	Normal (RR 10-24) Respiratory distress ( RR<10 or RR >24 or requiring intubation)		
6) Gastrointestinal symptoms (vomiting/ diarrhea/abdominal pain)	Yes No		

## 2.9 STUDY FLOWCHART



## 2.10 GANT CHART

	2018							2019												2020				
	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M
1. Designing assessment tool			→																					
2. Data Collection							→																	
3. Data Entry & Analysis													→											
5. Report Preparation																	→							
6. Submission of manuscript																							→	

No	Milestones	Date	Semester
1.	Draft research proposal to supervisor	July 2018	Semester 1 2018/2019
2.	Present research proposal to department	August 2018	
3.	Submit proposal to ethics committee	September 2018	
4.	Anticipated date for ethics approval	March 2019	Semester 2 2018/2019
5.	Data collection commencement	May 2019	
6.	Data collection complete	May 2020	Semester 2 2019/2020
7.	Data entry & analysis commencement	April 2020	
8.	Data entry & analysis complete	June 2020	Semester 1 2020/2021
9.	Review findings with supervisor	July 2020	
10.	Dissertation report write up	August 2020	
11.	Review draft final report with supervisor & corrections	October 2020	
12.	Submit final report	November 2020	