

**A PROFILE OF COMMUNITY
BASED ACUTE POISONING
AND IT'S ASSOCIATED MORTALITY AT THE
UNIVERSITY TEACHING HOSPITAL IN LUSAKA IN 2015**

BY

BORIS MWANZA

**A DISSERTATION SUBMITTED TO THE UNIVERSITY OF ZAMBIA IN PARTIAL
FULFILLMENT OF REQUIREMENTS OF THE DEGREE OF MASTER OF CLINICAL
PHARMACY**

THE UNIVERSITY OF ZAMBIA

LUSAKA

2017

©Copyright 2017

No part of this dissertation may be reproduced stored in a retrieval system or transmitted in any form without prior written permission of the researcher.

DECLARATION

I, **Boris Mwanza** hereby declare that the work on which this discussion is based is original except where acknowledgements indicate otherwise.

This dissertation is submitted for the degree of master of clinical pharmacy at the University of Zambia. Neither the whole work nor part of it has been submitted before for any degree or examination at this or any other university.

Signed.....on the.....day of.....

Computer number: 513800213

SUPERVISORS

1. Dr. L.T Muungo

Signature.....

Date

2. Dr. S. Kanyimba

Signature.....

Date

CERTIFICATE OF APPROVAL

This dissertation of **Boris Mwanza**, has been approved as fulfilling the requirement or partial fulfillment of the requirement for the award of master's degree in clinical pharmacy by the University of Zambia.

Signature for examiner onedate.....

Signature for examiner twodate.....

Signature for examiner threedate.....

DEDICATION

I dedicate this dissertation to my parents Mr. and Mrs. Mwanza for their love support and encouragement during my studies.

ABSTRACT

Background: Acute poisoning remains a common method employed for suicide worldwide. World Health Organization (WHO) estimates that about 0.3 million people die every year worldwide due to various poisoning agents.

Methodology: The study was a cross-sectional descriptive study. A retrospective survey of acute poisoning cases presenting at U.T.H medical emergency department was undertaken. This was conducted by identifying and reviewing all acute poisoning cases that presented at this department during the period 1st January, 2015 to 31th December, 2015 (a period of 12 months). A total of 131 patients' medical records and charts on poisoning were reviewed. The data was thereafter analyzed by using statistical package of social science (SPSS). All statistical tests were at 5% significance level.

Results: Of the 131 acute poisoning cases reviewed, 51.1% were female. Most patients (53.4%) were single and 47.3% were unemployed. Acute poisoning cases occurred more in the age-group of 20-39 years (49.6%). Most of poisoning cases (58.8%) occurred in areas associated with poor socio-economic status. Organophosphate poisoning accounted for (38.2%) of all the poisoning cases. Other common agents/drugs used were paracetamol tablets (7.6%), antibiotics (6.1%), antiretroviral (ARVs) (3.1%) and household chemicals (11.5%). Thirty four patients (26%) took more than one drug/ agent. Out of 109 patients who had the reason for their poisoning stated, 57 patients had relationship disharmony (32 married, 25 unmarried). Fourteen patients had family issues which mainly resulted from conflicts with parents and grandparents. The psychosocial problems of the 16 patients were not specified and accidental poisoning was seen in 5 patients. Majority of the patients (85.5%) were discharged without any complications and the mortality rate was observed at 4.6%. Low GCS (< 8) and hypothermia were common clinical features amongst patients that got admitted. The association between mortality and poisoning associated with alcohol was found to be statistically significant ($p=0.04$).

Conclusion: Acute poisoning is still a common phenomenon, majorly amongst females in the age group of 20 – 39 years, with poor quality of life. Relationship disharmony is the most common reason for poisoning. Organophosphate poisoning accounted for most of the poisoning cases. Drug/agent used can only be curtailed to a minimal extent. Prevention through early detection of vulnerable patients and early psychological management should be our goal.

ACKNOWLEDGEMENTS

I would like to extend my profound gratitude to my supervisors, Dr. L.T. Muungo and DR. S. Kanyimba, for supervising this clinical research report. I am indebted to them for generously giving up they precious time to read and comment on all aspect of this report. The author is indebted to University Teaching Hospital management for authorization to access medical records.

I am grateful to:

- Thandiwe Mwanza for her assistance with data collection and data management.
- Mr. Mulele Banda for his assistance with data analysis.
- Dr. Nason Lambwe and members of the firm for the discussion we have had during my placement in internal medicine department.
- Clinical pharmacist Jimmy Hangoma for providing me with some literature, for editing and proof reading my work.

My family deserves special mention for their continued support, prayers and motivation in all stages of preparing this report.

I would like to thank the Lord for giving me wisdom, strength and lifting me up when my morale was very low.

TABLE OF CONTENT

Copyright	I
Declaration	ii
Certificate of approval	iii
Dedication	iv
Abstract	v
Acknowledgements	Vi
List of tables	x
List of figures	Xi
List of appendices	Xi
List of abbreviations and acronyms	Xii
List of definitions	xiii

CHAPTER ONE

1.0. Background and introduction	1
1.1. Rationale of study	4
1.2. Research question	5
1.3. Study justification.....	5
1.4. Aim	6
1.5. Specific objectives.....	6

CHAPTER TWO

2.0. Literature review.....	7
2.1. Introduction	7
2.2. Epidemiology of poisoning.....	8
2.3. Demographical features associated with poisoning.....	9
2.4. Reasons for poisoning.....	10
2.5. Agents used in acute poisoning.....	14
2.6. Clinical state of patients presenting at ED.....	15
2.7. General management of poisoned patients.....	20
2.8. Outcome of poisoned patients.....	21

CHAPTER THREE

3.0.Methodology	22
3.1.Study site.....	22
3.2.Design	22
3.3.Study population.....	22
3.4.Sample size.....	23
3.5.Sampling method.....	23
3.6.Inclusion criteria.....	23
3.7.Exclusion criteria.....	23
3.8.Data collection	23
3.9.Data analysis.....	24
3.10. Conceptual framework.....	25
3.11. Ethical considerations	28

CHAPTER FOUR

4.0.Results	29
4.1.General information/demographics.....	29
4.1.1. Age distribution.....	29
4.1.2. Summary of demographics.....	30
4.1.3. Gender.....	30
4.1.4. Age group.....	30
4.1.5. Ethnic group.....	31
4.1.6. Occupation.....	31
4.1.7. Marital status	31
4.1.8. Residential area.....	31
4.2.Poisoning related information.....	32
4.2.1. Period of poisoning.....	32
4.2.1.1. Month	33
4.2.1.2.Day of the week.....	33
4.2.2. Type of poison/drug used.....	34
4.2.3. Multiple drug/agent used.....	34

4.2.4. Poisoning association with alcohol	35
4.2.5. Toxicology screen.....	35
4.2.6. Positive agent detected from toxicology	35
4.2.7. Source of the toxic agent used.....	36
4.2.8. Reasons for poisoning.....	36
4.2.9. Time between poisoning and presentation at the ED.....	37
4.2.10. Clinical state on presentation at the ED.....	38
4.2.11. Pre – hospital intervention.....	39
4.2.12. Medical morbidities.....	39
4.2.13. Outcome.....	40
4.2.14. Psychiatric/psychological referral.....	40
4.2.15. Deranged urea and creatinine	40
4.2.16. Deranged liver function tests.....	41
4.2.17. Management of the poisoned patients.....	41
4.2.18. Length hospital stay.....	41
4.3. Bivariate analysis.....	41
4.4. Multiple logistic regression analysis.....	42
 CHAPTER FIVE	
5.0. Discussion.....	43
5.1. Demographics of poisoning cases presenting at the ED.....	43
5.2. Reasons for poisoning.....	45
5.3. Timing of poisoning cases and drug/agent used.....	46
5.4. Clinical presentation and outcome.....	49
5.5. Limitation of the study.....	52
 CHAPTER SIX	
6.0. CONCLUSION AND RECOMMENDATIONS.....	53
6.1. Conclusion.....	53
6.2. Recommendations.....	53
REFERENCES	55

APPENDICES	63
-------------------------	----

LIST TABLES

Table 1: Variables with their associated definitions	25
Table 2: Age distribution of study patients.....	29
Table 3: Summary of demographics of the study patients.....	30
Table 4: Association between gender and residence type.....	32
Table 5: Period of poisoning.....	32
Table 6: Type of toxic agent exposed to.....	34
Table 7: Reasons for poisoning	37
Table 8: Time between poisoning and presentation at the ED.....	37
Table 9: Clinical state on presentation at the emergency department	38
Table 10: Pre – hospital intervention.....	39
Table 11: Medical co – morbidities of study patients.....	40
Table 12: Bivariate analysis for association with mortality.....	42

LIST OF FIGURES

Figure 1: Day of week when patients presented to the hospital.....	33
Figure 2: Poisoning association with alcohol.....	35
Figure 3: Source of drug/poison used.....	36

LIST OF APPENDICES

Appendix A: Documentary datasheet form.....	63
Appendix B: Schedule of activities.....	69
Appendix C: Budget	70
Appendix D: List of common drugs/substances of abuse.....	71
Appendix E: Clearance letter from Assistant Dean Post Graduate.....	73
Appendix F: Clearance letter from UTH management.....	74
Appendix G: Ethical approval from Research Ethics Committee.....	75

LIST OF ABBREVIATIONS AND ACRONYMS

AMEU	Adult Medical Emergency Unit
ARVs	Anti-Retroviral
CNS	Central Nervous System
DSH	Deliberate Self-Harm
DSP	Deliberate Self-Poisoning
ED	Emergency Department
GCS	Glasgow Coma Scale
GI	Gastro-Intestinal
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
MAW	Medical Admission Ward
NAC	N – Acetyl cysteine
NAPQI	Acetyl-P- Benzoquinonimine
NNRTI	Non-Nucleoside Reverse Transcriptase Inhibitor
NRTI	Nucleoside Reverse Transcriptase Inhibitor
PI	Protease Inhibitor
SPSS	Statistical Package of Social Science
STG	Standard Treatment Guidelines
U.T.H	University Teaching Hospital
W.H.O	World Health Organization

LIST OF DEFINITIONS

Acute toxicity: The harmful effect of a toxic agent that manifests itself in seconds, minutes, hours or within 2 days after exposure (Medical Dictionary, 2008)

Chronic toxicity: The harmful effect of a toxic agent that manifests itself after 2 days from the time of exposure (Medical Dictionary, 2008)

Drug: Any chemical compound used for the diagnosis or treatment of disease or injury, for the relief of pain or for the feeling it causes. A drug is either Pharmaceutical or illicit (Waddy, 2005).

Intentional Poisoning: This is a condition in which an individual takes a poisonous substance to cause physical or psychiatric harm to him or herself (Kupur, 2005).

Intoxication: This is a condition that follows the administration of a psychoactive substance and results in disturbances in the level of consciousness, cognition, perception, judgment, affection, or behavior or other psycho physiological functions and responses (WHO, 2004).

Misuse or abuse: The use of illicit or prescription or over-the-counter drugs in a manner other than as directed (WHO, 2004).

Overdose: When a drug is ingested, inhaled, injected, or absorbed through skin in excessive amounts and injures the body. Overdose is either intentional or unintentional (Medical Dictionary, 2008).

Poisoning: This refer to the development of dose-related adverse effects following exposure to chemicals, drugs or other xenobiotics through inhalation, ingestion, skin or eye contact, or inoculation (Waddy, 2007).

Profile:A representation of poisoning cases at the University Teaching Hospital from admission to discharge.

Substance: Any chemical compound that can cause physical or psychiatric harm, if exposed to (Clark *et al.*, 2011).

Toxicity: The ability of a chemical agent to cause injury (Medical Dictionary, 2008)

Toxicology: The science of adverse effects of chemicals on living organisms (Medical Dictionary, 2008).

Unintentional poisoning: This is a condition in which an individual takes a poisonous substance that can cause physical or psychiatric harm without knowing (Kupur, 2005).

CHAPTER ONE.

1.0 INTRODUCTION AND BACKGROUND

1.1 BACKGROUND

In the last 30 years, there has been extensive development of industrial compounds and pesticides to sustain a worldwide demographic expansion. Dangerous products are often introduced into the home, and in addition there has been a multiplication of active therapeutic drugs (Repetto, 2008). An ever increasing range of psychotropic and anti-depressant drugs are taken in attempted and complex suicides and there is massive abuse of addictive substance such as alcohol, tobacco, amphetamines, tranquilizers, heroin and cocaine (Ellenhorn *et al.*, 2009; Preda, 2001). Since 1980, accidents due to toxic exposures have become the most common cause of acute medical illness in many industrialized countries. They are also the second most common cause of death (after infectious disease) in many developing countries (Gossel and Bricker, 2006; Klasseb and Doll, 2008).

“Poisoning refers to the development of dose-related adverse effects following exposure to chemicals, drugs or other xenobiotics through inhalation, ingestion, skin or eye contact, or inoculation (Waddy, 2007). The dose makes the poison (Waddy, 2007; Mycyk, 2012).” Paracelsus, in the 18th century, was the first person who related poisoning to the dosage of the toxic substance. According to him, “all substances are poisons; there is none which is not a poison. The right dose differentiates a poison from a remedy (Haddad *et al.*, 2011).” Deliberate self-poisoning (DSP) has therefore been defined by the World Health Organization (WHO) multi-center study on Para suicide as an act with a nonfatal outcome in which an individual deliberately ingests a substance in excess of the prescribed or generally recognized therapeutic dosage (Kapure *et al.*, 2008).

Throughout the world, poisoning by drugs or chemicals, is an important medical emergency and carries a high morbidity and mortality rate (Manini *et al.*, 2011). Although acute poisoning can be either intentional or accidental, most acute poisonings are due to intentional act which may be potentially life-threatening and sometimes very fatal (Shadnia *et al.*, 2007). According to Kupur (2005), poisoning is the most common way of suicide in women and the second method in men and has been found to be responsible for 100,000 hospitalizations and over 1,300 deaths per year

in Kenya. In developing countries suicide by chemical poisoning is 15 times more than industrial countries and mortality rate due to acute poisoning is only second to road accidents (Shaw, 2005). Patients who attempt suicide, use drugs and poisons of different types and it seems that the type of drug used is related to the aim of the patients. Despite the popularity of drug-related poisoning as a method of suicide, the severity and extent of this action varies from country to country and region to region (Clark *et al.*, 2011).

Poisoning, directly or indirectly has been found to be responsible for more than 1 million illnesses worldwide annually (Singh and Unnikrishan, 2006). This however is only an estimate as many cases of poisoning go unreported. Acute poisoning accounts for about 100,000 hospital admissions in England and Wales every year, with a rising incidence (Townsend *et al.*, 2001). About 10% of the workload of emergency department and 20% of workload in the medical department in the United Kingdom are related to self-poisoning (Jones and Volan, 2009).

In Sub-Saharan countries, about 17% of the total ward admissions are due to acute poisoning. About 80% of these cases of poisoning are intentional and 20% are accidental. Poisoning in these cases is often due to exposure to or ingestion of household chemicals (e.g. paraffin) and agrochemicals (Malangu and Ogunbango, 2009). According to Waddy (2007) accidental poisoning in adults is often in the form of industrial exposure and iatrogenic poisoning resulting from drug interaction, incorrect prescribing and patients' misunderstanding of their medication. An analysis of poisoning in nineteen Kenyan hospitals showed a significant impact on both morbidity and mortality. The overall mortality rate from poisoning was 7% in the same study (Nyamu *et al.*, 2012). In developing countries, there is insufficient drug and chemical regulation, lack of surveillance systems, less enforcements, easy access to many different kinds of drugs or chemicals and these have been blamed for the higher poisoning rate and possible mortality (Owens *et al.*, 2005). Deliberate self-poisoning is typically employed by individuals, (most commonly single females struggling with psycho-social challenges in order to gain attention, express distress or to get revenge and not necessarily to end their lives (Eddleston and Philips, 2004).

World Health Organization estimates 0.3 million people die every year due to various poisoning agents (WHO, 2013 world report). Acute pesticide poisoning is one of the most common causes of intentional deaths worldwide (Jesslin *et al.*, 2010). High doses of analgesics, tranquillizers, and

antidepressants are the commonly used agents for intentional poisoning in industrialized countries (Maitai *et al.*, 2004) while, few studies done in South Africa and some other parts of Africa have shown paracetamol, antibiotics, non-steroidal anti-inflammatory drugs, anti-hypertension drugs, benzodiazepines and Organophosphate containing pesticides to be some of the common agents used for poisoning (Eddleston, 2006; Laubscher *et al.*, 2007).

Clinical presentation of poisoning cases in the emergency department ranges from an ambulant, asymptomatic patient, to a comatose patient. Time Interval between the Onset of poisoning and presentation at the emergency department, type, dose, potency, multiplicity of poison/drug used and association with alcohol intake are factors which often determine the clinical presentation and outcome of poisoned patients presenting at the emergency department (Fathelrahman *et al.*, 2008; Schlebuschet *et al.*, 2003; Spiller *et al.*, 2008).

The aim in the management of poisoning in the emergency department is to resuscitate the unstable patient by utilizing Standard Advanced Life Support Principles, determine the poison used, prevent or reduce the amount of poison absorbed, give the appropriate antidote and refer for further and/or supportive management such as rendered in the medical wards, intensive care units and psychiatric or psychology departments. In cases where the poison used is unknown, thorough physical examination become very important in order to detect certain known toxic syndromes (Fathelrahman *et al.*, 2008).

Toxicology screening is a pharmacological investigation carried out on patients (blood and urine samples). In order to confirm the presence of certain drugs and their concentrations in the body; urine samples are collected from patients suspected to have taken drugs of abuse while blood samples are collected when drugs like paracetamol, carbamazepine and tricyclic anti-depressants are suspected to have been used. Both samples are collected for complete toxicology screening when in doubt of the drug used. Other laboratory investigations like liver function tests, urea and electrolytes and clotting profiles are used to rule out the presence of complication such as hepatotoxicity, renal failure etc. (Henderson *et al.*, 2005).

In summary, poisoning is an important, relatively common acute medical presentation and the clinical outcome is a function of the poison used (dose, potency, multiple agents etc.), association with alcohol use, time interval between poisoning and presentation at the emergency

department, competence of attending health professional and immediate availability of antidotes and other emergency equipment for intervention. Poisoning could be intentional (e.g. deliberate self-poisoning and homicide) or unintentional (e.g. drug over dose) as mentioned above. For the purpose of this study, focus was on both types of poisoning. This is because of high incidence in parts of the developing countries owing to the vast availability of poisons coupled with sparse medical facilities, which increases the likelihood for morbidity and mortality (Singh and Unnikrishnan, 2006).

1.2 RATIONALE OF STUDY

World Health Organization (WHO) report, estimate poisoning as one of the most common causes of increased morbidity and mortality world-wide. It further estimates that about 0.3 million people die every year due to various poisoning agents (WHO, 2013 World Report). Suicide, an increasing phenomenon world-wide occurs every 40 seconds and it has been found that the most common method engaged in suicide is deliberate self-poisoning (Calitz *et al.*, 2008). A study done in Kenya on acute poisoning showed a significant impact on both morbidity and mortality (Nyamu *et al.*, 2012).

Furthermore, studies evaluating drug related hospitalization have estimated approximately, 5 – 10% of all admissions are drug related, with an expected rise in both mortality and health care expenditure (Sonalet *et al.*, 2007).

Patients admitted in hospital due to acute drug poisoning or other form of substance poisoning have poor long-term outcomes. Natural and unnatural causes of death occur, especially suicides (Malangu and Ogunbango, 2009). Patients with suicide attempts and deliberate self-induced drug poisonings tend to have social and health- related conditions that affect their quality of life; these include depression, substance and alcohol abuse, unemployment, alienation, and history of imprisonment (Thundiyilet *et al.*, 2008). It is also reported that patients admitted to hospital due to acute self-induced poisoning are often characterized by unemployment and alienation. This may complicate the preventive health care and lead to higher use of expensive acute and emergency visits in these patients with high morbidity and mortality (Kapure *et al.*, 2008).

Therefore, inadequate research into acute poisoning, a phenomenon of great public health concern in Zambia may lead to poor knowledge of health professional in the general approach to

victims of poisoning and result in poor outcome (Nyasulo, 2015 unpublished data). Therefore, the study was aimed at assessing the magnitude of acute poisoning and its associated mortality at the University Teaching Hospital.

1.3 RESEARCH QUESTION:

What is the profile of community based acute poisoning and its associated mortality and morbidity at University Teaching Hospital in 2015?

1.4 SIGNIFICANCE OF STUDY.

The study has profiled poisoning cases at the University Teaching Hospital (U.T.H). This hospital has been chosen because of it being the largest referral hospital in Zambia thus, having a large catchment area and also having state of the art equipment and very specialized work staff.

According to Meredith (2013), one of the greatest obstacles to effective prevention and control of poisoning is lack of reliable epidemiological data. Every year around the world, hundreds of thousands of people are exposed to poisoning. The exact numbers of those poisoned each year are not known, even for countries that have a good network of poison control centres such as the United States of America, Britain and Canada (Maitai *et al.*, 2004).

Acute poisoning by drugs and chemicals is a medical emergency and carries a high morbidity and mortality rate. Between 3.7 and 40 percent of poisoned patients admitted to hospital are in need of intensive care (Meredith, 20013). Acute drug- poisoned patients account for between 3 and 13 percent of patients treated in ICUs and the complication rate among these patients is very high (Singh and Unnikrishan, 2006). In general patients admitted to hospitals due to acute drug poisoning have a high number of readmission (Mordel *et al.*, 2012).

According to Nyasulo (2015 unpublished data) accidental and deliberate self-poisoning are common cases that are admitted at the emergency department at U.T.H but, no study has been done to profile these cases and assess the magnitude of the problem.

Research into the profile of poisoning cases has brought about the knowledge of the common agents implicated in poisoning. This will lead to a better and focused training of doctors,

paramedics and other health professionals, particularly those working in the emergency department on the management of such poisoning cases.

Furthermore, the knowledge on poisoning will enable prioritization of primary prophylaxis against would be victims and place into perspective the importance of specific antidotes and allow revision of the current treatment algorithms.

1.5 MAIN AIM OF STUDY

The main aim of the study was to profile community based acute poisoning and its associated mortality at the University Teaching Hospital in 2015.

1.6 SPECIFIC OBJECTIVES

1. To determine the demographics of patients presenting at U.T.H emergency department with acute poisoning.
2. To establish the reasons or circumstances surrounding acute poisoning.
3. To determine the toxic agents taken by patients and identify the most commonly taken agent.
4. To describe the clinical state of the patients presenting to U.T.H emergency department with acute poisoning.
5. To determine the clinical outcome of patients presenting to U.T.H emergency department with acute poisoning.
6. To determine management and length of hospital stay of poisoned patients at U.T.H.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

According to the World Health Organization (WHO) global report on violence and health in 2013, suicide, a worldwide phenomenon on the rising trend, occurs every 40 seconds and an attempt occurs every 1 – 3 seconds. It has also been found that the most common method engaged in suicide is drug poisoning (Calitz *et al.*, 2008).

A study on poisoning by pesticides has shown that most patients reach the hospital alive. The survival of such patients therefore, to a large extent depends on the competence of the attending doctors and other health professionals in the emergency department. Therefore, inadequate research into poisoning, a phenomenon of great public health, may lead to poor knowledge of health professional in general approach to victims of poisoning and this may result in poor outcome (Eddleston and philips, 2004). Good knowledge and awareness of health professionals on the common agents used for poisoning and the usual clinical features and outcome, through clinical research will incite them into acquiring proper diagnostic and management skills, thereby preventing unnecessary complications and death.

2.2 EPIDEMIOLOGY OF POISONING

Poisonings are on the whole an important and large group of causes leading to hospitalization. The proportion of visits varies depending on type of emergency ward. In Australia, poisoning accounted for 20% of all admission to the intensive-care unit and 5% of all medical-ward admissions (Novack *et al.*, 2005). Between 2001 and 2004, 976, 974 cases of poisoning presented to the emergency departments in the United States of America, with an incidence rate of 248 per 100, 000 among young white females (Prosser *et al.*, 2007). In the United Kingdom, poisoning accounts for 170, 000 presentations to hospitals each year, with profound impact on the health of individual patients (kapure *et al.*, 2010). In China and Turkey poisoning cases presenting at the emergency department account for about 3% of hospital admissions. In addition to the human cost, there is a substantial financial burden on the health services due to poisoning that is spread between emergency departments, acute medical units, critical care facilities, psychiatry and

psychology services, social services and primary care (Prescott *et al.*, 2009). For example, about 15 – 20% of the workload of medical units and 10% of the workload of the emergency department in the United Kingdom are due to drug or substance poisoning (Hawton, 2007).

Poisoning cases represented 0.3% of the hospital admission, and had a rate of 25.9 per 100, 000 population in Fiji Islands (Aghanwa, 2001). A study done in Oman (South – West Asia) showed poisoning to be on an increasing trend. The incidence rate was 12.8 per 100, 000 of the population in 2001 (Zaidan *et al.*, 2002).

Drug and substance poisoning appears to be a major public health issue in developing countries. In rural Sri Lanka, poisoning is one of the leading causes of hospital death (Senarathna *et al.*, 2008). A study done in Uganda on acute poisoning showed an equal prevalence of poisoning amongst males and females (Malangu, 2008) but this differs with a study done by Kumare *et al.* (2010), which showed that females were more involved in poisoning case than men. Another study done in 2007 showed a significant use of pesticides for self-poisoning in Uganda, Kenya, Nigeria, Botswana, Zimbabwe and Ethiopia (Gunnell *et al.*, 2007). This is collaborated by a study in south India which showed that most poisoning cases were due to pesticides (39.5%) (Jesslin *et al.*, 2010). From the above finding it could be seen that profile of poisoning cases differ from region to region thus, need to conduct similar research in our setting.

Irrespective of the rate of admissions there are also some other differences between different countries as well as between adult and childhood poisonings. In developed countries, the leading causes of adult poisoning are drugs and alcohol (Townsend *et al.*, 2001), while in developing countries pesticides are commonly used (Eddleston, 2000).

Most of the deaths from acute drug poisoning occur outside the hospital environment (Henry, 2005). The reported incidences of poisoning-related death are 15.6 per 100, 000 inhabitants per year in the United States, and there has been an increase in the incidents over the years, especially due to opioid toxicity (Birnbaum *et al.*, 2011). In 2004, the rate of unintentional poisoning deaths in America was 4.7 in females and 9.5 in males per 100, 000 inhabitants and was the second commonest cause of accidental death, after traffic accidents (Mowry *et al.*, 2013).

In view of the above epidemiological data most of the studies on acute poisoning have been done in developed countries therefore, more studies have to be done in developing countries to assess the magnitude of acute poisoning and its associated mortality.

2.3 DEMOGRAPHICAL FACTORS ASSOCIATED WITH POISONING:

Certain demographic factors have been associated with high risk for suicidal behaviors. Some of these factors are highlighted below:

Age: A study done in Kenya showed that self-poisoning was prevalent in the age bracket 21 – 30 years (Burrow *et al.*, 2000). Also, a study done in India showed the same trend (Jesslinet *al.*, 2010). These studies highlighted the fact that this age group is more vulnerable to psycho-social challenges and mortality rate is also high in this same age group. However, both these studies focused on both adult and children poisoning but this study only focused on adult poisoning alone.

Gender:

Majority of the attempted suicide cases are documented to have occurred among the females whereas approximately 80% of successful suicide cases in South Africa occurred among the males (Schlebusch, 2005). This is collaborated by Kumar *et al* (2010) who showed that female were more involved in poisoning case than men.

Sexual Orientation:

Increased suicidal risk has been associated with bisexuality and homosexuality amongst youths but has not been substantiated amongst adults (McDanielset *al.*, 2001).

Race:

In a South African study done in 2005, the racial distribution of suicidal behavior was: 43.3% Blacks, 38.4% Whites, 15.9% Coloreds and 2% Asians (Schlebusch, 2005).

Employment Status and Occupation:

Suicidal behavior has been shown to be more likely amongst the unemployed. Also, individuals engaged in high-risk occupation (e.g. police, anesthesiologist) are more likely to engage in suicidal behavior (Bongar, 2002; Maris *et al.*, 2000).

Religious Beliefs:

Suicide rates are lower among people with religious beliefs which prohibit suicide. Orthodox Roman Catholics have lower rates of suicide than other populations (Sadocket *et al.*, 2003).

Relationships and Living Arrangements:

Unmarried people and those living alone are more likely to be suicidal (Bongar, 2002). Also social Isolation raises the level of irritability, hostility and aggression which are associated with increased risk for suicide.

In an American study, young white females between 15 to 19 years of age were at the highest risk of poisoning (Prosser *et al.*, 2007). In the United Kingdom, majority of poisoning cases were female; with a female-male ration of 1.45:1 and median age of 32 years (Prescott *et al.*, 2009). In an Australian study, about 50% of poisoning cases were unmarried and 76% had their highest level of education at the secondary school. This study also showed an almost equal rate of poisoning between the employed and unemployed (Carter *et al.*, 2006).

A study done in Oman (South –West Asia) revealed that 78% of poisoning cases were female. Also, majority of these poisoning cases (53.1%) were unmarried (Zaidan *et al.*, 2002).The age group with the highest incidence (54.1%) was 20 – 30 years. The most vulnerable group of people for poisoning in this study were students, housewives and the unemployed. Also, in an Indian study, poisoning was found to be more common in the female gender and the vulnerable age group was between 20 – 30 years (Bajracharya *et al.*, 2008).

The few studies done in South Africa also showed more females to be involved in poisoning compared to their male counterparts. The highest number of overdoses cases per square kilometer occurred in Fairyland an informal settlement in the Western Cape, with a high density of people and very poor socio-economic circumstances (Eddleston, 2006; Laubscher *et al.*, 2007). The

unemployment rate for patients between the ages of 18 and 65 in this study was 53.7% (Laubscher *et al.*, 2007).

2.4 REASONS FOR POISONING

Factors associated with poisoning include psychological, socio-economic, cultural and health concerns. Frustration due to unemployment, breakdown of relationship amongst teenagers and young adults, marital problems and post-traumatic stress disorder (e.g. rape) may lead to feelings of low esteem, worthlessness and depression. In the same vein the awareness and treatment burden of disease like diabetes, hypertension, human immune deficiency virus (HIV) infection and cancer may lead to depression; in the absence of urgent psychological and/or psychiatric intervention, ideation of self-harm in form of poisoning may set in (Wasserman *et al.*, 2012). The following are known risk factors for suicidal behaviors.

Inheritance – suicidal behaviors run in families and there is likelihood of their independent inheritance, of mental disorders. Heritability of suicide has been confirmed in twin studies. Family history of suicidal behavior is an independent risk factor for attempting suicide (Wasserman *et al.*, 2012).

Major depression – amongst patients who complete suicide, depression is usually severe and is often associated with insomnia, agitation, anxiety, appetite and weight loss, severe hopelessness, contrasting feelings of heavy guilt, worthlessness thought of death and recurrent suicidal ideation (Calitz *et al.*, 2008).

Bipolar disorder – suicide mortality is approximately 25 times higher amongst people with bipolar disorder when compared to the general population (Spiller *et al.*, 2010).

Anxiety disorder – anxiety disorders, especially in adolescents and young adults, are associated with increased lifetime incidence of suicide ideation and suicide attempts (Wasserman *et al.*, 2012).

Alcohol and other substance abuse: all substance abuse disorders increase the risk of suicide. Long term use of alcohol, which is an intoxicating substance, has been associated with impairment of cognitive processes, increased impulsivity and aggression, and low threshold for triggers of suicidal behavior. Suicide victims who suffer from alcohol and other substance use

disorder are often younger, male, divorced or separated. They often suffer from recent adverse life events and they are also likely to be intoxicated at the time of the suicidal act (Townsend *et al.*, 2004).

Schizophrenia – The increased risk of suicide in schizophrenic patients is associated with previous depressive disorders, substance misuse or dependence, previous suicide attempts, agitation and motor restlessness, fear of mental disintegration, poor adherence to treatment and recent loss events. Schizophrenic patients living alone are at greater risk of suicide (Wasserman *et al.*, 2012).

Trauma – traumas are regarded as significant risk factors for suicide, especially when inflicted in the form of physical violence, mental and sexual abuse both in childhood and adulthood, bullying, victimization and exclusion at school or in the work place. Population-based studies and review of clinical studies have shown that patients who have experienced childhood trauma are more vulnerable to later social stress or adversity and are prone to suicidal behavior (Prescott *et al.*, 2009).

Stressful life events – negative life events such as loss, change in life situation, and different narcissistic injuries can act both as a catalyst and as a factor, which precipitates the development of the suicidal process. Traumatic loss includes not only death of, or separation from a partner, friend or a significant other; but also a loss of a national or cultural affiliation, loss of health; loss of possessions or autonomy due to hospitalization, loss of employment; study opportunities, home or financial position. Important transitions or changes in life situation such as entering or leaving periods of development, e.g. puberty, middle age, the menopause or old age, can be a risk situation for vulnerable individuals. Unsolved relationship problems, family violence, particularly childhood physical and sexual abuse, insecure sexual orientation especially in adolescence and young adults, increase the risk of attempted suicide and suicide in those with vulnerable personalities (Prosser *et al.*, 2007).

Chronic illness – considerable connections have been proven to exist between suicidal behavior and disease of the CNS such as multiple sclerosis, Huntington's chorea, epilepsy, Parkinson's disease, migraine, brain and spinal cord lesions, as well as in patients with stroke, certain forms of cancer, diabetes and chronic pain. Also, studies have shown increased risk of suicide in

neurological disorders and cancer. Studies in cardiac, lung and other somatic disorders are fewer and the results are not conclusive. In children and adolescents as in adults other physical disorders associated with elevated suicide risk are: New Onset diabetes mellitus, bronchial asthma, HIV, epilepsy and multiple sclerosis (Carter *et al.*, 2006).

In an Australian study (Clover *et al.*, 2004), 82% of deliberate self-poisoning patients were reported to have been exposed to one or more traumatic events in their lifetime and greater percentage of woman, compared to their male counterparts were seriously physically attacked, assaulted, raped and experienced great shock because an untoward event happened to someone close to them.

A study done in Oman (South – West Asia) showed correlation between deliberate poisoning and social destabilization and poverty (Zaidan *et al.*, 2002). This finding is well corroborated by a WHO declaration in 2001. “Suicide rates are stable in periods of socio-economic stability but rise during periods of major economic changes (WHO, 2010)”. The top three causes of poisoning in the same study done in Oman were family, social and marital problems. The most frequent conflict with family members relates to choice of spouse, inter-generational conflict and family disputes. These accounted for 30% of poisoning cases. 15.4% of poisoning cases had social problems which involved poor rapport, social isolation and unresponsive social network. 10.6% of the patients engaged in poisoning as a result of poor achievement, poor insight/control over affairs of life. Chronic illness and bereavement (9.8%), marital disharmony (12.2%), financial problems (10.6%) and work-related stress (8.1%) were some of the other causes of poisoning identified (Zaidan *et al.*, 2002).

In a study done in Bloemfontein (2005) on attempted suicide, the researchers attributed the high incidence of attempted suicide in the month of November to exams, work or other year-end stressors. In 2006, most attempted-suicide patients were admitted in the first quarter of the year and the reason for the high number of admission at the beginning of 2006 may be associated with increased levels of stress after holiday and festive season, less support from the family, loneliness and adaptation challenges of the New Year (Calitz *et al.*, 2008).

The precipitating factors (in numerical order) found in the study were problematic relationships (55.4%), financial problems (22.9%); psychiatric problems (22.1%); arguments (19.8%); abuse

(18.2%); feeling of low self-esteem, worthlessness, hopelessness or humiliation (16.7%); recent life changes (13.2%); unstable family life (9.3%); lack of social support (9.3%); scholastic problems (9.3%); isolation/rejection (8.9%); chronic medical condition (7.8%); substance use or abuse (9.1%); pregnancy (5.4%); imprisonment and involvement in crime (2.7%); problems at work (2.3%) and childhood trauma (2.3%). Many of the participants had more than one precipitating factor (Calitz *et al.*, 2008).

An assessment of poverty, unemployment and inequality in the Free State in 2005 showed that poverty rates vary greatly between racial groups. While there is virtually no poverty recorded among Asian and white people, poverty estimates shoots up to 53.2% for Colored people and 63.9% amongst Blacks. Poverty has also been shown to be a rural phenomenon, with the rural poverty rate estimated at 69.5% compared to 52.4% in urban areas (Pauwet *et al.*, 2005).

2.5 AGENTS USED IN ACUTE DRUG POISONING

The choice of toxic substance as a method for poisoning varies greatly between different countries; this seems to indicate more dependence on substance availability than its lethality. The choice of a toxic substance may predict the outcome of a self-poisoning episode such a length of hospital stay and death (Meredith, 2013; Spiller *et al.*, 2008). Other factors like age, gender and ethnicity may affect the choice of substance used for poisoning. Also, the speed and severity of poisoning depend on certain pharmacological properties of the drug: absorption, volume of distribution, cell membrane passage, and protein binding etc. (Haddad *et al.*, 2011). Other pharmacological factors that might be associated with the outcome of poisoning cases include the quantity, multiplicity of drugs and association of poisoning with alcohol intake or use of other substance of abuse (e.g. cannabis).

The agents implicated in acute poisoning include household chemicals, modern medicine (prescription and over the counter), agrochemicals, drugs of abuse, traditional medicine and plants (Malangu and Ogunbango, 2009). A report on the agents used for poisoning in the United Kingdom reveals that paracetamol and paracetamol-containing compounds are implicated in about 50% of the cases (Townsend *et al.*, 2001). Anti-depressants were used in 20% of the cases and this high rate of anti-depressants use has been corrected with an increase in the rate of its

prescription. 3.6% of patients made use of opiates. Non- ingestible poisons such as bleach and disinfectants were used for poisoning in only about 1% of the patients (Townsend *et al.*, 2001).

About 37% of the patients made use of a single category of drug/substance for poisoning while 63% made use of substance from the combination of different classes (e.g. analgesics taken with anti-depressant). Patients in the younger age-group tend to take multiple agents, compared to the other patients. Differences have also been in the choice of drugs used for poisoning amongst age-groups; while younger patients tend to make use of paracetamol, older patients made use of anti-depressants and sedatives for self-poisoning (Townsend *et al.*, 2001). Alcohol use in conjunction with self-poisoning was reported in 29% of poisoning cases in a British study (Owens and Jones, 2005).

In Oman, 26% of the patients made use of non-medicinal agents such as household detergents, Organophosphate pesticides and solvents and perfumes for poisoning. Amongst the drugs used for poisoning, non-steroidal analgesics such as paracetamol, ibuprofen and aspirin were implicated in about 41% of the cases. Psychotropic drugs used for acute poisoning were: diazepam (5.6%) fluoxetine (4.9%) amitriptyline (4.1%) carbamazepine (2.4%). Other agents used for poisoning according to this study included glibenclamide, metronidazole nadolol and cough expectorant. Multiple agents were used in 18.7% of the cases and these agents included non-steroidal analgesics solvents, detergents, psychotropic agents and cough expectorants (Zaidan *et al.*, 2002). However, this study on focused on deliberate self-poisoning only, accidental poisoning was not considered.

The study done on poisoning in Paarl hospital showed that Sundays and Mondays had the highest incidence of overdoses presenting to the hospital and Friday, the lowest. There was a downward trend of overdoses from Monday to Friday. The average number of cases of overdoses per day was 1.13 (range 0.4 per day) The most common agents used were tricyclic anti-depressants (20.4%) and paracetamol (20.4%). Multiple drugs were used in 42.3% of cases and 5% concurrently used alcohol (Laubscher *et al.*, 2007).

Study done on attempted suicide in Bloemfontein showed that most (66%) of the participants overdosed on prescription medication, 12% overdose on household chemicals while 7% of the cases overdoses on other chemicals (Calitz *et al.*, 2008). Most (19.7%) of the participants who

overdosed used anti-depressants. Analgesics were used in 8.2% of instances. The most commonly used household chemical for poisoning were bleach (15.2) and paraffin (36.4%) (Calitz *et al.*, 2008).

Most of the various studies done in different parts of the world have shown that agents used for poisoning vary greatly between different countries. Therefore, it was very relevant to conduct research on acute poisoning in our setting to ascertain the various agents used and their associated mortality.

2.6 CLINICAL STATE OF PATIENTS ON PRESENTING AT THE EMERGENCY DEPARTMENT.

The clinical state of poisoned patients presenting at the emergency department depends on the agent used and their pharmacological characteristics. The clinical features are functions of the mechanism of action of agents i.e. adrenergic, cholinergic and centrally acting drugs. Certain pharmacokinetic characteristics of these agents such as half-life, volume of distribution and bioavailability will also determine the onset and duration of the signs and symptoms of poisoning. Thus, patients presenting soon after overdosing on drug with long half-life need to be observed for appropriate duration of time in order to look out for the signs and symptoms which may manifest later.

Also, self-poisoning on multiple agents may result in the patient presenting with a constellation of non-specific clinical features which, amongst other reasons may be due to drug –drug interaction. Association of self-poisoning with alcohol use might also lead to the exaggeration of the clinical features of poisoning arising from the primary agent.

The following are some drugs commonly implicated in poisoning and corresponding clinical features associated with their toxicities.

Paracetamol (Acetaminophen)

Paracetamol also known as acetaminophen is analgesic that is commonly used around the world due to its relative safety and non-irritant characteristic to the gastric mucosa. Paracetamol has both analgesic and antipyretic properties (Bohnert *et al.*, 2006). In severe intoxication, the clinical features of progressive liver failure develops within 2 – 5 days (Rossiter, 2012).

Paracetamol is the drug commonly used for poisoning in the United Kingdom. On estimate, 70,000 case present annually. Paracetamol poisoning is a frequent cause of acute liver failure often requiring liver transplantation in both the UK and the United States (Carter *et al.*, 2006). Ingestion of paracetamol in the excess of 7.5g is said to be substantial over dosage (Rossiter, 2012).

Antibiotics

Amoxicillin, erythromycin, metronidazole, doxycycline and cephalosporins are the antibiotics commonly prescribed as first line agents for the common infections affecting the respiratory tract, ear, nose and throat and genitourinary systems. Over dosage on antibiotics, most times only aggravate their usual side effects e.g. nausea, vomiting, diarrhea and hypersensitivity (Carter *et al.*, 2006).

Anti-hypertensives

The common anti-hypertensives in use are hydrochlorothiazide, enalapril, nifedipine, atenolol and prazosin. Case of over dosage on anti-hypertensives presents with hypotension, palpitation, dizziness and confusion (Henderson *et al.*, 2007).

Benzodiazepines

Benzodiazepines are often prescribed for sedation in anxiety disorders, insomnia, seizure management and as adjunct treatment in some psychiatric disorders. Examples of the common ones in use are diazepam, clonazepam and lorazepam. In toxic levels, patients may present with fatigue, drowsiness, ataxia and respiration depression (Rossiter, 2012).

Anti-epileptics

The common ones in use are Phenobarbital, phenytoin, carbamazepine and valproic acid. When overdosed, patients may present with ataxia, drowsiness confusion, hallucination and gastrointestinal (GI) symptoms such as nausea, diarrhea and vomiting (Suokas *et al.*, 2001).

Anti-depressants

These drugs are employed in the management of different spectrum of depressive disorders. Examples of the common one in use are amitriptyline (tricyclic derivative), fluoxetine and citalopram (selective serotonin re-uptake inhibitors). Features seen in the toxic patients depends on the mechanism of action of the drug used. Common features of toxicity include confusion, tremor, drowsiness, extrapyramidal symptoms and GI symptoms (Rossiter, 2012).

Anti-retroviral (ARVs)

These are the drugs used in the treatment of the human immunodeficiency virus (HIV) infection. The four available classes and their examples are:

- Nucleoside, reverse transcriptase inhibitors (NRTIs) – lamivudine, tenofovir, stavudine, didanosine, zidovudine
- Non-nucleoside reverse transcriptase inhibitors (NRTIs) – efavirenz and nevirapine
- Protease inhibitors (PIs) – saquinavir, indinavir and lopinavir, to mention but a few.
- Fusion inhibitors e.g. enfuvirtide

When overdosed on ARVs, patients may presents with GI symptoms, headache, fever, and fatigue. Complications that may arise include pancreatitis, elevated liver enzymes and lactic acidosis (Strand *et al.*, 2010).

In cases where the poison used is unknown, thorough physical examination becomes very important in order to detect certain known symptoms and signs associated with overdose of particular agents/drugs/poison (i.e. toxic syndromes), depending on their various pharmacological characteristics. Some of the common classes of drugs and their toxic syndromes are as follows:

Anticholinergic

Common signs: Agitated delirium, often with visual hallucinations, mumbling speech, tachycardia, dry flushed skin, dilated pupils, myoclonus, mild pyrexia, urinary retention, and decreased bowel sounds. Seizures and arrhythmias may occur in severe cases.

Common causes: Antihistamines, ant Parkinsonism medication(amantadine), antipsychotics, antidepressants, antispasmodics, mydriatics, skeletal muscle relaxants and many plants, most notably daturastramonium (also known as jimson weed) (Harlbut and Kuling, 2006).

Sympathomimetic

Common signs: Delusions, agitation, paranoia, tachycardia, hypertension and hyperpyrexia, diaphoresis, piloerection, slight mydriasis, hyperreflexia. Seizures and arrhythmias may occur in severe cases.

Common causes: Cocaine, amphetamine, methamphetamine (and derivatives), over-the-counter decongestants (phenylpropanolamine, ephedrine and pseudoephedrine).

Caffeine and theophylline overdoses cause similar findings secondary to catecholamine release (Mordel *et al.*, 2012).

Opiate/Sedative

Common signs: Coma, respiratory depression, miosis, hypotension, bradycardia, hypothermia, acute lung injury and decreased bowel sounds.

Common causes: Narcotics, barbiturates, benzodiazepines, glutethimide methyprylon, methaqualone and meprobamate (Harlbut and Kuling, 2006; Mordel *et al.*, 2012).

Cholinergic

Common signs: Confusion/central nervous system depression, weakness, salivation, lacrimation, urinary and fecal incontinence, GI cramping, emesis, diaphoresis, muscle fasciculations, pulmonary edema, miosis, bradycardia (or tachycardia) and seizures.

Common causes: Organophosphates and carbamate insecticides, physostigmine and edrophonium (Mordel *et al.*, 2012).

Serotonin

Common signs: Fever, tremor, incoordination, agitation, mental status changes, diaphoresis, myoclonus, diarrhea and rigidity.

Common causes: Fluoxetine, sertraline, paroxetine and venlafaxine; the preceding drugs in combination with monoamine oxidase inhibitors (Niskanen *et al.*, 2009).

According to a study done in Denmark, abnormal vital signs and low GCS have been associated with an increased risk of mortality (Johansson *et al.*, 2012).

For the purpose of this study, the Glasgow coma scale (GCS), blood pressure, pulse rate, respiratory rate and temperature will be employed as measure of the clinical state of patients presenting to the emergency department. This is because these are the common and consistent parameters regularly measured at the emergency departments. Normal ranges of these vital signs will be defined as follows:

Blood pressure: High (hypertension) – equal to or greater than 140/90mmHg; low (hypotension) – less than 90/60mmHg (Mowry *et al.*, 2013; Burrow *et al.*, 2000).

Pulse: High (tachycardia) – more than 100beats per minutes; low (bradycardia) - less than 60 beats per minute (Kumar and Clark, 2009; Dugdale, 2012).

Respiratory rate: High – more than 20 cycles per minute; Low (bradypnoea) – less than 12 cycles per minute (Kumar and Clark, 2009; Dugdale, 2012).

Temperature (axillary): High – greater than 37.5⁰C; Low – less 36.5⁰C (Satar and Seydaoglu, 2005).

The Glasgow comma scale (**GCS**) is a measure of patient's level of consciousness. The normal value is 15, which is the highest scores. Patients with scores ≤ 8 are often very unstable and as such, require intubation.

2.7 GENERAL MANAGEMENT OF DRUG-POISONED PATIENTS

The care of drug- poisoned patients consists of four elements: initial life support, decontamination, in some cases antidotal therapy and enhanced elimination (Spiller *et al.*, 2008).

There is lack of evidence-based data on initial life support and the management of acute drug-poison patients. According to some authors and guidelines, the initial life support consists of airways management and correction of circulatory status. Protecting the airway is essential in order to prevent aspiration and respiratory insufficiency due to lowered consciousness (Rosenberg *et al.*, 2003). There is rarely a specific treatment for drug poisoning but the cause of the poisoning should be assessed during the initial life support. Symptoms of poisoning are unspecific, the medical history of the patients can be unreliable and in some cases, such as in severe paracetamol poisoning, the symptoms are delayed and this makes initial life support challenging (Ryynanen *et al.*, 2010).

Induced emesis, gastric lavage, bowel irrigation and activated charcoal are some of the procedures that are used for decontaminating the used toxic agent.

Several antidotes are used in acute poisonings such as naloxone in opioid poisoning, flumazenil in benzodiazepine poisonings and digoxin-specific antibodies in digitalis poisoning (WHO, 2013). The acute medical history of drug-poisoned patients is unreliable (Ryynanen *et al.*, 2010). Therefore, the use of antidote in cases other than patients with definitive diagnosis of certain poisoning may be harmful and cause complications such as seizures in tricyclic antidepressant poisoning in flumazenil administration (Rosenberg *et al.*, 2003).

Paracetamol is a typical agent used in drug poisonings in most countries (Rossiter, 2012). In overdose, its toxic metabolite n-acetyl-p-benzoquinonimine [NAPQI] production exceeds the elimination, which depends on the amount of glutathione in hepatic cells. N-Acetylcysteine [NAC] replaces glutathione and enhances the detoxification of NAPQI (Rossiter, 2012). The use of NAC in severe paracetamol poisoning has been shown to have benefits (Satar and Seydaoglu, 2005).

2.8 OUTCOME OF POISONING CASES

Factors thought to determine the outcome of poisoning cases include quantity, multiplicity and potency of the agent, concomitant use of alcohol, time interval before seeking medical attention and the presence of medical co-morbidities (Prosser *et al.*, 2007). Patients engaging the use of paraffin for poisoning may come down with severe respiratory complication such as aspiration pneumonitis. Also, those employing the use of large doses of paracetamol or organophosphates often end up with severe organ-system complications; death might even ensue.

Delay in seeking medical attention may lead to greater amount of the agent being absorbed into the system and thereby increasing the tendency for a worse outcome. Also, patients with medical co-morbidity prior to poisoning already have compromised organ-system and such patients have greater tendency for failed resuscitation and an eventual poor outcome.

In the Oman study on drug poisoning, 75.6% of the patients were admitted in the general medical wards, with 7.3% having unspecified complications (Zaidan *et al.*, 2002). In the study done in Paarl hospital on overdose, most of the patients were kept overnight. Forty-three patients (21.9%) were discharged the same day and 44 (22.4%) patients were admitted to the medical ward. Only 13 patients (8.5%) were admitted to the high care unit (Malangu and Ogunbango, 2009). For psycho-social assessments, 61(31%) patients were assessed by the social worker at the emergency department while 53 (27%) patients were given appointment to see the community social worker (Malangu and Ogunbango, 2009).

In view of the above literature most of the studies on acute poisoning have been done in developed countries therefore, more studies have to be done in developing countries to assess the magnitude of acute drug poisoning and its associated mortality. Furthermore, most studies have shown that poisoning trends differ from region from region and country from country hence, the more reason such similar studies need to be undertaken in our settings.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This chapter explains the research methods and approaches that were used to collect and analyze the data obtained for the purpose of this study. Thus, the approaches used to identify and examine acute poisoning cases presenting at the emergency department of the University Teaching Hospital, as well as the method of data collection will be discussed in detail and explored.

3.1 STUDY SITE

The study was conducted at the University Teaching Hospital (U.T.H), in the medical department. The University Teaching Hospital is the largest referral hospital in Zambia; it has a total of 1600 in-patient beds and specialized out-patient clinics. Patients in the department of internal medicine are admitted via adult medical emergency unit (AMEU) into the medical admission ward (MAW) for onward transfer to the main medical wards for definitive care. The rationale for selecting U.T.H as the setting for this study is due to the fact that, it is the biggest hospital in the country, which provides emergency, secondary and tertiary health services for communities.

3.2 DESIGN

The study was a cross-sectional descriptive study. A retrospective survey of acute poisoning cases presenting at U.T.H in 2015 was undertaken. This was conducted by identifying and reviewing all acute poisoning cases that presented at the emergency department of U.T.H during the period 1st January, 2015 to 31th December, 2015 (a period of 12 months).

3.3 STUDY POPULATION

The target and study population comprised of all the cases of acute poisoning that presented at the emergency department of University Teaching Hospital during the period of study (1st January, 2015 to 31th December, 2015).

3.4 SAMPLE SIZE

The sample size consisted of all the cases of acute poisoning that fall within the stipulated 12 months period (1st January, 2015 to 31th December, 2015). A total of **198** cases of poisoning were entered in the admission register at the emergency department, but only 131 were considered for the study as 67 files could not be found or traced by the records department and therefore, presumed misplaced or lost. Therefore the sample size for study was **131**.

3.5 SAMPLING

The study was retrospective by nature, which signifies that all occurrences of poisoning within the period of study was included. To ensure relevance of the study in the recent present, the past 12 months before the commencement of the study was chosen as the specified time period to focus on, this being the period from 1 January 2015 to 31 December 2015. Therefore, the sampling method that was employed by this study was **apopulation sampling method**, which involves the inclusion of all the acute poisoning cases that occurred at the specified period of time.

3.6 INCLUSION CRITERIA

- All acute poisonings that occurred during the specified period.
- Patients more than 14 years from the last birthday

3.7 EXCLUSION CRITERIA

- Patients less than 14 years
- Missing medical files. (These are files that were not available from the medical record keeping department.)

3.8 DATA COLLECTION

Pre- tested documentary data forms were used to record all the relevant information extracted from the medical files of patients, who fell within the specified study period. The patient's medical files were identified using the medical admission log book of 2015. The admission log books is where the patient's details upon admission to the medical emergency department are recorded. The details that are recorded include patient's names, file number, diagnosis and

gender just to mention but a few. Using the patient's file number and name from the medical admission log book, the researcher then retrieved medical file from the medical clerk's office where these medical files are stored. Then using the data collection sheet, relevant information was extracted from these medical files. For the purpose of this study, each patient was assigned a code number and the data collected was kept on a password protected computer in order to ensure confidentiality. These documentary data forms were designed to collect information on the patient's demographic details (gender, age, ethnicity, occupation, marital status) and facts related to the poisoning, such as the date the event occurred why the patient poisoned him/herself, the clinical state of the patient on presentation at the emergency department, the pre-hospital intervention, complications, the outcome of the case and the type of poison used. The few studies done in South Africa and some other parts of Africa have shown paracetamol, antibiotics, non-steroidal anti-inflammatory drugs, anti-hypertension drugs, benzodiazepines and organophosphate containing pesticide to be some of the common agent used for self-poisoning (Eddleston, 2004; Laubscher *et al.*, 2007). The drugs used by these patients for poisoning were determined by history and/or by carrying out toxicology screening on the patients. The data forms are compiled with relevant input from the review of literature and pre-tested on a selected group of patient files to ensure that the questions are balanced, correctly constructed and that crucial information would be obtained.

3.9 DATA ANALYSIS

Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 21. All statistical tests were at 5% significance level. The Pearson's chi-squared test was used for comparison of proportions between groups. The Fisher's exact test was used when one or more of the cells had an expected frequency of five or less. Study variables were checked for evidence of collinearity based on a Spearman coefficient > 0.8 . Selection for logistic regression model was considered at level $P < 0.20$ or known clinical significance. Backward selection method was used to obtain the final logistic regression model for predicting mortality. The backward selection method removes terms one at a time beginning with the largest p-value and continuing until all remaining effects are significant at a specified level or removing more terms results in poorer fit.

3.10 VARIABLES

SPECIFIC OBJECTIVES	VARIABLES	INDICATOR/UNIT OF MEASUREMENT:
1. Demographics of patients presenting at U.T.H with drug poisoning	1. Gender	<ul style="list-style-type: none"> - Male - Female
	2. Age group (years)	<ul style="list-style-type: none"> 12-19 20-29 30-39 40-49 50-59 60-69 ≥-70
	3. Ethnic group	<ul style="list-style-type: none"> Black White Coloured Indian Chinese/Asian Not Captured
	4. Occupation	<ul style="list-style-type: none"> Formal Informal Unemployed Self-employed Not captured
	5. Marital Status	<ul style="list-style-type: none"> Single Married Separated/divorced Not captured Widowed

	6. Residential area	Urban - Low density - Medium density - High density Rural Not Captured
	7. Income level	- < 500 - 600 < 1500 - Not captured
2. To establish the reasons or Circumstances surrounding Poisoning	Circumstances of Poisoning	Deliberate Poisoning - Marital issues - Relationship Issues (unmarried) - Psycho-social - Medical reason - Depression - Unemployment - post traumatic stress disorder - others Accidental Poisoning - Occupational - Drug over dose - Drug abuse overdose
3.To determine the toxic agents taken by patients and identify the most commonly taken agent	Toxic agent involved	Household chemicals Medicines Agro vet chemicals Herbal medicines Plants Drugs of abuse Others
4.To describe the clinical state of patients, presenting to U.T.HEmergency department with drug poisoning	1. Glasgow coma Scale*	15 9-14 ≤ 8 Not captured
	2. Blood pressure*	Normal High Not captured

	3.Pulse*	Normal Low High Not Captured
	4.Respiratory rate*	Normal Low High Not Captured
	5.Temperature*	Normal Low High Not captured
	6.Oxygen Saturation*	Normal Low Not Captured
5. To determine the clinical Outcome of patients presenting to U.T.H emergency department with poisoning	Outcomes	(Survived) <ul style="list-style-type: none"> - Discharged with short term complications - Discharged Permanent Complications - Discharged without Complications (Died) Patient who died
6. Length of hospital stay	Hospital stay	<ul style="list-style-type: none"> - Less than or equal 2 day - More than 2 day
7.Management of poisoned patients	Appropriate initial Management	<ul style="list-style-type: none"> - Management according to literature guide lines (Standard Treatment Guidelines) - Management not according to literature guide lines (STG).

*For the purpose of this study, the Glasgow coma scale (GCS), blood pressure, pulse rate, respiratory rate and temperature were employed as measure of the clinical state of patients presenting to the emergency department. This is because these are the common and consistent

parameters regularly measured at the emergency departments. Normal ranges of these vital signs were defined as follows:

Blood pressure: high (hypertension) – equal to or greater than 140/90mmHg; low (hypotension) – less than 90/60mmHg (Mowry *et al.*, 2013; Burrow *et al.*, 2000).

Pulse: High (tachycardia) – more than 100beats per minutes; low (bradycardia) - less than 60 beats per minute (Kumar and Clark, 2009; Dugdale, 2012).

Respiratory rate: High – more than 20 cycles per minute; Low (bradypnoea) – less than 12 cycles per minute (Kumar and Clark, 2009; Dugdale, 2012).

Temperature (axillary): High – greater than 37.5⁰C; Low – less 36.5⁰C (Satar and Seydaoglu, 2005).

Oxygen saturation: normal between 95 to 100% and low – less than 94 % (Kumar and Clark, 2009; Dugdale, 2012).

The Glasgow comma scale (**GCS**) is a measure of patient's level of consciousness. The normal value is 15, which is the highest scores. Patients with scores ≤ 8 are often very unstable and as such, require intubation(Satar and Seydaoglu, 2005).

3.11 Ethical Considerations

Before the commencement of the study, approval was sought from Excellence in Research Ethics (ERES) and permission was obtained from U.T.H management. The study also obtained permission from the department of internal medicine as well as the graduate forum. Only information approved by the research ethics committee was collected. Patient's therapeutical management was not interfered with as this was a retrospective study. In the context of good clinical practice actual names were not used and strict confidentiality was maintained at all times by using of a unique study identity number on the files and forms and furthermore, questionnaires were kept in lockable cupboard and soft copies were secured with passwords.

CHAPTER 4

4.0 RESULTS

This chapter gives a description of the demographics of study patients that took part in the study, type of toxic agents exposed to, reasons for poisoning, clinical state on presentation at the emergency department and outcome of the poisoned patients.

4.1 INFORMATION ON DEMOGRAPHICS OF STUDY PATIENTS

There were a total 131 study patients that were considered in this study.

4.1.1 Age distribution of study patients.

Table 2. Age distribution of study patients.

Age group (years)	Frequency	Percent	Cumulative Percent
<18	11	8.4	8.4
18-19	15	11.5	19.8
20-29	65	49.6	69.5
30-39	27	20.6	90.1
40-49	9	6.9	96.9
50-59	2	1.5	98.5
70+	2	1.5	100
Total	131	100	

4.1.1 Age group

Sixty five cases (49.6%) of the poisoning cases occurred amongst the age group of 20- 29 years. This was followed in the rank by 27 cases (20.6%) occurring amongst the age group 30-39 years. Therefore in this study, 92 cases (70.2%) of poisoning cases occurred amongst the age group of 20- 39 years. This shows that poisoning commonly occurred amongst the younger population.

4.1.2 Summary of demographic information of study patients

Table 3. Summary of demographic information of study patients

Variable	Frequency	
	Number	Percent
Gender		
Male	64	48.9
Female	67	51.1
Occupation		
Unemployed	62	47.3
Students/scholars	19	14.5
Employed	34	26.0
Not stated	16	12.2
Marital status		
Single	70	53.4
Married	48	36.6
Separated/Divorced	9	6.9
Widowed	2	1.5
Not stated	2	1.5
Area of residence		
Low density	20	15.3
Medium density	21	16.0
High density	77	58.8
Rural	5	3.8
Not stated	8	6.1

4.1.3 Gender

There were slightly more female patients than male patients, 67/131 (51.1%) vs 64/131 (48.9%), however, this difference in proportion was not statistically significant (P-value = 0.79).

4.1.4 Age group

Sixty five cases (49.6%) of the poisoning cases occurred amongst the age group of 20- 29 years. This was followed in the rank by 27 cases (20.6%) occurring amongst the age group 30-39 years. Therefore in this study, 92 cases (70.2%) of poisoning cases occurred amongst the age group of 20- 39 years. This shows that poisoning commonly occurred amongst the younger population.

4.1.5 Ethnic group.

Most of the patients, 125/131 (95.4%), were of black ethnicity while 4/131 (3.8%) were colored and one Indian/Asian was seen in the study.

4.1.6 Occupation

There were 34/131 (26%) of the patients that were employed, 19/131 (14.5%) were students/scholars, 62/131 (47.3%) were unemployed, and occupation information was missing for 16/131 (12.2%) of the patients. This result shows that most patients presenting with poisoning were unemployed. Also about a fifth of the poisoning cases were scholars and students.

4.1.7 Marital status

There were 70/131 (53.4%) of the patients that were single, 48/131 (36.6%) that were married, 9/131 (6.9%) that were separated or divorced, and 2/131 (1.5%) that were widowed.

4.1.8 Residential area

A greater proportion of the patients, 77/131 (58.8%), were from high density residential locations. There were 21/131 (16%) from medium density locations, 20/131 (15.3%) from low density locations, and 5/131 (3.8%) from rural locations. This result shows that the majority (74.8%, N=98) of the poisoning cases occurred in areas associated with low socio-economic status.

Table 4 Association between gender and residence type.

	LOW	MEDIUM	HIGH	RURAL	NOT	TOTAL
	DENSITY	DENSITY	DENSITY	AREAS	CAPTURED	
Gender						
Male	10	10	36	4	3	64
Female	10	11	41	1	5	67
Total	20	21	77	5	8	131

This shows that most of the study patients resided in high density locations as compared to low density locations and females were the mostly affected.

4.2 POISONING- RELATED INFORMATION

4.2.1 Period of poisoning

Table 5 – period of poisoning

Variable	Frequency	Percentage
Period of poisoning		
Month		
January 2015	10	7.6
February, 2015	20	15.3
March, 2015	8	6.1
April 2015	21	16.0
May, 2015	No data	0
June, 2015	15	11.5
July, 2015	10	7.6
August, 2015	16	12.2
September, 2015	8	6.1
October, 2015	No data	0
November, 2015	14	10.7
December, 2015	9	6.9

4.2.1.1 Month

Considering the 12 months of the study period, most (16.0%, N=21) of the poisoning cases occurred in April 2015 while the lowest frequencies were observed in March 2015, September 2015 and December 2015.

4.2.1.2 Day of the week when patients presented to the hospital

Slightly more patients presented on Mondays 27/131 (21%), followed by Sundays 24/131 (19%) and Saturdays 22/131 (17%). Fewest patients were seen on Thursdays, 7/131 (5%).

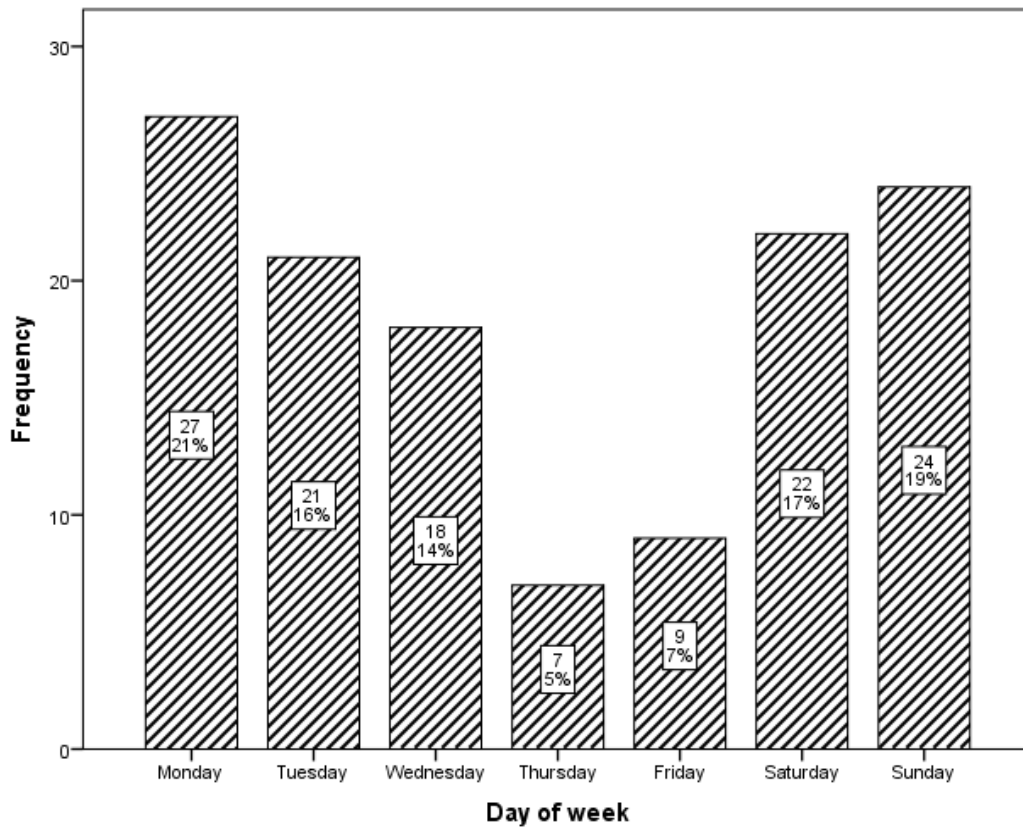


Figure 1. Shows the day of the week when patients presented to the hospital.

4.2.2 TYPE OF POISON/ DRUG EXPOSED TO.

Table 6- Type of toxic agents patients were exposed to.

Toxic agent	Frequency	Percent
Household chemicals	15	11.5
'Others'	11	8.4
Antibiotics	8	6.1
ARVs	4	3.1
Antidepressants	5	3.8
Herbal medicines	1	0.8
Heroin/cocaine	6	4.6
Iron tablets	2	1.5
Organophosphates	50	38.2
Paracetamol tablets	10	7.6
Alcohol	8	6.1
Rat poison	7	5.3
Unknown	4	3.1
Total	131	100.0

Organophosphate poisoning accounted for the majority (38.2% N=50) of the cases. Household chemicals and “other” agents were used for poisoning in 11.5% (N=15) and 8.4% (N=11) of the cases respectively. Paracetamol poisoning accounted for 7.6% (N=10) of all the cases. Antiretrovirals (ARVs) were used by approximately 3.1% (N= 4) of the patients. The household chemicals used for poisoning included paraffin, hair relaxer, furniture polish, after shave, bleach, battery acid, nail polish remover, toilet detergents and liquid dish washer. ‘Other’ agents/drugs used for poisoning included multivitamins tablets, laxatives, oral hypoglycaemic agents, cannabis ear drops, metoclopramide, aspirin, simvastatin, prednisone, carbon monoxide poisoning, isoniazid and sucralfate.

4.2.3 Multiple drug/agent exposed to.

Majority of the patients (73.3%, N=96) used only one drug/agent for poisoning. About 26% of the patients (34/131) were exposed to at least two toxic agents, but only one patient was exposed to more than three toxic agents.

4.2.4 Poisoning associated with alcohol

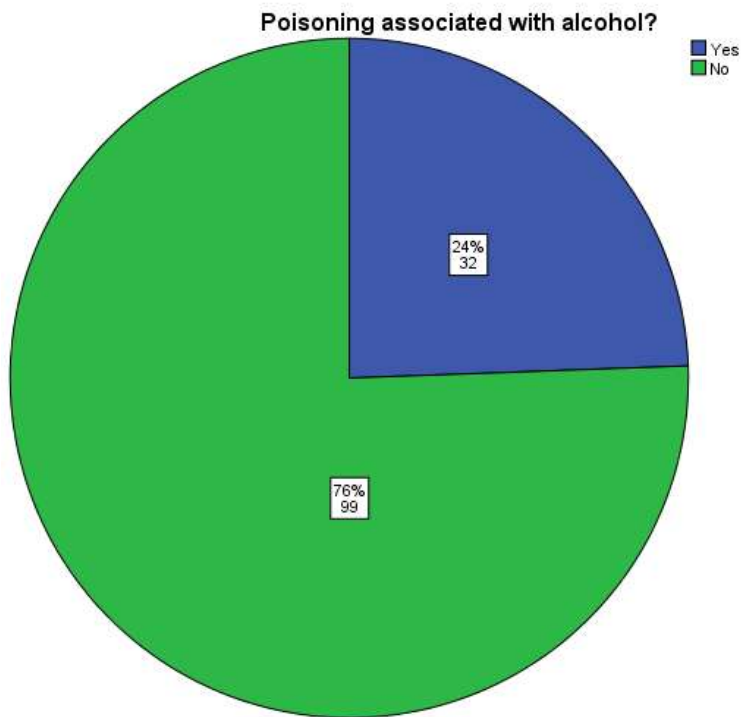


Figure 2 shows poisoning associated with alcohol intake

Only 24% (N=32) of the poisoning cases were associated with alcohol use.

4.2.5 Toxicology screen.

Toxicology screening was done in 49.6 % (N=65) of the cases. The test was either omitted or adjudged unnecessary for the other patients.

4.2.6 Positive agents detected from the toxicology screen.

Cannabis, opiates and paracetamol were some of agents that were detected after toxicology screening was done.

4.2.7 Source of the drugs/ agents used

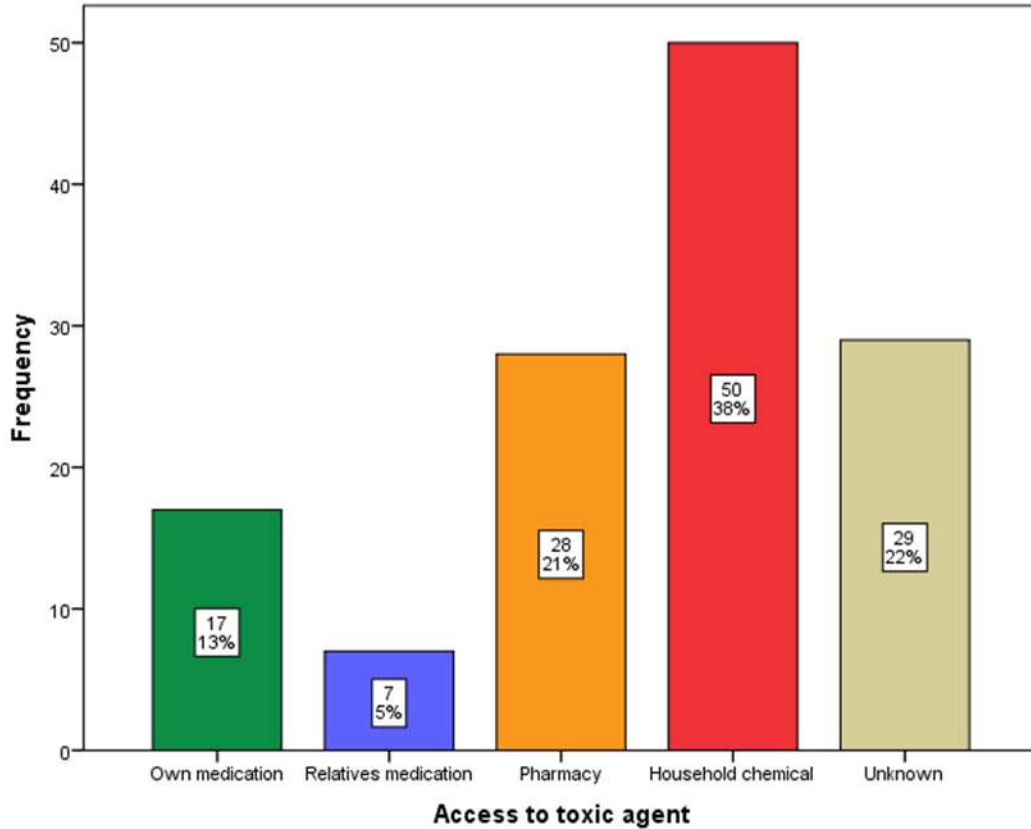


Figure 3-Source of drugs/ agents used.

Most of the drugs/ agents used for poisoning were obtained from household chemicals, 50/131 (37.3%), and the pharmacy 28/131 (20.9%). Self-medication accounted for 17/131 (12.7%) of the poisoning cases while relatives medication accounted for 7/131 (5%) of the poisoning cases. Access to poison was not captured in the records of 29 patients (22%).

4.2.8 REASONS FOR POISONING.

This information was absent from the clinical notes of 20 patients (15.3%). However, out of the 111 patients (84.7%) who had this information captured in their clinical notes, 57 had relationship disharmony (25 unmarried, 32 married). Fourteen patients had family issues which mainly resulted from conflicts with parents and grandparents. The medical reasons found amongst 7 patients were HIV infection, cancer and depression. The psychosocial problem of the 16 patients were not specified. Accidental poisoning accounted for 3.8% (N=5) of these cases and these mainly were overdose from prescription medication.

Table 7. Reasons for poisoning.

Reasons for poisoning	Frequency	Percent
Marital issues	32	24.4
Relationship issues	25	19.1
Psycho-social problems	16	12.2
Medical reasons	7	5.3
Family issues	14	10.7
Depression	6	4.6
Post-traumatic stress	4	3.1
Accidental poisoning	5	3.8
Poisoned by others	2	1.5
Unknown	20	15.3
Total	131	100.0

4.2.9 Time between poisoning and presentation at the emergency department.

Table 8 Time between poisoning and presentation at the emergency department

Time between poisoning and presentation	Frequency	Percent
0-3 hours	74	56.5
4-6 hours	38	29.0
7-9 hours	8	6.1
> 9 hours	2	1.5
Not stated	9	6.9
Total	131	100.0

Slightly more than half of the patients, 74/131 (56.5%), presented within 3 hours of poisoning, and 38/131 (29.0%) presented within 4 to 6 hours while 8/131 (6.1%) and 2/131 (1.5%) presented within 7-9 hours and greater than 9 hours respectively. About 9 patients (6.9%) had no information as regards time of presentation to the emergency department.

4.2.10 CLINICAL STATE ON PRESENTATION AT THE EMERGENCY DEPARTMENT.

Table 9. Clinical state on presentation at the emergency department.

Variable	Frequency	percentage
Patients' Glasgow Coma Scale (GCS)		
15	53	40.5
9-14	24	18.3
<=8	26	19.8
Not stated	28	21.4
Blood pressure		
Normal	72	55.0
Low	35	26.7
High	22	16.8
Not stated	1	0.8
Pulse rate		
Normal	54	41.2
Low	3	2.3
High	63	48.1
Not stated	11	8.4
Respiratory rate		
Normal	47	35.9
Low	1	0.8
High	36	27.5
Not stated	47	35.9
Body temperature		
Normal	73	55.7
Low	44	33.6
High	10	7.6
Not stated	4	3.1
Oxygen saturation		
Normal	87	66.4
Low	24	18.3
High	17	13.0
Not stated	3	2.3

There were 53/131 (39.6%) patients who presented with GCS 15, and 24/131 (17.9%) with GCS 9 – 14. There were 26/131 (19.4%) patients with GCS \leq 8. There were 72/131 (53.7%) patients with normal blood pressure, 35/131 (26.1%) with low blood pressure, and 22/131 (16.4%) with

high blood pressure. There were 54/131 (40.3%) patients with normal pulse rate, 63/131 (47%) with high pulse rate, and 3/131 (2.2%) had low pulse rate. There were 47/131 (35.1%) patients with normal respiratory rate, 36/131 (26.9%) with high respiratory rate, and 1/131 (0.7%) had low respiratory rate. There were 73/131 (54.5%) patients with normal body temperature, 10/131 (7.5%) with high body temperature, and 44/131 (32.8%) patients had low body temperature. A bigger proportion of the patients, 87/131 (64.9%), had normal oxygen saturation, 24/131 (17.9%) had low oxygen saturation, and 17/131 (12.7%) had high oxygen saturation. Vomiting blood, and convulsions were among the other symptoms on clinical presentation with < 3%.

4.2.11Pre- hospital intervention

Table 10-Pre- hospital intervention

Variable	Frequency	
	Number	Percent
Pre-hospital intervention		
Induced emesis	23	17.6
Charcoal (unprocessed)	4	3.1
Not stated	104	79.4

There was no documentation about pre-hospital intervention in most of the cases- 79.4% (N=104). However, 23 patients had emesis induced prior to presentation at the emergency department and 4 patients were given charcoal prior to presentation at the hospital.

4.2.12Medical co-morbidities of study patients

Most of the patients (63.4%, N=83) had no medical co-morbidities. Depression and human immunodeficiency virus infection were the most common medical co-morbidities, with 11.5% (N=15) and 9.9% (N=13) respectively. Other medical co –morbidities found amongst these patients, accounting for 8.4% (N=11) of these patients included arthritis, cancer, peptic ulcer disease, asthma, dental problems and unspecified psychiatric illness

Table 11 -Medical co-morbidities

Variable	Frequency	Percentage
Medical co-morbidity		
Hypertension	3	2.3
Depression	15	11.5
Epilepsy	6	4.6
HIV/AIDS	13	9.9
Others	11	8.4
None	83	63.4

4.2.13OUTCOME OF POISONED PATIENTS

There were 112/131 (85.5%) patients who were discharged without any complications, 7/131 (5.2%) were discharged with short term complications, and 6/131 (4.6%) patients died. The outcome of 6 patients was not stated in their clinical notes. These patients probably absconded from the wards before a decision could be made about them. The short term complications included coughing blood occasionally, constipation and deranged laboratory results.

4.2.14Psychiatric/ psychological referral

Ninety five patients (72.5%) were referred for psychological/psychiatric evaluation while 36 (27.5%) patients were not. The reason for not be referred to the psychiatric department could be because most patients left without formal discharge.

4.2.15Deranged urea and creatinine

Over 60% of the poisoning cases had normal urea and creatinine levels. Abnormalities were found in less than 2.5% of the cases. About 35% of the patients had no renal function test done. This was probably due to omission or test being adjudged unnecessary.

4.2.16 Deranged liver function tests

About 54% of the patients had normal liver function tests. Abnormalities were found in about 7.5% of these cases. About 38% of the cases had no liver function test done. This may also be due to omission or the test being deemed unnecessary by the attending doctor.

4.2.17 Management of poisoned patients.

The large majority of the patients, 121/131 (92.4%), were managed according to literature guidelines (Standard Treatment Guideline of Zambia). There were 6/131 (4.6%) patients who were not managed according to literature guidelines. The main reason why the six patients were not managed according to guideline was unavailability of the desired antidote therefore, the attending medical personal opted for alternative available drugs.

4.2.18 Length of hospital stay

There were 4/131 (3.1%) patients that stayed in the hospital for 1 day, 67/131 (51.1%) stayed for 2 days, 41/131 (31.1%) stayed for 3 days, 8/131 (6.1%) stayed for 4 days, and 4/131 (3.1%) stayed in the hospital for 5 days.

4.3 BIVARIATE ANALYSIS

The following patient variables were associated with mortality; gender ($P = 0.02$), occupation ($P = 0.01$), poisoning associated with alcohol ($P = 0.04$), time between poisoning and presentation at emergency department ($P < 0.01$), state on presentation ($P = 0.01$), blood pressure ($P = 0.02$), oxygen saturation ($P = 0.02$), and hospital stay duration ($P < 0.01$).

Men had about 10 times increased odds for mortality when compared to females [Crude Odds Ratio (OR) = 9.66, 95% Confidence Interval (CI) = 1.17 – 79.72, $P = 0.04$]. Compared to employed patients, unemployed patients had about 18% increased odds for mortality (OR = 1.18, CI = 0.10 – 13.50) but this was not significant, $P = 0.90$. Students and scholars had about 12 times increased odds for mortality (OR = 12.69, CI = 1.35 – 119.33, $P = 0.03$). Patients with poisoning associated with alcohol had 4 times increased odds for mortality when compared to poisoned patients that did not take alcohol (OR = 4.38, CI = 1.10 – 17.48, $P = 0.04$). Patients who presented at the emergency department more than 6 hours after poisoning had about 8 times increases odds for mortality (OR = 8.67, CI = 1.73 – 43.44, $P = 0.01$).

Table 12 Bivariate analysis for association with mortality

Variable	Not died		Died		P-value
	n	%	N	%	
Gender					
Male	53	45.3%	8	88.9%	0.02
Female	64	54.7%	1	11.1%	
Occupation					
Unemployed	56	54.9%	2	25.0%	0.01
Students/scholars	13	12.7%	5	62.5%	
Employed	33	32.4%	1	12.5%	
Poisoning associated with alcohol					
Yes	26	22.2%	5	55.6%	0.04
No	91	77.8%	4	44.4%	

Time between poisoning and presentation					
0-3 hours	73	66.4%	0	0.0%	< 0.01
4-6 hours	31	28.2%	6	66.7%	
7-9 hours	5	4.5%	2	22.2%	
> 9 hours	1	0.9%	1	11.1%	
State on presentation at the ED (GCS)					
15	51	55.4%	1	11.1%	0.01
9-14	21	22.8%	2	22.2%	
<=8	20	21.7%	6	66.7%	
Blood pressure					
Normal	67	57.8%	2	22.2%	0.02
Low	28	24.1%	6	66.7%	
High	21	18.1%	1	11.1%	
Oxygen saturation					
Normal	81	70.4%	4	44.4%	0.02
Low	18	15.7%	5	55.6%	
High	16	13.9%	0	0.0%	

4.4 MULTIPLE LOGISTIC REGRESSION ANALYSIS

Compared to patients with high blood pressure, patients with normal blood pressure had on average 80% reduced odds for mortality but this was not statistically significant [Adjusted Odds Ratio (AOR) = 0.20, 95% Confidence Interval (CI) = 0.20 – 1.71, P-value = 0.14]. Patients with low blood pressure had similar odds for mortality compared to patients with high blood pressure (AOR = 1.00, CI = 0.29 – 3.45, P-value = 0.99).

CHAPTER FIVE

DISCUSSION

5.1. Demographics of poisoning cases presenting at the emergency department of the University Teaching Hospital.

In this study, it was found that females accounted for more cases of poisoning than males. The evidence is that out of 131 study patients, 67 (51.1%) were females while males accounted for 64 (48.9%). The higher incidence of poisoning amongst females as shown in this study is similar to previous studies done by Waddy, (2007) and Calitz *et al.*, (2008) who found 52% and 53% respectively. The female gender may therefore be more prone to poisoning. However, men on the other hand generally tend to attempt suicide by employing much more dangerous and violent methods such as hanging and gunshot. More often than not, they succeed in killing themselves. This may be the reason why they are less represented in the statistics of poisoning presenting at the emergency department (Calitz *et al.*, 2008). This study also showed that men had about 10 times increased odds for mortality than females [Crude Odds Ratio (OR) = 9.66, 95% Confidence Interval (CI) = 1.17 – 79.72, P = 0.04]. This is similar to a study done in Kenya where the mortality of men was as high as 76.2% compared to that of females that was 23.8 % (Nyamu *et al.*, 2012).

The study also provides evidence that the age group of 20 – 29 years accounted for the most cases of poisoning. The evidence is that out of the 131 study patients, 65 (49.6%) were from this stated age group and this was followed by the age – group 30 – 39 years which accounted for 27 (20.6%). The probable reason could be that these age groups are involved in different love relationships which perhaps don't work out. However, the findings of this study are slightly different from those of Prosser and colleagues (2007) in American who found that the age group 15- 19 years accounted for the most cases of poisoning. Similar results were found in the UK, by Prescott *et al.*, (2009) where the ages with majority of the poisoning cases were found to be less than 30 years. In the studies carried out in Oman and India; (Zaiden *et al.*, 2002; Bajracharya *et al.*, 2008) poisoning occurred in the age – group of 20 – 30 years. Also, a study done by Laubscher, (2007) in Paarl Western Cape found the median age to be 27.3 years which reflect similarities to this study.

This study shows that poisoning is most common amongst blacks. The evidence is that out of 131 study patients 125 (95.4%) were blacks, 4 (3.1%) were colored and only one was Indian. It is uncertain why only one Indian was seen in this study. This may be as a result of the lost data or due to the preference of some patients to certain private hospitals; a study on the profile of poisoning in these private hospitals might be beneficial in explaining this finding. Studies (Zaiden *et al.*, 2002; Bajracharya *et al.*, 2008) done in some Asian countries have shown poisoning to be of concern. Also, comparative studies done by Merillet *et al.*, (2011) and Bhurga and colleagues (2001) in the UK on poisoning and attempted suicide amongst races (Asian, white and black females) showed that poisoning was common amongst female Asian and least common amongst black females. These, therefore shows that poisoning is also a problem among the Asian population. The fact that only one is represented in this study might only be due to uncertain reasons. The four colored seen in the study mainly were due to opioid overdose. The differences in the poisons taken by different racial groups may mainly be due to availability and affordability of the poisons.

The study findings shows that poisoning cases were common amongst the unemployed. This is evident from the fact that out of 131 study patients, 62 (47.3%) were unemployed (excluding scholars and students). The probable reason could be lack of income and stress to cope with life's demands in this group of people. The findings of this study are similar to those by Stark *et al.*, (2010) and Laubscher, (2007) who found unemployment rates of 45% and 53.7% respectively in patients presenting with poisoning. There is therefore a strong possibility of unemployment being an important predisposing factor to suicidal behaviors. Compared to employed patients, unemployed patients in this study had about 18% increased odds for mortality (OR=1.18, CL=0.10-13.50) but this was not statistically significant ($p= 0.09$).

Scholars and students contributed about 14% of the poisoning cases. This may be due to certain problems peculiar to this group of people such as: relationship disharmony, unwanted pregnancies, academic stress etc. A similar result was found in a study done in Oman where a higher incidence of poisoning was found amongst the unemployed and students (Bajracharya *et al.*, 2008). Also, in a previous South African study done by Calitz *et al.*, (2008) students were found to contribute about 30% of patients with suicidal behaviors.

In this study, it was found that single (unmarried) study patients accounted for most of the poisoning cases. The evidence is that out of 131 study patients, 70 (53.4%) were single. This might be a reflection of cultural marital practices amongst Zambians represented in this study. In contrast to this study, unmarried poisoning cases were 45.6% in an Australian study done by Carter *et al.*, (2006) and 53.1 % in an Oman study(Zaiden *et al.*, 2002).

This study shows that the majority of the poisoning cases occurred in areas associated with low socio – economic status (informal settlements and locations). The evidence is that out of 131 study patients, 77(58.8%) were from high density locations. Lack of basic life needs might be the probable reasons why poisoning is high in this group of people. An assessment of poverty, unemployment and inequality in Zambia in 2005 showed poverty and unemployment to be very high (Nyasulo *et al.*, 2015).A similar result was found in a Western Cape by a study done by Laubscher, (2007) where the highest number of overdose cases per square kilometers occurred in an informal settlement with high density of people and very poor socio – economic circumstances.

In all, this study shows that the majority of poisoning cases occurred amongst the unemployed in the age – group 20-29 years, living in areas with poor socio – economic status. It can also be deduced that the majority of these poisoning cases were black females who were single and unemployed, residing in areas with poor socio – economic status.

A Zimbabwean study on the profile of parasuicide cases showed that women might be more sensitive to certain life stressors (Munasheet *et al.*, 2004).The age – group of 20 – 29 years falls within the working and reproductive age. This Age – group is associated with pregnancy, child – bearing and up – bringing, single parenting, employment seeking, and vulnerability to assault, abuse and rape. These stressors may predispose the affected women to depression and in the absence of adequate support services e.g. by community social workers, counselors or psychologists, suicidal ideation may set in.

5.2 Reasons for Poisoning

The information regarding the reasons for poisoning was captured in the case records of only 111 (84.7%) study patients. The various reasons identified as the reason for poisoning amongst these 111 patients were: marital problems, relationship disharmony, psycho – social problems

(unspecified), health concerns, family issues, depression and unemployment (see table 7). The highest amongst the above mentioned reasons was relationship disharmony. The evidence is that out of 131 study patients, 57 (43.5%) had relationship problems.

In a discussion with chilimba hamavhwa (clinical Psychiatrist), a lecturer at chainama college department of psychiatry, on the 3rd of May, 2016, the identified reasons for poisoning, as listed in the paragraph above, are the most common psychosocial economic stressors implicated in many patients with suicidal behaviors in Lusaka. The group of patients having unspecified psycho – social reasons captured in their case records as the reason for poisoning is therefore assumed to composed of the same reasons listed in the paragraph above.

Most of the marital and relationship problems were as a result of misunderstanding, infidelity unwanted pregnancies, sexual dissatisfaction, financial constraints, relationship breakdown/divorce/separation and the associated court verdict on the custody of the children arising from these relationships.

Inability to cope with the reality of some chronic and terminal medical conditions such as hypertension, diabetes mellitus, HIV infection and cancers is often the cause of suicidal ideation in these patients. Also the burden accompanying these medical conditions e.g. pain, side effects of their treatment is over whelming and unbearable to some patients.

Family issues as reasons for poisoning were as a result of conflict/quarrel with relatives (parents, grandparents etc.) mostly arising from disapproval of their boy/girlfriends and unspecified family conflicts. Post-traumatic stress disorder as reasons for poisoning in four patients in this study was a result of rape and loss of a close relative.

Accidental poisoning was found in 3.8% (N=5) of the patients with poisoning and this was mainly due to overdose of prescription medicines.

In all, these findings are similar to the results of the previous studies done in Australia (Clover *et al.*, 2004), Oman (Zaiden *et al.*, 2002) and Bloemfontein (Calitzet *al.*, 2004) where similar reasons were associated with patients' suicidal behaviors.

5.3 Timing of Poisoning cases and drugs/agents used

Considering the 12 month study period, majority (16.0%, N=21) of the poisoning cases occurred in April 2015 while the lowest frequencies were observed in September, 2015. No particular reason was identified for these discrepancies but could be due to availability of the poisoning cases from the records department. For instance, no poisoning cases were found for the months of May 2015, and October 2015. Most of the poisoning cases occurred during the weekend (Saturday and Sunday). The evidence is that out of 131 cases of poisoning, 46 (36%) occurred during the weekend. Inactivity and idleness associated with the weekends might have given room for deeper deliberation of these patients on their life stressors; the ensuing depressed state of mind may subsequently prompt suicidal attempt. This is somewhat similar to a study done in the Western Cape where Sundays and Mondays had the highest incidence of overdoses (Laubscher, 2007) also this study shows that poisoning occurred more during the first four months of the year. People generally tend to over – spend during the end of the year holiday and festive period such that thereafter, they find it difficult to cater for their usual monthly expenses during the first couple of months of the following year. Also, this period marks the beginning of a new academic session for scholars and students who might also be returning from home. Lack of coping strategies for their new academic hurdles, coupled with possible financial and psycho – social stressors from home may trigger self – poisoning ideation for attention seeking.

Study done by Calitz and colleagues (2008) in Bloemfontein on attempt suicide showed that the increased rate noted in November 2005 might be due to exams, work or other year – end stressors. It was also noted that in 2006 (the same study), most attempted – suicide patients were admitted in the first quarter of the year and the reason for high rate of attempted suicide presentation at this period of the year has been associated with increased levels of stress after the holiday and festive season, less support from the family, loneliness and adaption challenges of New Year.

This study shows that organophosphates pesticides were the most used poisoning agents. The evidence is that out of 131 study patients, 50 (38.2%) used organophosphate pesticides for poisoning. Poisoning with pesticides chemicals, either accidental or suicidal, has become common due to easy availability and low cost of these pesticides. Organophosphate insecticides (doom, zoom and boam) were the most implicated pesticides in this study. The finding of this

study are similar to a study done in Kenya where 43% of the cases were due pesticides (Nyamu *et al.*, 2012). Similarly, reports available from some of the Asian countries (Pakistan and India) and some African countries (Uganda and Botswana) describes organophosphates crop spray and drugs as the commonly used agents in many poisoning cases (Kupar *et al.*, 2002). Lang *et al.*, (2012) have also revealed that organophosphates are the most commonly used suicidal poisons irrespective of age, sex, and occupation in most victims in India.

Poisoning due to therapeutic drugs, paracetamol, one of the most common over the counter medication, was the drug with the highest frequency of use (7.6%) for poisoning in this study. This may be due to the fact that paracetamol is readily available and is used in most homes for the treatment of minor pains/aches and fever. A study done in UK by Townsend *et al.*, (2001) on poisoning showed that paracetamol and paracetamol – containing compounds were implicated in about 50% of the cases, while 41% of poisoning cases made use of paracetamol and non – steroidal anti – inflammatory agents in an Oman study (Zaiden *et al.*, 2002).

The use antidepressants for poisoning (3.8%) may imply that depression is common amongst poisoning cases. This can substantiate by the fact that most patients overdosed on their medication and relatives' medication (see figure 3). Also, when compared, the percentage of patients having depression as co- morbidity (table 9) it can deduced that most of these depressed patients took their own medication for poisoning. A high rate (20%) of the use of antidepressant for poisoning in UK has been correlated with increase in the rate of its prescription (Townsend *et al.*, 2001). In addition household chemicals were used by a great percentage (11.5%) of the patients with poisoning. Majority of these household agents/chemicals are readily available with little or no restrictions to their purchase. This however, differs a lot from findings in a similar study done in UK where non – ingestible poisons such as bleach and disinfectants were used for poisoning in only about 1% of patients (Townsend *et al.*, 2001).

About 3.1% of the patients used antiretrovirals (ARVs). Approximately 1.5 million Zambians are on ARVs for the treatment of HIV infection and 2,205 centres are capable of administering ARVs (Nyasulo *et al.*, 2015). The widespread availability of these drugs coupled with a high tendency for depression amongst these patients, might explain the reason for its use for poisoning.

Twenty six percent of the patients used more than one drug/agent for poisoning. The probable reason could be that they wanted to achieve greater toxic effects by using more than one agent. This is similar to a South African study done by Jones and Volan, (2010) where 25.7% of patients overdosed on more than one drug. On the contrary, the finding of this study are different from those of Singh and Unnikrishnan (2006) in UK who found that 63% of poisoning cases made use of substances from a combination of different classes.

Twenty four percent of the poisoning cases were associated with alcohol use whereas, alcohol use in conjunction with self – poisoning was reported in 29% of poisoning cases in a British study (Owen and Jones, 2011). Alcohol use has been associated with impairment of cognitive processes, increases impulsivity and aggression, this might explain the reason why it is associated with poisoning. Association between mortality and poisoning associated with alcohol was found to be statistically significant ($p= 0.04$). It therefore, can be deduced that alcohol intake increases the odd of mortality in poisoning.

In essence, drugs/agents used for poisoning are relatively available and little can be done to curtail their accessibility. Therefore, prevention through psycho – social support still is the way out.

5.4 Clinical Presentation at the emergency department and Outcome of study patients.

Most of the patients had normal vital signs and were fully conscious and coherent when assessed at the emergency department (see table 9). It is therefore possible that some of cases involved individuals who were seeking attention from close family members and/or loved ones. However some of these patients did not have their vital signs adequately recorded in the clinical notes. Most of the patients presented within six hours to the emergency department from the time of poisoning. The evidence is that out of 131 study patients, 102 (85.5%) presented within 6 hours from the time of poisoning. However, patients who presented at the emergency department more than 6 hours after poisoning had about 8 times increased odds for mortality as compared to those who presented within six hours. (OR=8.67, CL=1.73-43.44, P=0.01).

The GCS observed in some of the poisoning cases might be as a result of their delayed arrival at the emergency department. Delay in response by emergency medical services personnel, possibly as a result of their huge work load may also be responsible for the late presentation to

the emergency department. The choice of drug/agent employed for poisoning might also have significantly determined the GCS at the emergency department; central nervous system drugs such as antiepileptics and antidepressants may be responsible for the depressed levels of consciousness amongst patients who overdosed on these drugs. Also, patients with underlying medical co- morbidities may already have a compromised organ- system; and a tendency to deteriorate faster is therefore possible in them.

The association between patients' GCS and clinical outcome, was statistically significant the p value was 0.01. Patients with GCS of 15 had better outcome, as most of them got discharged without complications. On the other hand, all the patients with GCS ≤ 8 had a high chance of mortality as compared to the one with normal GCS. Also considering association between patients' oxygen saturation and clinical outcome, patients with normal saturation got discharged without complications while majority of those with low oxygen saturation had an increased chance of mortality [p value 0.02]. More attention should therefore be given to ensuring optimal oxygen saturation for poisoned patients by the emergency medical personnel right from the scene of incidence.

In all, majority (85.5%) of the patients were discharged without complications. This may be due to the fact that most of them (91.6%) presented timorously (within 9 hours) at the emergency department. Also, most (90.1%) of the patients were less than 40 years old; only two were beyond 59 years. Majority (63.4%) were also without medical co – morbidities. These factors (young age and absent medical co – morbidity) are in favor of functional, non – deteriorating organ – system and good response to resuscitation, thereby increasing the chance for favorable outcome. In addition, this may further corroborate the fact that these patients engaged in poisoning in order to seek attention from close relatives and/or loved ones; they probably did not intend to commit suicide.

Most of the patients who did not combine alcohol with drug(s)/agent(s) for poisoning but patients with poisoning associated with alcohol had 4 times increased odds for mortality (OR = 4.38, CI = 1.10 – 17.48, P = 0.04) as compared to patients that did not take any alcohol. It is therefore certain that association of poisoning with alcohol use is associated with worse outcome.

Abnormal renal and liver function tests were only found in few patients. These might be underlying abnormalities amongst those (36.7%) with medical co –morbidity, since majority (85%) of these patients arrived at the emergency within 6 hours of the incidence and the blood tests were done soon after their arrival; it is unlikely that these abnormalities were directly related to the poisoning.

All of the admissions were into the medical wards. This is in keeping with a study (Jones and Volan, 2010) done in the United Kingdom where about 20% of the workload of the medical department is due to self – poisoning. There is therefore, a great need for better fortification and equipping of the internal medicine department in order to optimally meet this demand.

The mortality rate in the study was 4.6% (N=6), one female and five males. A 32 year old female with HIV infection, took half a bottle potassium permanganate. Even though she arrived at the emergency department within three hours, she died nine hours following presentation. This suggests that medical co – morbidity and pharmacological characteristics of drugs/agents used might be important determinants of the clinical outcome of poisoning. Two out of the five males were suspected to be poisoned by friends while drinking alcohol and the other three took organophosphate insecticides (boam and doom). Amongst the three that took organophosphate insecticides two were suspected to have taken alcohol prior to poisoning.

Majority of the patients were referred to the psychiatric department for evaluation. The evidence is that out of the 131 study patients, 95 (77.6%) were referred to the psychiatric department. This was most likely due to the existing hospital policy regarding poisoning cases at the university teaching hospital. Most cases get referred, first to the psychologist. Following the psychologists' assessment some cases are referred to the psychiatrist for further assessment and management.

5.5. Limitation of the study

The study focused only on one hospital in Zambia. Therefore, the results of the study may not be generalized to all the hospitals in the country. However, the University Teaching Hospital being the highest referral hospital in the country, it is hoped that the information obtained from the study would be applicable to most of the others hospitals.

Some medical files of patients were misplaced or lost from the records' department therefore, were not included in the study. For example, no data was available for the months of May, 2015 and October, 2015. This might have significantly influenced the results in this study. Furthermore, incomplete patient' history (particularly the reason for poisoning) taking by the attending medical personnel have rendered some poisoning case files unsuitable for the study. The fact that only records were analyzed as opposed to direct contact with the patients is also a limitation.

The presence of some private specialist hospitals might have attracted some of the poisoning cases, most especially the patients with medical insurance. This particular preference of some patients to go to these "other hospitals" might be the reason for few – representation of other ethnic groups in this study.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In conclusion, this study has shown that poisoning mostly occurred amongst females. It also showed a higher incidence amongst the age group 20 – 29 years. Majority of them resided in areas with poor socio economic status and are faced with relationship, marital, employment and other psycho – social- economic problems. These are the usual stressors that trigger suicidal ideation in them.

The main reasons for poisoning that were found in this study included the following; relationship disharmony, medical reasons, family issues, psycho –social problems, post-traumatic stress and depression.

The most common agents used for poisoning were organophosphate pesticides, which are readily available and are considerable very affordable. The most common therapeutic drug used for poisoning was paracetamol, which is an over the counter medication. Other drugs used for poisoning were prescribed medications e.g. antidepressants and ARVs. Also, household chemicals were employed for poisoning and these included: paraffin, hair relaxer, furniture polish, after shave, bleach, battery acid, nail polish remover, toilet detergents and liquid dish washer.

Majority of the patients had normal vital signs and were fully conscious and coherent when assessed at the emergency department. The mortality rate incidence was observed at 4.7% (N=6) as majority of the patients were discharged without any complications.

6.2 Recommendations

1. Suicide among young adult is a public health problem and pesticides are the main agents used. Consequently, strict rules should be instituted by the Zambia government regarding the sale of pesticides, which are easily accessible and affordable.

2. It will be beneficial and more informative if this study can be repeated in the private hospitals in Zambia. This may help to get more accurate racial representation of poisoning.
3. Prevention of poisoning may be achieved through psycho – social support by community counselors, social workers and psychologists to the age – group mostly affected. Venues/locations to find such people include schools, hospitals, various places of work and homes, and most especially those situated in areas with poor socio – economic status.
4. Doctors and other health professionals should pay more attention to the psycho – social part of history taking, as vulnerable patients can be identified easily and referred appropriately for psychological assistance on time.
5. Caution should be taken by pharmacists and doctors when prescribing medication, most especially those that have been shown to be commonly used for poisoning.
6. Proper training of paramedics, emergency department doctors and other relevant health professionals in the management of poisoning is of utmost importance. Adequate supply of antidotes and other equipments required for the management of poisoning, to the emergency department and other relevant departments, most especially internal medicine, should be scaled up by the ministry of health.
7. Finally, a lot of important information was not captured in the patient’s case notes, as seen in this study; it is therefore suggested that a poisoning document, containing the necessary information be drawn up and printed out for use in the emergency department when assessing these patients.

REFERENCES

- Aghanwa, H.S. (2001), 'Attempted suicide by drug overdose and by poison-ingestion method seen at the main general hospital in the Fiji islands: a comparative study', *General Hospital Psychiatry*; **23**(5): 266-71.
- Bajracharya, M.R., Manandhar, K, Deo K.K., Pahari, S.K. (2008), 'Age and gender distribution in deliberate self-poisoning cases', *Post Graduate Medical Journal of Nepal*, **8**(1);78-53.
- Birnbaum, H.G., White, A.G., Schiller M., Waldman, T., Cleveland, J.M., and Roland, C.L. (2011), 'Societal costs of prescription opioid abuse, dependence, and misuse in the United States', *Pain Medicine*; **12**: 657-667.
- Bhugra, D., Desai, M., Baldwin D.S. (2001), 'Attempted suicide in west London, rates across ethnic communities'. *Psychological medicine*; **29**(5): 1125-30.
- Bongar, B. (2002), 'The suicidal patient: clinical and legal standards of care Washington DC' American Psychological Association; **21**(6): 34-76.
- Bohnert, A.S., Fudalej, S., & Iigen, M.A. (2006), 'Increasing poisoning mortality rates in the United States', *Public Health Rep* **125**(4): 542-547.
- Burrows, S., Bowman, B., Matzopoulos R., Van Niekerk, A. (2000), 'A profile of fatal injuries in South Africa; second annual report of the national injury mortality surveillance system. Tygerberg: MRC-UNISA crime, violence and injury lead programme.
- Calitz, F.J.W., Philane, L., Joubert, G. (2008), 'The Profile Analysis of Attempted-Suicide Patients Referred to Pelonomi Hospital for Psychological Evaluation and Treatment', *South African Journal of Psychiatry*. **14**(1): 5-14.
- Carter, G.L., Safranko, I., Lewin, T.J., Whyte, I.M, Bryant, J.L. (2006), 'Psychiatric hospitalization after deliberate self-poisoning', *The American Association of Suicidology Apr*; **36**(2): 213-22.
- Cater G., Reith D.M., Whyte I.M., & McPherson M. (2005). 'Repeated self- poisoning: increasing severity of self-harm as a predictor of subsequent suicide', *British Journal of Psychiatry* **186**: 253-257.

Centers for Disease Control and Prevention. National Vital Statistics System mortality data. (2015) Available from URL: <http://www.cdc.gov/nchs/deaths.htm>.

Clark, M., Frank, G., Doris, T.M. (2011), 'Acute poisoning cases in selected hospital in southern Africa'. *Journal of Traumatic Stress*; **43**(1): 45- 43.

Clover, K., Carter, G.L., Whyte, I.M., (2004), 'Post-traumatic stress disorder among deliberate self-poisoning patients', *Journal of Traumatic Stress*; **17**(6): 509-17.

Doak, M.W., Nixon, A.C., Lupton, D.J., Waring, W.S. (2009), 'Self-poisoning in older adults: patterns of drug ingestion and clinical outcomes;' **38**:407-411.

Eddleston, M. (2006), 'Patterns and problems of deliberate self-poisoning in the developing world', *QJM*; **93**(11): 715-731

Eddleston, M., Philips, M.R. (2004), 'Self-Poisoning with Pesticides', *British Medical Journal Jan 3*; **328**: 42 – 4.

Ellenhorn, M.J., Barceloux, D.G. (2005), 'Medical Toxicology, Prevention, Diagnosis and Treatment', New York. Elsevier; 2005: 4 – 5.

Fathelrahman, A.L., Fatah, A.B., Rahman, A.B., Zain, Z.M. (2008), 'Self-Poisoning by Drugs and Chemicals: Variations in Demographics, Associated Factors and Final Outcomes', *General Hospital Psychiatry*; **30**: 467-70.

Favara, D.M. (2013), 'The burden of deliberate self-harm on the critical care unit of a peri-urban referral hospital in the Eastern Cape: a five year review of 419 patients', *SAfrMedJ*; **103**(1):40-43.

Fox, G., Hawton, N. (2004), 'Deliberate Self-Harm in Adolescence', *British Medical Journal Jan 5*; **328**: 46.

Gossel, T.A., Bricker J.D., (2006), 'Toxicology in Perspective', *Principles of Clinical Toxicology*, 3rdEd. New York, Raven: 1 – 39.

Gunnell, D., Eddleston, M., Phillips, M.R., Konradsen, F. (2007), 'The global distribution of fatal pesticide self-poisoning: systematic review', *BioMed Central Public Health*; **6**(7): 357-71.

- Haddad, L.M., Shannon, M.W., Winchester, J.F. (2011), 'Clinical Management of Poisoning and Drug Overdose', 3rd Ed. Philadelphia: Saunders.
- Hawton, K. (2007), 'Psychiatric assessment and management of deliberate self-poisoning patients', *Medicine psychiatric journal*; **35**(10): 565-69.
- Henderson, A., Wright, M & Pond, S.M. (2005), 'Experience with 732 acute overdose patients admitted to an intensive care unit over six years', *Med J Aust* **158**(1): 28-30.
- Henry, M. (2005), 'Assessment of acute poisoning in selective hospitals'. *Medical journal on poisoning*; **32**(3):32-60
- Hurlbut, K., Kuling, K. (2006), 'General approach to poisonings', *Emergency Medicine Secrets*. 4th Ed. Philadelphia: Elsevier/ Mosby.
- Jesslin, M.,Pahari, S.K.,Birubbaum, G. (2010), 'Mortality due to various poisoning agent in South Indian'. *Indian medical journal for pharmacology*; **3**(2): 754- 87.
- Johansson, F., Annerud, C., Jenson, O.N., Lassen, A. (2012). 'Patients arriving by ambulance to the emergency department: vital signs and 30 day mortality', *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*; **20**(2): 37-43.
- Jones,A.I., Volan, G. (2009), 'Management of Self-Poisoning', *British Medical Journal*: **27**: 319: 1414-17.
- Kapur, N., Cooper, J., Hiroeh, Y., May, C., Appleby, L., House, A. (2005), 'Emergency Department Management and Outcome for Self-Poisoning', a Cohort Study. *General House Psychiatry*; **26**(1): 36-41.
- Kapur, N., House, A., Creed, F., Feldman, E., Friedman, T., Guthrie, E. (2008) 'Management of Deliberate Self Poisoning in Adults in Four Teaching Hospitals', Descriptive Study. *British Medical Journal*; **316**(316) 831-32.
- Klasseb, C.D., Doyll, J. (2004), *Evaluation of Safety: Toxicology, the Basic Science of Poisons*, 2ndEd. New York, McMillan, 2004: 11 – 27.
- Kumar P, Clark M. (2007) *Clinical medicine*. 7th Ed. Philadelphia: Saunders Elsevier.

- Lang, B., Shankar, R.P., Partha, P. (2012), 'Mortality due to organophosphate poisoning in southern India'. *Indian J Pharmacol ISSN*; 1631-2976.
- Laubscher, C., Van, M., Rooyen, E.E.M. (2007), 'The Profile of the Overdose Patient Presenting at Paarl Hospital Emergency Department', *South African Family Practice*; **49**(2): 16-23
- Maitai, C.K., Kibwage, I.O., Guantai, A.N., Ombega, J.N., and Ndemo F. (2004), 'Profile of acute poisoning in selected hospitals in Kenya', *AFr J, Pharm Sci*7(8); 7-11.
- Malangu, N. (2008), 'Acute poisoning at two hospitals in Kampala-Uganda', *Journal of Forensic and Legal Medicine*; **15**(8): 489-92
- Malangu, N., Ogunbango, G.A. (2009), 'A Profile of Acute Poisoning at Selected Hospitals in South Africa', *Southern African Journal of Epidemiology and Infection*; **24**(2): 14-16
- Manini, A.F., Nelson, L.S., Olsen, D., Vlahov, D., Hoffman, R.S. (2011), 'Medical Examiner and Medical Toxicologist Agreement on Cause of Death', *Forensic Science International*; **43**(32):45-65.
- Maris, R.W., Berman, A.L., Silverman, M.M. (2000), *Comprehensive textbook of Suicidology*. 4th Ed New York: Guilford.
- McDaniel, J.S., Purcell, D., Augelli, A.R., (2001), 'The relationship between sexual orientation and risk for suicide: research findings and future directions for research and prevention'. *Suicide and Life-threatening Behavior*; 31: 84- 106.
- Meredith. T.J. (2013), 'Epidemiology of Poisoning', *PharmacolTher*; 29(34); 251-256.
- Merill, J., Owens, J., Baldwin, D.S. (2011), 'Ethnic differences in self- poisoning: A comparison of Asians and White groups'. *British journal of psychiatry*; 148: 708-12.
- Mordel, A., Winkler, E., Almog, S., Tirosh, M., Ezra, D. (2012), 'Seizures after flumazenil administration in a case of combined benzodiazepine and tricyclic antidepressant overdose', *Critical Care Med*20(12): 1733-1734.
- Mowry, J.B., Spyker, D.A., Cantilena, L.R., Bailey, J.E., Ford, M. (2013), 'Annual report of the American Association of Poison Control Centers,' National Poison Data System (NPDS): 30th annual report; 51:949-1229.

Mycyk, M.B. (2012), Poisoning and Drug Overdose. In: Longo DL, Kasper DL, Jameson JL, Fauci AS, Hauler SL, Loscalzo J, editors. Harrison's Principles of Internal Medicine 18thEd. New York: McGraw-Hill.

Niskanen, M., Reinikainen, M., Pettila, V. (2009), 'Case- mix-adjusted length of stay and mortality in 23 Finnish ICUs' *Intensive Care Med* **35**(6): 1060-1067.

Novack, V., Jotkowitz, A.B., Delgado, J., Shleyfer, E., Barski, L., Porath, A. (2005), 'Deliberate self-poisoning with acetaminophen: a comparison with other medications', *European Journal of Internal Medicine*; **16**(1): 585-89.

Nyamu, M., Duyando, T., Watson. T.M. (2012), 'A profile of acute poisoning cases in southern Kenya: a comparison study'. *Kenyan pharmacology journal*; **3**(4): 23 6-67.

Nyasulo S. (2015), Management of organophosphate poisoned patients at the University Teaching Hospital'. Bpharm thesis, the University of Zambia.

Owens, D.W., Jones, S.J. (2005), 'The accident and emergency department management of deliberate self-poisoning', *The British Journal of Psychiatry*; **152**: 830-3

Pauw, K., Van Schoor, M., Chant, L., Valente, C. (2005), 'A profile of the Free State province: demographics, poverty, inequality and unemployment', *Provide Project Background Paper*; **12**(6); 67-87.

Preda, F. (2001), 'Anti-depressants-Associated Mania and Psychosis Resulting in Psychiatric Admission', *Journal of Clinical Psychiatry*, **62** (1): 30 – 3.

Prescott, K., Stratton, R., Freyer, A., Hall, I., Le Jeyne, I. (2009), 'Detailed analyses of self-poisoning episodes presenting to a large regional teaching hospital in the UK'. *British Journal of Clinical Pharmacology*; 68(2).

Prosser, J.M., Perrone, J., Pines, J.M., (2007), 'The epidemiology of intentional non-fatal self-harms poisoning in the United States'. *Journal of Medical Toxicology*; **3**(1): 20-4.

- Repetto, M.R., (2004), 'Epidemiology of Poisoning due to Pharmaceutical Products', Poison Control Centre, Seville Spain. *European Journal of Epidemiology*, 13: 353-6.
- Rosenberg, P.J., Livingstone, D.J., Mclellen, B.A. (2003), 'Effect of whole-bowel irrigation on the antidotal efficacy of oral activated charcoal'. *Ann Emerg Med* **17** (7): 681-683.
- Rossiter, D., ed. (2012), South African Medicines Formulary. 10th Ed. Cape Town: Health and Medical Publishing Group.
- Ryynanen, O.P., Iiro, T., Reitala, J., Palve, H., & Malmivaara, A. (2010), 'Is advanced life support better than basic life support in prehospital care?' A systematic review. *Scand J Trauma Resusc Emerg Med* 18: 62.
- Sadock, B.L., Sadock, V.A., (2003), 'Kaplan and Sadocks synopsis of psychiatry'. 9th Ed. Philadelphia: Lippincott William and Wilkins.
- Satar, S., and Seydaoglu, G. (2005), 'Analysis of acute adult poisoning in a 6- year period and factor affecting the hospital stay', *Adv Ther* **22**(2): 137-147.
- Schlebusch, L., (2005). 'Suicidal behavior in South Africa'. Pietermaritzburg: *University of Kwa Zulu-Natal press*; 14; 12.
- Schlebusch, L., Vawda, N.B.M., Bosch, B.A. (2003), 'Suicidal Behaviour in Black South Africans'. *Crisis press*; **24**(1): 24-28
- Senarathna, L., Adams, J., De Silva, D., Buckley, N.A., Dawson, A.H. (2008), 'Personal and professional challenges in the management of deliberate self-poisoning patients in rural Sri Lanka: a qualitative study of rural hospital doctors experiences and perceptions' *Biomed Central Public Health*; 8: 373-79.
- Shadnia, S., Esmaily, H., Sasanian, G., Pajoumand, A., Hassanian-Moghaddam, H., Abdollahi, M. (2007), 'Pattern of Acute Poisoning Tehran-Iran in 2007'. *Human and Experimental Toxicology*; **26**(9): 753-6.
- Shaw, N. (2005), 'Management of deliberate self-poisoning patients in selected hospitals in Kenya'. *Journal of Medical Toxicology*; **4**(3): 20-4.
- Shiel, W., Stoppler, M. (2008), Webster's new world medical dictionary: Wiley pub 2008.

- Singh, B., Unnikrishan, B. (2006), 'A Profile of Acute Poisoning at Mangalore (South India)'. *Journal of Clinical Forensic Medicine*; **13**(3): 112-16
- Sonal, S.M., Adheena, M.C., Anju, P.G., Hamsa, N.A. (2007), 'Drug Related Hospital Admission'. Manipal University; *Crit Care* **14**(5): 175.
- Spiller, H.A., Appana, S., Brock, G.N. (2008), 'Epidemiological Trends of Suicide and Attempted Suicide by Poisoning in the US: 2000-2010'. *Legal Medicine*; **12**(4) 177-85
- Stark, k., Joubert, G., Struwing, M. (2010), Suicide cases investigated at the state mortuary Bloemfontein'. *South Africa family practice*.**52** (4): 332-35.
- Strand, K., Walther, S.M., Reinikainen, M., Ala-Kokko, T., Nolin, T., Martner, J., Mussalo, P., Soreide, E.,&Flaatten, H.K. (2010), 'Variations in the length of stay of intensive care unit nonsurvivors in three Scandinavian countries'. *Crit Care* **14**(5): 175.
- Suokas, J., Suominen K., Isomesta, E., Ostamo, A., & Lonnqvist, J. (2001), 'Long-term risk factors for suicide mortality after attempted suicide- findings of a 14-year follow- up study'. *Acta Psychiatr Scand* **104** (2): 117-121.
- Thundiyil, J.G., Stober, J., Besbelli, N., Pronczuk, J. (2008), 'Acute Pesticide Poisoning: A Proposed Classification Tool'. *Bull World Health Organ*, 86: 205-9.
- Townsend, E., Hawton, K., Harris, L., Bale, E., Bond, A. (2001), 'Substance used in deliberate Self-Poisoning: Trends and Associations with Age, Gender, Repetition and Suicide Intent'. *Social Psychiatry and Psychiatric Epidemiology*; 36: 228-34.
- Waddys, S. (2007), 'Management of the Poisoned Patient'. *Anesthesia and Intensive Care Medicine*; **8**(11): 474-76.
- Wasserman, D., Rihmer, Z., Rujescu, D., Sarchiapone, M., Sokolowski, M., Titelman, D., Zalsman, G., Zemishlany Z., Carli, V. (2012), 'The European Psychiatric Association (EPA) guidance on suicide treatment and prevention'. *European Psychiatry*; **27**(2): 129-41.

Watson, W.A., Litovitz, T.L., Rodgers, G.C. (2004), 'Annual Report of the American Association of Poison Control Centers Toxic Exposure Surveillance System'. *Am JEmergMed*; 23:589-666. Available at [[Http://dx.doi.org/10.1016/j.ajem.2005.05.001](http://dx.doi.org/10.1016/j.ajem.2005.05.001)].

World Health Organization. (2013), *Mental health: new understanding, new hope*. Geneva. WHO; 2013.

Zaidan, Z.A.J., Burke, D.T., Dorvlo, A.S.S., Al-Naamani, A., Al-Suleimani, A., Al-Hussaini A.A., Al-Sharbati M.M., Al-Adawi, S. (2002), 'Deliberate self-poisoning in Oman'. *Tropical Medicine and International Health*; 7(6): 549-56.

CHAPTER FIVE

Appendices

Appendix A: Documentary Datasheet form

Section A – General information / Demographics

1. Gender

Male (1)	Female (2)	
----------	------------	--

2. Age group (year)

≤ (1) 18	18 – 19 (2)	20 – 29 (3)	30 – 39 (4)	40 – 49 (5)	50 – 59 (6)	60 – 69 (7)	≥ - 70 (8)
-------------	----------------	----------------	----------------	----------------	----------------	----------------	---------------

3. Religion

Christian	1	Muslim	2	Jew	3
Buddhist	4	African/Traditional	5	Other	6

4. Ethnic Group

Black	1	white	2	Coloured	3
Indian	4	Chinese/Asian	5	other	6

5. (a) Occupation

Formal Employment (1)	Informal Employment (2)	Unemployed (3)	Student/scholar (4)	Employed (5)
-----------------------------	-------------------------------	-------------------	------------------------	-----------------

5. (b) If employed

Unskilled	1	Semi-skilled	2	skilled	3	professional	4
-----------	---	--------------	---	---------	---	--------------	---

6. Marital Status

Single	1	Married	2	Separated/divorce	3	widowed	4
--------	---	---------	---	-------------------	---	---------	---

7. Area of residence

Low density	1	Medium density	2	High density	3
Rural	4	Others	5		6

8. Income level

< 500	1	600 - 1500	2	>1500	3	Others	4
-------	---	------------	---	-------	---	--------	---

9. Day of the Week.

Monday	1	Tuesday	2	Wednesday	3		
Thursday	4	Friday	5	Saturday	6	Sunday	7

10. Type of Toxic agent exposed to

.....
 (b) Multiple Toxic agents exposed to:

Two	1	three	2	≥ three	3
-----	---	-------	---	---------	---

11. Quantity of toxic agent exposed to (if known)

Milligrams (mg)	1	Mills (ml)	2	Percentage %	3	others	4
-----------------	---	------------	---	--------------	---	--------	---

12. Poisoning associated with alcohol

yes	1	No	2
-----	---	----	---

13. Toxic screen done

yes	1	No	2
-----	---	----	---

14. If yes, positive agents (s) identity

.....

15. Access to toxic agent

Own Medication (1)	Relatives Medication (2)	Pharmacy (3)	Household Chemical (4)	Not stated (5)
-----------------------	-----------------------------	-----------------	---------------------------	-------------------

16. Reason for poisoning

Marital issues	1
Relationship issues(unmarried)	2
Psycho-social	3
Medical reasons	4
Family issues	5
Depression	6
Unemployment	7
Post-traumatic stress disorder	8

17. Any previous poisoning

18. If yes, how many times

Once	1	Twice	2	> Twice	3
------	---	-------	---	---------	---

19. Time between poisoning and presentation at the emergency department

0 – 3 hrs.	1	4 – 6 hrs.	2	
7– 9 hrs.	3	- >9hrs	4	Not stated 5

19. Clinical state on presentation

(a) GCS

15	1	9 - 14	2	≤ 8	3	Not stated stated	4
----	---	--------	---	-----	---	----------------------	---

(b) Blood Pressure

Normal	1	low	2	High	3	Not stated	4
--------	---	-----	---	------	---	---------------	---

(c) Pulse Rate

Normal	1	Low	2	High	3	Not stated	4
--------	---	-----	---	------	---	---------------	---

(d) Respiratory rate

Normal	1	Low	2	High	3	Not stated	4
--------	---	-----	---	------	---	---------------	---

(e) Temperature

Normal	1	Low	2	High	3	Not stated	4
--------	---	-----	---	------	---	---------------	---

(f) Oxygen Saturation

Normal	1	Low	2	Not stated	3
--------	---	-----	---	---------------	---

(g) Other symptoms.....

21. Pre-hospital intervention

Induce & emesis	1	charcoal	2	other	3	Not stated	4
-----------------	---	----------	---	-------	---	------------	---

22. Medical-co-morbidities if known

.....

23. (a) Outcome

Discharged without complications	1
----------------------------------	---

(b)

Discharged with short term complications	2
--	---

(c)

Discharge with permanent complications	3
--	---

(d)

Death	4
-------	---

24. If admitted, where

Medical ward	1	Surgical Ward	2	I.C.U	3	Other	4
--------------	---	---------------	---	-------	---	-------	---

25. Psychiatric / Psychologist referral

yes	1	No	2
-----	---	----	---

26. Management of Poisoned patients 50

(a)

Management according to literature guide lines	1
--	---

(b)

Management not according to literature guide line	2
---	---

(c) If (b) reasons why.....

27. Length of hospital stay.....

APPENDIX. B(FROM AUGUST 2015 TO JUNE 2016).

SCHEDULE OF ACTIVITIES.

ACTIVITY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAY	APR	MAY	JUN
Idea Submission											
Proposal writing											
Proposal presentation to the department											
Proposal presentation to the graduation forum											
Proposal submission to the UNZA biomedical ethics committee											
Data collection											
Data analysis and report writing											
Defending the thesis											

APPENDIX C.

BUDGET

ITEM	QUANTITY	UNIT COST	TOTAL COST KWACHA
Transport	01	3000.00	3,000.00
Printing	30	300.00	9,000.00
Stationary	01	2,000.00	2,000.00
Ethics approval	01	2000.00	2,000.00
Data collection	01	3,000.00	3,000.00
Miscellaneous	01	5920.00	5,920.00
Total			24,920.00

APPENDIX D.

LIST OF COMMON DRUGS/SUBSTANCE OF ABUSE.

Alcohol

Ayahuasca

Bath salts (synthetic cathinones)

Cocaine

DMT

GHB

Hallucinogens

Heroin

Ketamine

Khat

LSD

Marijuana (cannabis)

MDMA (Ecstasy/molly)

Mescaline (peyote)

Methamphetamine

Over- the- counter cough/cold medicines (dextromethorphan)

Prescription opioids

Prescription sedatives (tranquilizers, depressants)

Prescription stimulants

Psilocybin

Steroids (anabolic)

Synthetic cannabinoids (“k”/ “spice”)

Tobacco

Source: 2015 the national institute of drug abuse U.S.A. (National survey on drug use and Health from samhsai.gov)

Appendix F



THE UNIVERSITY OF ZAMBIA

SCHOOL OF MEDICINE

Telephone : +260211252641

Telegram: UNZA, Lusaka

Telex: UNZALU ZA 44370

Email: assistantdeanpgmedicine@unza.zm

P.O Box 50110

Lusaka, Zambia

17th February, 2016

Mr. Boris Mwanza
Department of Pharmacy
School of Medicine
UNZA
LUSAKA

Dear Mr. Mwanza,

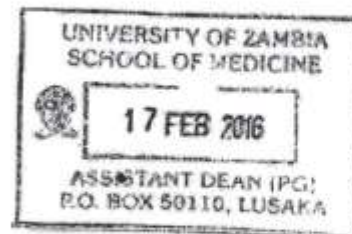
RE: GRADUATE PROPOSAL PRESENTATION FORUM

Following the presentation of your dissertation entitled "A Profile of Community Based Acute Poisoning and its Associated Mortality at University Teaching Hospital" your supervisor has confirmed that the necessary corrections to your research proposal have been done.

You can proceed and present to the Research Ethics.

Yours faithfully,

Dr. S.H. Nzala
ASSISTANT DEAN, POSTGRADUATE
Cc: HOD, Pharmacy



Appendix F

Boris Mwanza
C/O The University of Zambia
School of Medicine
Department of pharmacy
P.O. Box 50110
Lusaka, Zambia.
18 April 2016.



The senior medical superintendent,
University teaching hospital
P/Bag RW 1X
Ridgeway
Lusaka.
Dear Sir,



RE: REQUEST FOR PERMISSION TO CONDUCT A MASTER OF CLINICAL RESEARCH PROJECT.

I am a postgraduate student at the University of Zambia pursuing a Master of Clinical Pharmacy currently in the third year.

I would like to conduct a clinical project for my dissertation entitled **"A profile of community based acute poisoning and its associated mortality at university teaching hospital."**

I write to request for permission to conduct this study at this hospital (data collection). I have obtained ethical approval from excellent in research ethics (ERES).

Please find herewith a supporting letter from my university and approval letter from the ethics committee.

Your favorable consideration will be greatly appreciated.

Yours faithfully,

A handwritten signature in black ink, appearing to be "Boris Mwanza".

Boris Mwanza.

Pharmacist.

(+260964032616).

Appendix G



33 Joseph Mwilwa Road
Rhodes Park, Lusaka
Tel: +260 955 155 633
+260 955 155 634
Cell: +260 966 765 503
Email: eresconverge@yahoo.co.uk

I.R.B. No. 00005948
E.W.A. No. 00011697

15th April, 2016

Ref. No. 2016-Feb-011

The Principal Investigator
Mr Boris Mwanza
Ndola Central Hospital Postal Agency
P.O. Box
NDOLA

LUSAKA.

Dear Mr Mwanza,

RE: A PROFILE OF COMMUNITY BASED ACUTE POISONING AND ITS ASSOCIATED MORTALITY AT UNIVERSITY TEACHING HOSPITAL.

Reference is made to your submission of the corrected version of your protocol dated 15th April, 2016. The IRB resolved to approve this study and your participation as Principal Investigator for a period of one year.

Review Type	Ordinary	Approval No. 2016-Feb-011
Approval and Expiry Date	Approval Date: 15 th April, 2016	Expiry Date: 14 th April, 2017
Protocol Version and Date	Version – Nil	-
Information Sheet, Consent Forms and Dates	English	14 th April, 2017
Consent form ID and Date	Version- Nil	14 th April, 2017
Recruitment Materials	Nil	14 th April, 2017
Other Study Documents	Documentary Data sheet Form.	14 th April, 2017
Number of participants approved for study	-	-

Specific conditions will apply to this approval. As Principal Investigator it is your responsibility to ensure that the contents of this letter are adhered to.

If these are not adhered to, the approval may be suspended. Should the study be suspended, study sponsors and other regulatory authorities will be informed.


Conditions of Approval

- No participant may be involved in any study procedure prior to the study approval or after the expiration date.
- All unanticipated or Serious Adverse Events (SAEs) must be reported to the IRB within 5 days.
- All protocol modifications must be IRB approved prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address.
- All protocol deviations must be reported to the IRB within 5 working days.
- All recruitment materials must be approved by the IRB prior to being used.
- Principal investigators are responsible for initiating Continuing Review proceedings. Documents must be received by the IRB at least 30 days before the expiry date. This is for the purpose of facilitating the review process. Any documents received less than 30 days before expiry will be labelled "late submissions" and will incur a penalty.
- Every 6 (six) months a progress report form supplied by ERES IRB must be filled in and submitted to us.

Should you have any questions regarding anything indicated in this letter, please do not hesitate to get in touch with us at the above indicated address.

On behalf of ERES Converge IRB, we would like to wish you all the success as you carry out your study.

Yours faithfully,
ERES CONVERGE IRB


P.B. Dr. Esther Munalula-Nkandu
BSc (Hons), MSc, MA Bioethics, PgD R/Ethics, PhD
CHAIRPERSON