The occurrence and management of accidental childhood poisonings in a South African urban suburb: a mixed-methods study

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A Dissertation submitted to the Faculty of Health Sciences,
University of the Witwatersrand, Johannesburg,
in fulfilment of the requirements for the degree of
Master of Science in Medicine
in the Department of Pharmacy and Pharmacology

Johannesburg, South Africa, 2017

DECLARATION

I, Ayesha Yusuf Ahmed, declare that this dissertation is my own work. It is being submitted for the degree of Master of Science in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

(signature)

30th day of **October**, 2017

DEDICATION

To my unborn child,

my nieces and nephews,

and to the millions of children

in South Africa and around the world –

whom we as adults shall endeavour to always protect.

PRESENTATIONS AND PUBLICATIONS

Presentations

[2012]

- Presented a poster (category: Education, Policy and Systems) at the "Faculty of Health Sciences Research Day", at the University of the Witwatersrand, Johannesburg, South Africa (September 2012). Title: Pediatric Poisonings in Lenasia

- Presented an oral presentation and received the "Young Scientist Award " for the best oral presentation in Clinical Pharmacology at the "Annual Congress of the South African Society for Basic and Clinical Pharmacology " at the University of Pretoria, South Africa (September/October 2012). Title: Pediatric Poisonings in Lenasia

- Presented a poster and received 2nd place for "Best Poster" at the "2012 Wits 4th Cross-Faculty Postgraduate Symposium" at the University of the Witwatersrand, Johannesburg, South Africa (October 2012). Title: Pediatric Poisonings in Lenasia

[2013]

- Presented a poster (category: Clinical Pharmacology) at the "Experimental Biology 2013" conference, held at the Boston Convention and Exhibition Centre, Boston, Massachusetts, United States of America. (April 2013). Title: The occurrence and management of pediatric poisonings in Lenasia, South Africa

- Presented an oral presentation (category: Health and intervention) at the "School of Therapeutic Sciences Research Day" at the University of the Witwatersrand, Johannesburg, South Africa (September 2013). Title: The occurrence and management of pediatric poisonings

  [2014]

- Presented a poster (category: Education, Policy and Systems) at the "Faculty of Health Sciences Research Day", at the University of the Witwatersrand, Johannesburg, South Africa (September 2014). Title: Accidental household poisoning in children

Published conference abstracts

- Ahmed A.Y. and Moch S. (2013). The occurrence and management of pediatric poisonings in Lenasia, South Africa. *The FASEB Journal*, 27(1 Supplement), pp.1101-3.

- Ahmed A and Moch S. (2015). Accidental household poisoning in children. *South Afr J Infect Dis*, 30(1), 49

ABSTRACT

Accidental poisoning amongst children is a common childhood injury worldwide, attributed commonly to household substances and medications stored within the immediate environment of the child. The incidence of childhood poisonings in South Africa's most populated and urbanized province of Gauteng is unknown, due to poor record-keeping at medical facilities regarding the incidence and classification of poisoning, coupled with the lack of a local Poison's Information Centre (PIC).

A mixed-methods, case-study design was used to investigate the occurrence of poisonings and poisons management by parents/guardians and healthcare practitioners in the urban suburb of Gauteng, Lenasia. A cross- sectional, self-administered survey was administered to parents/guardians of children attending a random sample of crèches and primary schools in Lenasia, questioning the number of poisonous household substances stored and storage level of these substances, the occurrence of poisoning incidents amongst children and the associated management and knowledge of PIC's. Semi-structured interviews were used to explore the local practice of healthcare practitioners regarding accidental childhood poisoning.

A total of 4530 questionnaires were handed out, 1730 (38.2%) were returned completed and 256 cases of accidental poisoning were reported. Medications were the most common substances stored, followed by cosmetics and household detergents. More than half (63.26%) of all substances were stored at a level of accessibility to children, with pesticides most commonly stored out of reach of children. The occurrence of a poisoning was significantly associated with the employment status of the mother ($p=0.031$) and the general non-drug chemical category of household substances ($p<0.001$)
The categories of household substances were significantly associated with the level of storage ($p=0.021$) and the management of poisoning ($p<0.001$). There is a lack of knowledge of PIC's and the prevention and management of poisonings amongst parents/guardians. Semi-structured interviews with healthcare practitioners revealed few cases of poisoning presented at healthcare practitioners, however there is a need for improving health literacy amongst caregivers through community awareness programmes and inter-professional development in addressing this preventable phenomenon amongst children.

ACKNOWLEDGEMENTS

- Mrs Shirra Moch (Supervisor) for her unwavering support, dedication and commitment to supervising my project
- Department of Pharmacy and Pharmacology – Staff and fellow masters students for continued motivation and support
- The crèches and primary schools who consented to participate in the study and the parents of children attending these schools who participated in the study
- The health practitioners who participated in the semi-structured interviews
- The University of the Witwatersrand, Faculty of Health Sciences Research Committee, for funding towards conducting the research.
- The University of the Witwatersrand staff bursary fund
- The University of the Witwatersrand, Faculty of Health Sciences Research Office: Postgraduate Student Travel Fund, for funding towards attending an international conference.
- The University of the Witwatersrand: Postgraduate Travel Award, for funding towards attending an international conference.
- My parents, siblings, and in-laws for their support and confidence in me
- My husband Ebrahim, for his love, support and encouragement in ensuring I achieve my goals
- My Creator, for without whom, none of this would be possible

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

CAPFSA	Child Accident Prevention Foundation in South Africa
CRC	Child Resistance Container
CRQ	Central Research Question
GDE	Gauteng Department of Education
HREC	Human Research Ethics Committee
HPCSA	Health Professionals Council of South Africa
NIMSS	National Injury Mortality Surveillance System
OR	Odds Ratio
P	Probability
PCC	Poison Control Centre
PIC	Poison Information Centre
PSASA	Paraffin Safety Association of South Africa
RCWMCH	Red Cross War Memorial Children's Hospital
SDG	Sustainable Development Goal
USA	United States of America
WHO	World Health Organisation

Chapter 1 INTRODUCTION AND BACKGROUND

1.1 Problem Statement

> "*There are no statistics which reflect accurately the over-all incidence of childhood poisoning in South Africa*" (Leary, 1976)

More than 40 years ago, statistics regarding childhood poisoning in South Africa were unknown, and through the inception of South Africa's first Poison Information centre (PIC), at the Red-Cross War Memorial Children's Hospital (RCWMCH) in the Cape, researchers attempted to illustrate the condition in South Africa by reporting on calls attended to at the centre (Leary, 1976). The successful operation of the PIC was noted, with optimism that the services would develop through systemised processes.

So what has transpired over the years, in an effort to prevent, monitor and manage poisoning in South Africa?

Over the past 40 years, additional PIC's were established and their services have advanced, having developed their own poisons database programme, making strides both nationally and internationally, by guiding the development of PIC's in other African countries. However, despite the transformation, development, and data explosion, with only two functional PIC's in South Africa, a true indication of the extent of childhood poisonings in the country remains unknown.

> "The actual incidence and spectrum of acute poisonings in South Africa (SA) are unknown,..." (Veale *et al*., 2013)

Although South African PIC's do publish records of their statistics, this is not representative of the entire country. Their results are based on the calls made to the PIC and referrals from the adjacent hospitals and do not represent the non-reported cases that are attended to by healthcare practitioners in private practice nor do they account for the acute emergency cases presenting to private and public hospitals, which may portray a different picture of the status of poisoning amongst children in South Africa (Marks and van Hoving, 2016)

Upon reviewing the literature regarding accidental household poisonings in children in South Africa, none investigated the urban situation of Gauteng.

Since there is no PIC in Gauteng, and studies have not been conducted in the urban environment, there remains a knowledge gap on poisoning trends among children in the most densely urbanised province of South Africa. In addition, little is known about the awareness of poisonous substances and safety practices of parents/guardians regarding these substances.

1.2 Purpose of the Study

The purpose of this study was to survey the current situation of accidental household poisonings among children under the age of 12 in an urban environment and the management of poisonings by parents/guardians. In addition, to qualitatively explore the local practice of health practitioners (general practitioners and pharmacists) regarding the management of poisoning cases.

The southern Gauteng suburb of Lenasia was chosen for this study as it is a large suburb comprised of mixed socio-economic strata.

1.3 Structure of Dissertation

This dissertation is structured into six chapters, and the outline of each chapter is presented in Figure 1.1 below. The references and appendices will follow the concluding chapter.

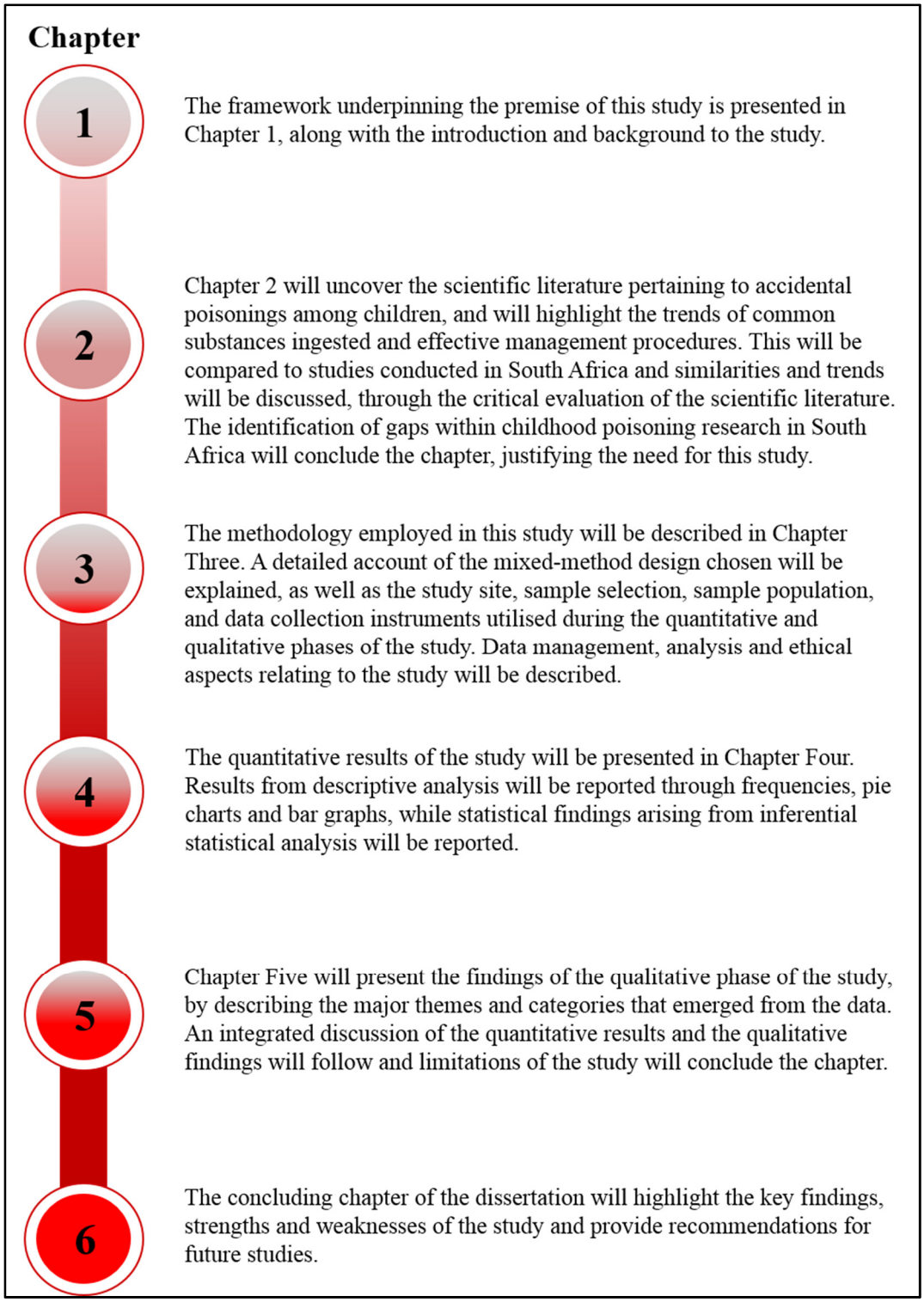

Figure 1.1 Structural outline of the chapters of the dissertation

1.4 Overview of unintentional poisoning in children

Poisoning is one of the top five leading causes of unintentional injuries in children worldwide (Peden *et al*., 2008). Mortality due to poisonings are generally low (1.8 deaths per 100 000 children), with low-income countries recording more deaths than high-income countries. Contrary to the mortality rates, there is no accurate reflection of morbidity rates as obtaining credible data from countries remains a limiting factor (Holder *et al*., 2008).

The Sustainable Development Goals (SDGs), adopted in 2015 by the United Nations is aimed at transforming the world through seventeen goals covering areas of social, economic, environmental and health monitoring by the year 2030. The SDG-3 which targets health priorities, makes provision to actively target mortality rates due to unintentional poisoning (WHO, 2016) (See Figure 1.2 below).

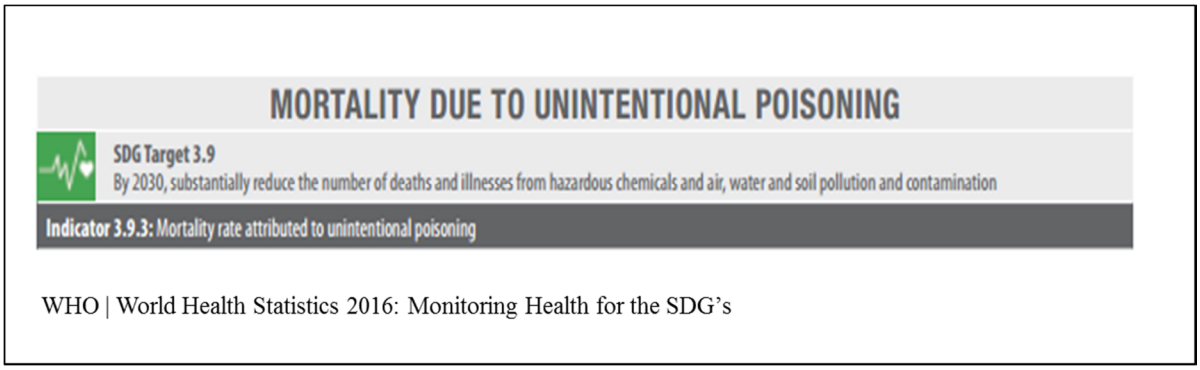

Figure 1.2 Sustainable development goals targeting unintentional poisonings.
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The inclusion of targeting mortality rates due to unintentional poisoning in the SDGs highlights the importance of monitoring poisoning cases around the world. However, as noted in the report, unintentional poisoning data is available for only 40-74% of countries, and less than 40% of the countries worldwide have data that can be broken down into smaller components to understand the underlying trends or insights emerging from the data

(WHO, 2016). This suggests improved monitoring and documentation of poisoning cases is warranted, in order to appropriately address the issue and reach the target.

In order to understand the phenomenon of unintentional poisoning, a brief background describing what a poison is, exposure to poisonous substances, reasons for the occurrence of poisoning and examples of common poisonous substances in accidental childhood poisoning will be discussed.

1.4.1 What is a poison?

A poison is a substance which can cause mild or severe harm upon entering the body (Henry and Wiseman, 1997). Some chemical substances exert harmful effects on the body in small amounts, while other chemicals are only dangerous when large amounts are taken in.

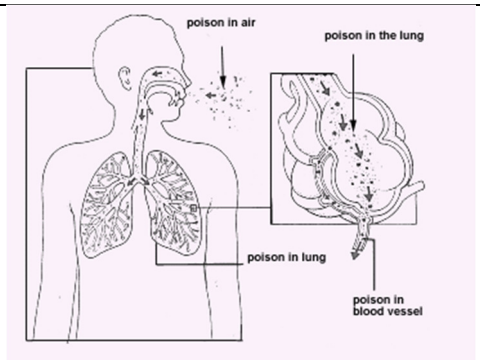
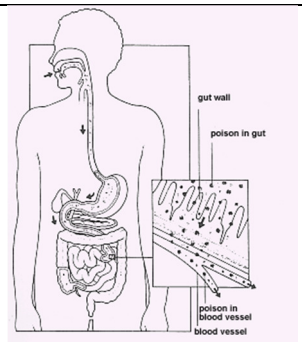
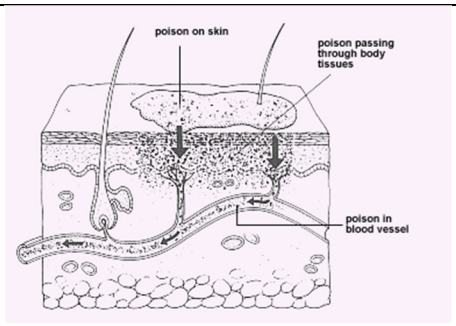
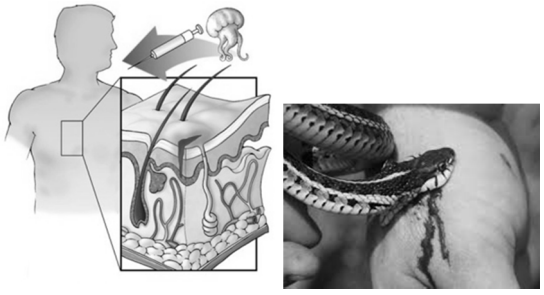
Exposure to a poison occurs when a person is in contact with a poison. This effect is dependent on the duration of exposure and the amount of poison entering the body. A once-off exposure lasting for a few seconds up to a few hours (less than 24 hours) is referred to as an acute exposure, whereas continuous contact with small amounts of a poisonous substance over many days or years is known as chronic exposure (Klaassen and Amdur, 1996) . This kind of exposure is seen in pesticide exposure or lead exposure, where small amounts of pesticide or lead accumulate in the body and a harmful effect is experienced immediately or many days or months later.

1.4.2 Routes of poison exposure

Exposure to a poisonous substance can occur through various mediums and is identified through its route of entry into the human body. There are four major routes

of entry that allow a poisonous substance to enter the body (Klaassen and Amdur, 1996) . These are described in Table 1.1 below:

Table 1.1 Routes of exposure to poisonous substances

i. Inhalation - of fumes, gases, smoke, dust through the nasal passages or mouth	
ii. Ingestion - of medicines, household substances, cleaning agents. This is the most common route of accidental poisoning, especially among children.	
iii. absorption - of pesticides and splashes of various other poisonous substances through the skin	
iv. injection - poisonous substances injected through a syringe or an animal bite or sting, either enters the underlying muscle or directly enters the blood vessel.	

Source of images: Henry and Wiseman, 1997.
Figures republished with permission of WHO – see Appendix P

1.4.2.1 Effects of poison on the body

Many harmful effects are experienced through exposure to a poisonous substance, depending on the amount of absorption of the poison into the body. These effects are classified as either local or systemic effects (Henry and Wiseman, 1997).

Local effects are confined to the body part in contact with the poisonous substances. Figure 1.3 illustrates some of the local effects experienced through harm to the skin, damage to the eyes and irritation of the airways. In cases of exposure through injection sites, or animal bites, the localised effects commence with pain and swelling and can progress to severe systemic effects (Henry and Wiseman, 1997).

Systemic effects occur when the substance absorbed travels and is distributed throughout the body to distant sites, resulting in deleterious effects (Klaassen and Amdur, 1996). Organs that are targeted during this process include the brain, nerves, heart, liver, skin and kidneys. Many medications and animals bites are known to cause severe systemic effects in the body. In addition to targeting organs, an unborn baby exposed to poisons through the mother is at risk of developmental harm, eg: stunted neurological development.

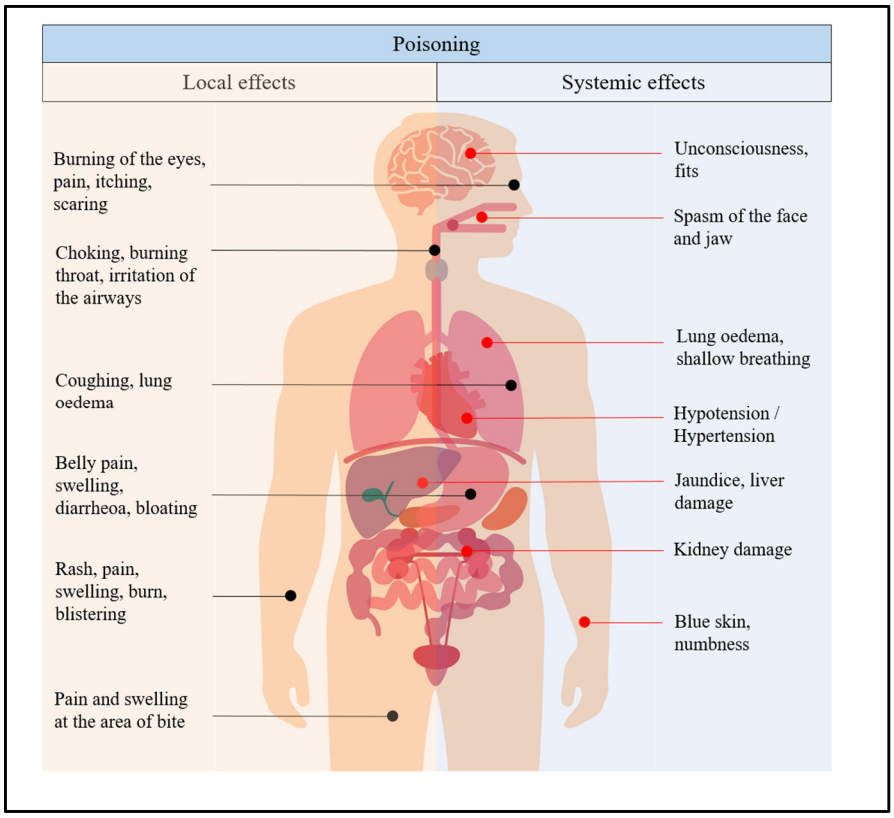


Figure 1.3 Representation of points of local and systemic effects experienced through poisoning.

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1.4.3 Causes of poisoning

Poisoning can occur amongst all ages of the population. The occurrence of poisoning in children less than 6 months of age and as young as 1 month of age have been reported in two separate studies in United States of America (USA) (Kang and Brooks, 2016) and South Africa (Marks and van Hoving, 2016) respectively. Even though all age-groups are at a risk of poisoning, the reason for the occurrence of poisoning varies across different age groups and can be classified as intentional or unintentional (Henry and Wiseman, 1997) as illustrated in Figure 1.4.

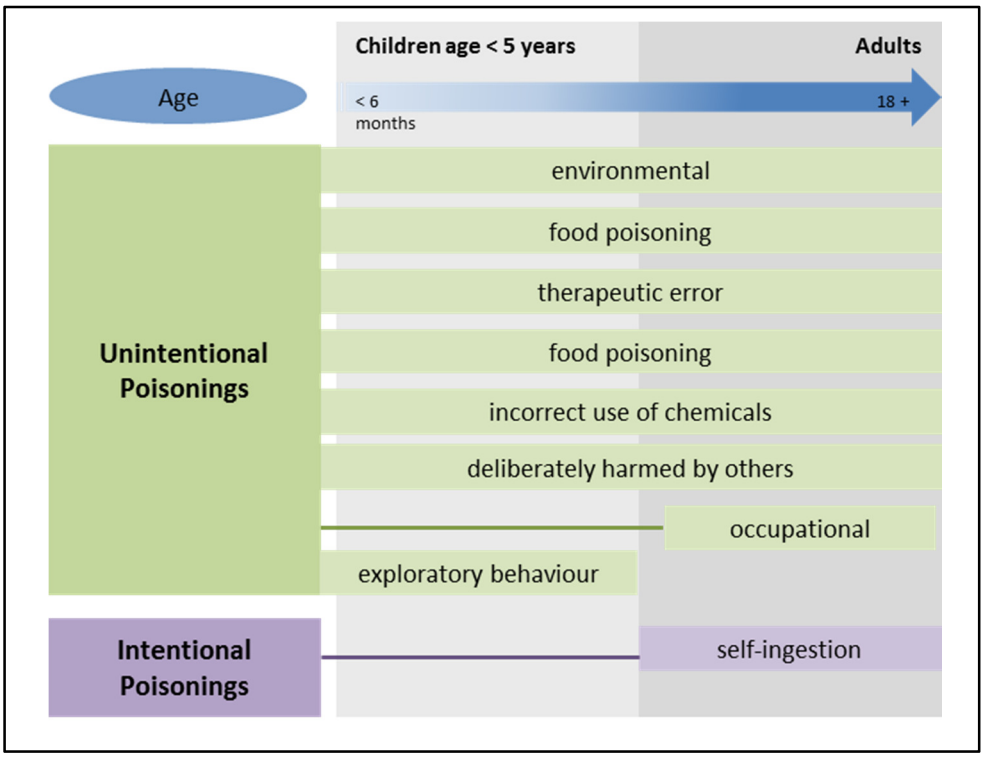

Figure 1.4 Reasons for unintentional and intentional poisoning across different age groups

Unintentional poisoning is attributed to different external factors and can occur through occupational exposure (pesticides) or environmental hazards (lead poisoning), therapeutic error by administering and consuming the incorrect medication or dose of medication , through food poisoning, incorrect use of chemicals by failing to adhere to precautionary measures or failure to store the chemicals appropriately and in children who explore their surroundings and are unaware of the hazardous nature of substances found in their immediate environment .

In contrast, intentional poisoning occurs through self- ingestion of poisonous chemicals or medication in an effort to exert harm upon one's body or to cause death (Eddleston, 2000; Ajdacic-Gross *et al.*, 2008). The use of poisonous substances in attempting suicide is not limited to adults only, as international studies have revealed an increase in self-poisoning among children as young as 10 years of age (Sandilands

and Bateman, 2016; Tyrrell *et al*., 2016). The substances implicated in poisoning cases vary considerably and are more often than not found in the household.

1.4.4 Common poisonous substances in childhood poisoning

From daily household cleaning agents, fuels such as paraffin, toiletries and medications, the environment of the child is filled with chemical hazards. Studies documenting the epidemiology of childhood poisonings worldwide have recorded the most common substances responsible for poisonings among children (McGuigan, 1999; Balme *et al*., 2012; Marks and van Hoving, 2016). These include:

- Cosmetic/personal care products
- Household cleaning agents
- Medications and pharmaceutical agents and traditional medicines
- Industrial products
- Insecticides/pesticides
- Plants
- Paraffin

Whilst the above mentioned substances have been identified as the most common substances worldwide, the incidences of these substances may vary from country to country, based on their social and demographic situation. These differences will be addressed as the literature is examined in the subsequent chapters.

In developed countries, there is robust data regarding the epidemiology of accidental childhood poisonings due to the well-integrated PIC networks. As a result, these countries are able to monitor the changing trends in accidental poisoning. In South Africa, the situation differs as there is a lack of networking between various institutions/monitoring bodies, and most data emanating from South African studies, are based on admissions to hospitals affiliated to the PIC's. As there are only two operating PIC's in South Africa, and both are based in the same province thus serving the same geographical region, the data is broadly representative of this specific area. As a result, the other provinces in South Africa are underrepresented.

There exists a need to investigate the status of accidental poisoning amongst children in rural and urban South Africa to understand how far we as a country have come in addressing the problem, how we compare to other countries, and recognising our contribution to the WHO goals of reducing poisoning globally.

In the Literature review to follow, international trends in accidental childhood poisoning will be presented, and evaluated against the South African context, highlighting areas of potential research and engagement within South Africa.

Chapter 2 LITERATURE REVIEW

In this chapter, a literature review of studies pertaining to the scope of this study will be presented commencing with an overview of the epidemiology of childhood poisonings world-wide, followed by the management of poisonings and preventative measures initiated in addressing this occurrence and will be compared to the situation presenting in South Africa. An appraisal of the studies focussing solely on accidental childhood poisonings in South Africa will follow, providing the rationale and motivation for conducting this study. The chapter will conclude with the Aims and objectives set out for the study.

2.1 Global epidemiology of childhood poisoning

Documented as a global health problem amongst children of all ages, poisoning mostly effects those under the age of five years (Holder *et al*., 2008).

A true account of the incidence of poisoning worldwide is unknown, due to the incomparable forms of published information (Holder *et al*., 2008) resulting from inherent biases from PIC's and hospital data (Hoffman, 2007). Nevertheless, the data published is valuable to globally assess trends in poisoning across different countries and in planning preventative and educational measures.

Mintegi and colleagues (2017) in their multicentre study investigation aimed to provide a representation of the global incidence of poisonings amongst children. This study predominantly represented high income countries (HIC) with a few low to middle income countries (LMIC), excluding African countries. Their results suggest a bimodal age distribution, with most unintentional poisoning cases occurring in the home, reported in the under 5 age category, with a later peak in the mid-teen age range due to intentional poisoning as a result of suicide attempts or recreational use. These findings are similar to independent

studies (Veale *et al*., 2013; Ansong *et al*., 2016 and Manouchehrifar *et al*, 2016) conducted in global regions not represented by the multicentre study. This is further supported by findings of the American Association of Poison Control Centres, in their 33rd annual report (Mowry *et al*., 2016), in which the frequency of human exposures logged were predominant in children under 5 years and teenagers.

As a child of this age is a dependent child, unintentional poisonings in this age group is attributed to the explorative and curious nature as well as associated risk factors within the immediate surroundings of the child.

2.2 Factors associated with accidental poisoning

Various familial and environmental factors have been assessed for their association with the occurrence of poisoning in children. The presence of poisonous substances and their level of storage (Presgrave *et al*., 2008), parent educational levels (Manzar *et al*., 2010) supervision of children (Morrongiello, 2005), and number of siblings (Petridou, 1996) have been commonly associated with the occurrence of poisoning. Other studies focussing on specific outcomes have reported assocations between the addiction levels of parents and the occurrence of poisoning in children (Ayubi *et al*., 2016).

However, these factors are not common across all countries due to differing socio-economic circumstances, cultural beliefs and education systems. Studies conducted in culturally rich communities (Petridou, 1996; Chatsantiprapa *et al*., 2001) have reported insignificant associations between poisonings and parental supervision, as children in these communities are more often than not in the care of the parent or grand-parent, in contrast to children from western cultures who are primarily supervised by a non-related care-giver (Chatsantiprapa *et al*., 2001).

In South Africa, a qualitative study, interviewing parents residing in informal settlements, reported findings suggesting that storage levels and socio-economic factors (poverty, lack of supervision, unemployment or parental negligence due to substance abuse) contribute to the risk of poisonings amongst children (Munro *et al*., 2006)

These risk factors have been succintly summarised according to the Haddon Matrix (see Table 2.1 below), to provide a framework of understanding the nature of the problem, thereby assissting individuals in planning preventative measures in addressing the problem (Runyan, 1998).

Table 2.1 Haddon Matrix applied to the risk factors for childhood poisoning* (WHO, 2008)

	Child	Agent	Physical environment	Socioeconomic environment
Pre-event	Age and developmental factors (such as curiosity, judgement); gender; parental supervision.	Ease of opening package; attractiveness of substance; inadequate labelling; poor storage.	Cupboards within easy reach of children; absence of locking devices on cabinets; exposure to agents.	Lack of regulations and standards for toxic products and packaging; poverty; lack of awareness of toxicity and poisoning risks among caregivers.
Event	Child's secrecy about ingestion; parent not noticing unusual behaviour.	Toxicity of chemical; dose consumed; ease with which substance can be consumed (for instance, as liquid rather than solid).	Places where child can ingest substances without being seen.	Lack of awareness by caregivers of how to react; lack of appropriate and timely decontamination by health-care workers.
Post-event	Child's inability to communicate incident; lack of access to poison control centre.	Chemical agent without an antidote.	Lack of adequate pre-hospital care, acute care and rehabilitation.	No poison control centre or lack of information on how to contact centre; lack of access to emergency medical care.

*Table extracted from the World Health oragnisation, World report on child injury prevention, page 130. . Table republished with permission of WHO – see Appendix P

2.2.1 Substances commonly implicated in accidental childhood poisoning

Various substances have been reported by PIC's and hospitals as common agents implicated with unintentional childhood poisonings amongst children, based on the geographical area of representation, socio-economic profile and cultural beliefs

existent in the area. Among the most common agents reported are, medications, household chemicals, detergents, irritant and corrosives, paraffin and pesticides.

In HIC such as the United States, cosmetics and personal care products, household cleaning agents and analgesics account for the most common substances involved in poisoning in children under the age of 5 years while central nervous system drugs, chemicals and alcohol were the least common substances (Mowry *et al*., 2016). These categories of most common substances have remained consistent for the past 10 years in the United states (Watson *et al*., 2005).

The scenario in LIC countries differs considerbaly, with paraffin (kerosene) reported as the most common agent, followed by medications and insecticides (Manzar *et al*., 2010). Similar trends were found in other LIC studies (Nhachi and Kasilo, 1994; Presgrave *et al*., 2008).

In South Africa, the latest reports of childhood poisoning from two PIC's, indicate that paraffin, drug-chemicals, household cleaning agents and pesticides are the most common substances reported in childhood poisoning (Balme *et al*., 2012; Veale *et al*., 2013).

While most ingestions in children are non-serious and can be managed at home through contacting the services of a PIC (McGregor *et al*., 2009; Marks and van Hoving, 2016) or a healthcare practitioner (Shannon, 2000), many cases of poisoning exposures (63%) present unneccesarily at the emergency room (Chafee-Bahoman and Lovejoy, 1983) incurring unnecessary expense to the state (LoVecchio *et al*., 2008). This increased burden, highlights the role of promoting the access of PIC as a resource tool in attending to poisoning cases.

The invaluable role of PIC's in providing expertise in managing cases throughout the country and thereby reducing healthcare costs to both the individual and the state have been reported by Miller and Lestina (1997) and LoVecchio and colleagues (2008). In South Africa, there are no studies investigating the positive effect of PIC cost-savings to the economy and the patient. As a result, the public do not realise the value of the of PIC in the management of poisonings, and warrants increased promotion of their expertise and services to the country at large

2.3 The role of Poison Information Centres

The first poison centre in the world opened its doors in the early 1950's in the United States of America (USA), prompted by pediatric practices requiring a source of information for ingredients of medications and household substances (Scherz and Robertson, 1978). Sixty years later, the the services of poison centres has developed from using a card index system (Lovejoy *et al*., 1994) to an online near real-time capturing network of 55 regional poison control centres (PCC) countrywide (Mowry *et al*, 2016).

The fundamental role of a PIC is to manage a poisoning case through assessment and advisory means, and to provide an information service with optional services of a laboratoy and treatment unit (WHO, "Poison Centres," n.d). In addition, they are able to monitor trends of poisoning and advise government and national policy.

2.3.1 Inception of PIC's in South Africa

With the inception of the first PIC in the Western Cape (formerly the Cape Peninsula), over 20 years ago, the RCWMCH PIC was the first source in South Africa reporting analysis of poisoning cases among children treated at the hospital (Leary,

1976). Being the only Poison information centre in the country and the only institute with data to show, publication of data of calls received at the poison information centre or patients attending or admitted at the RCWMCH set the benchmark as a means of reporting poisoning data. This method of reporting PIC data and hospital record data became synonymous among various researchers, around the country and is evident in the studies published (Hobson, 1987; Müller *et al*., 1993). Obtaining data from hospitals or PIC'S was worthy of publication as these centres held the monopoly in terms of collection and dissemination of information regarding childhood poisoning. The RCWMCH PIC was not to be exclusive, as additional PIC's made a modest appearance in other areas of the country. However, recent literature reports data only from the two PIC's in the Western Cape indicating that there are limited published studies emanating from PIC's that existed in other parts of the country. The additional PIC's located in the Gauteng, Free-State and Kwa-Zulu Natal regions subsequently terminated their services in the early 2000's due to financial constraints. The two functional PIC's have serviced the country well since their inception, and more recently the RCWMCH PIC developed their own poison database called Afritox, which is available to the public and professional communities (UCT, "Poisons Information Centre," n.d).

Since 2015, the RCWMCH and Tygerberg PIC have provided a consolidated national emergency response number available 24 hours/ 7 days a week (Bertrand *et al*., 2016). This combined emergency telephone services allows for real-time logging of poisoning cases, which provide meaningful data, and advise policy within the country.

This data aids in promoting prevention, awareness and educational initiatives among the public and is a resourceful tool for healthcare practitioners.

2.4 Interventions in addressing the occurrence of poisoning

Poison Information Centres play a crucial role in disseminating the information gathered, into meaningful educational and preventive measures in an effort to increase awareness and reduce poisonings. Although the public can easily contact PIC's, PIC's do not engage with the public on a day to day basis and as a result, need to disseminate their information through other information sources such as healthcare professionals, health educators, government and policy makers, to relay the information down to the public. Thus an integrated approach is the ideal way of addressing prevention measures regarding poisoning.

One of the most successful interventions regarding childhood poisoning was the introduction of Child resistant containers (CRC) (Rodgers, 1996), which resulted in successfully decreasing the frequency of poisoning amongst children (Flanagan *et al*., 2005). In South Africa, interventions in addressing poisonings involved the implementation of CRC's which was instated at policy level and proved successful in its outcome in effectively reducing paraffin poisonings amongst children (Krug *et al*., 1994).

Further intervention strategies implemented and proven significant in reducing risks of poisoning amongst children include, promoting safe storage of medicines and household products (Le Blanc *et al*., 2006; Gielen *et al*., 2007; Swart *et al*., 2007), educating children, parents and care-givers regarding the dangers of poisonous substances and correct prevention methods (Kendrick *et al*., 2008) and promotion of the services of PIC's.

A three tier prevention system for comprehensive injury prevention has been recommended by de Ramirez and colleagues (2012). These include setting interventions that prevent exposure (primary intervention), managing exposures effectively in the household (secondary prevention) and ensuring successful professional management in the case of referrals or presentation at the emergency room (tertiary prevention).

A wide range of interventions have been tested and proven significant in reducing poisoning exposures, however accidental poisonings continue to occur. This suggests that preventive interventions and education should be a continuous effort and not only practised during certain periods of time. The continuous awareness of these substances will go a long way in promoting safety of children.

2.5 Rationale for conducting the study

While an overview of the literature pertaining to childhood poisoning has been presented in the preceding section of this chapter, the following critique will cover studies that specifically focus on accidental childhood poisonings in South Africa by analysing the following components:

1. purpose of the study
2. area of representation of study
3. methodology followed
4. data sources utilised
5. conclusions and recommendations emerging from the studies

These components provide a comprehensive overview of the direction of focus pertaining to studies conducted in South Africa, by drawing attention to the growth of knowledge within the field of childhood poisoning. Through a critique, the strengths and progression of literature is identified, while knowledge gaps are uncovered thereby highlighting areas of future research (Torraco, 2005).

A literature search was performed to identify studies profiling poisoning cases in South Africa by accessing the PubMed database and Google scholar. Search terms used included,

"childhood poisoning", "pediatric poisoning" "accidental poisoning" "accidental childhood poisoning" "household poisoning", "poisoning in South Africa". In the interest of the delineation of this study, these studies were thereafter filtered to exclude studies with unrelated variables and identify studies with key variables related to this study as depicted in Figure 2.1 below. The reference lists of included papers were assessed for additional relevant studies.

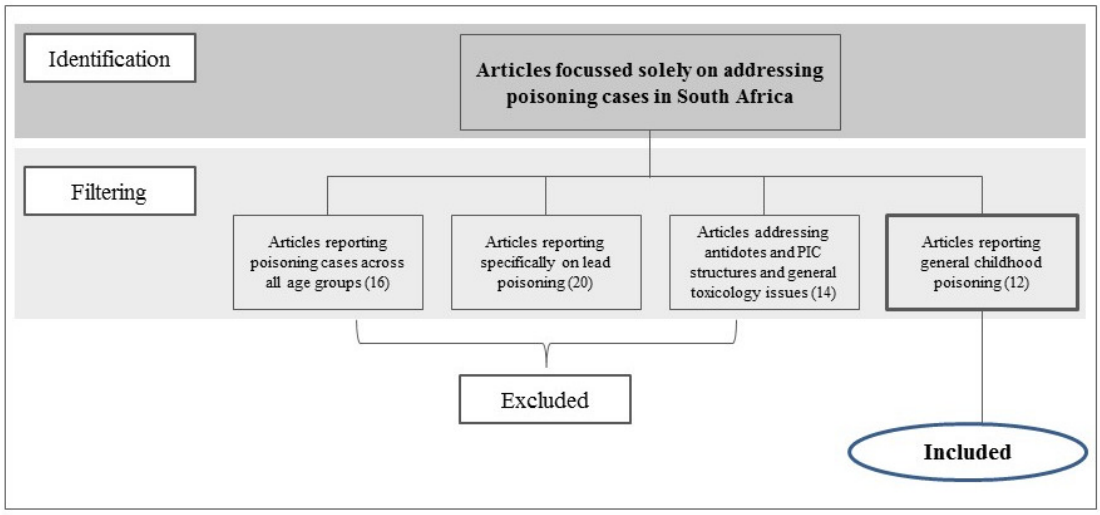

Figure 2.1 Selection process of studies included in the review

Following the above process, 12 studies spanning the past 40 years were included in the review and are chronologically presented in the following table. The chronological representation is useful in achieving an oversight of the progression of research in the field (Cronin *et al*., 2008). However in the critique to follow, a concept-centric approach will be applied to synthesize the literature available (Webster and Watson, 2002) and explore the methodological literature, thereby highlighting the development of the focus on childhood poisonings

Table 2.2 Forty year representation of studies focussing on childhood poisonings in South Africa

Author(s) and Year	Purpose	Area	Methodological design	Data source	Conclusions/ Recommendations
Leary, P.M. (1976)	Statistical analysis of poisoning cases treated at the Red Cross Childrens Hospital	Cape Town (Western Cape)	Retrospective analysis of hospital records between 1970 - 1973	Red Cross Children's Hospital records	Early childhood poisoning is characterised by medicinals and household items. Constant vigilance should be maintained to avoid such accidents.
Korb ,F.A. & Young M.H. (1985)	Determine the prevalence of poisoning in children in the Cape	Cape peninsula	1. Retrospective analysis of hospital records from March 1982 to February 1983 2. Comparative analysis with records of previous years	Red Cross War Memorial Children's Hospital	Low mortality and High morbidity rate with serious consequences on the health of a child and health services expense. Prevention strategies should encompass a holistic approach in understanding the overall effect. Medicines most common agent
Lewis H.H. *et al* (1989)	Determine the circumstances surrounding poisoning in children and types of substances ingested	Pretoria	1. Retrospective review and comparison of hospital records for the year 1984 with data collected between 1981 and 1982. 2. Personal/Telephonic interview of parents	H.F.Verwoerd Hospital Parents of subjects	The greatest risk of poisoning is the household environment of children around the age of 5 years despite parental supervision. These accidents occur even when parents are acquainted with the risks
Roberts J.C. *et al* (1990)	Document the pattern of childhood poisoning in the western cape	Western Cape	Retrospective analysis of poisoning cases treated at the RCWMCH during 1987 AND PIC call logs	RCWMCH and PIC call logs	Vigilance is important in the prevention of childhood poisonings
De Wet B. *et al* (1994)	Determine the incidence and cost of treatment of paraffin poisoning in children of the Cape peninsula during 1990 , in order to ascertain the most economical preventative safety measure	Cape peninsula	Retrospective study of records for the year 1990	6 hospitals in the Cape Peninsula	Legal enforcement of standardised, reusable child-resistant containers for paraffin storage. Monitor consumer behaviour in relation to admissions during the campaign period
Ellis, J.B. *et al* (1994)	Overview of the paraffin ingestion problem	Ga-Rankuwa township north of Pretoria	Retrospective review of hospital records during 1992	Ga-Rankuwa Hospital	Improve electricity supply thereby eliminating the need for paraffin. CRC's and child-resistant caps. Education regarding paraffin use. Change of colour of paraffin.
Reed & Conradie (1997)	Epidemiology of paraffin poisoning amongst rural African children and the clinical features	Mpumalanga	Prospective study of children admitted	Shongwe Mission Hospital	Awareness through storage and supervision measures
Malangu N. *et al* (2005)	Description of the occurrence, cost and management of paraffin poisoning amongst children in a rural hospital	Mpumalanga	Retrospective analysis of medical records from Jan 2000 to June 2001 of children under the age of 12.	Philadelphia Hospital, Mpumalanga	More prevalent in children < than 5 years of age, with boys more affected than girls. Overuse of antibiotics by doctors warrants increased education in rational antibiotic use and community education.
Tolosana A. *et al* (2009)	Characterise the pattern of pesticide use and exposure in South African children	Eastern and Western Cape	Collaborative investigation sourcing data from a UK[1] study - Examination of children - Self-administered questionnaire	Children from 4 areas. Urban, rural, and informal settlements Parents/guardians of the children	In LIC there is a high exposure to pesticides in the home environment. Further research required to investigate the effects of pesticide exposure on the health of children
Balme K. *et al* (2010)	Profiling pesticide exposure of poisoning amongst children admitted to the RCWMCH	Western Cape	Retrospective review of hospital records between Jan 2003 and Dec 2008	Red Cross War Memorial Children's Hospital	Although there is an increase in pesticide exposure and poisoning, it is unknown as it is not notified with health authorities
Balme K. *et al* (2012)	Profiling exposure and poisoning amongst children who presented to the RCWMCH	Western Cape	Retrospective review of hospital patient records between Jan 2003 and Dec 2008	Red Cross War Memorial Children's Hospital	Declining number of incidents over the past 20 years., however increasing incidents of household substances, resulting in specific prevention initiatives
Marks C.J., & van Hoving D.J. (2016)	Analysis of toxic substances responsible for acute poisoning in infants < 1 and severity of exposure	Non-specific	Retrospective analysis of PIC records	Tygerberg Poison Information Centre (TPIC)	Most poisoning exposures are not serious and can be managed at home. Identification and documentation of poisoning in this special population is important.

2.5.1 Overview of studies focussing on childhood poisonings in South Africa

The 12 studies above succinctly represent the areas of interest in the field of childhood poisoning. Studies historically reported on retrospective data emanating from PIC data bases and hospital medical records. This conventional quantitative method has served the basic purpose of blanket reporting a statistic in an effort of disseminating information and guiding practice. The findings of early studies (Lewis *et al*., 1989) were congruent with international studies with regards to demographic profiling and identifying in reporting that children under the age of five years were at highest risk of poisoning with medicinals and household products.

As time elapsed and paraffin was used as a common fuel agent against the backdrop of a deprived South African community, the concern of paraffin poisoning garnered more attention and studies within the 1990's period focussed not only on the incidence of poisoning but the associated costs of healthcare and introduced the element of testing prevention practices and intervention methods. The inclusion of high paraffin usage areas (predominantly rural areas) formed the main area of focus, and low-income areas within a close region of the Cape PIC'S were included in these studies. Retrospectively reviewing hospital and PIC data recording paraffin poisoning incidence formed the methodology of these studies. These quantitative techniques yielded results which influenced national policy decisions and in 1996 through the establishment of the Paraffin Safety Association of South Africa (PSASA), regulations regarding the sales and storage of paraffin were mandated (Carolissen and Matzopoulos, 2004) . These regulations resulted in increased awareness and subsequently a decrease in the reported paraffin poisoning cases.

Not long after the heightened awareness of paraffin poisoning, pesticide poisoning drew interest in researchers, when high pesticide use in farming occurred, and studies profiled the patterns of pesticide poisoning in children. Studies reporting on specific substances have proven successful in grabbing the attention of government as policies were thereafter implemented in combination with awareness campaigns. However once these yielded positive results, awareness campaigns became obsolete. Much of what transpired after this period of focussed studies, was general reporting or profiling of PIC data, highlighting incidences of poisoning through household substances. It appears that the current trend of childhood poisoning mimics that of 40 years ago, with household substances at the core of childhood poisonings, albeit a lower incidence and more specifically in children less than five years of age.

2.5.2 Overview of methodology used in South African studies

The strengths of using PIC and hospital data is the dependence on reliability. However, as data from PICs in the Cape region and hospitals in selective rural areas were data sources, the statistic does not infer much about other areas in South Africa, in particular urban areas. Even though PICs were set up in other areas of the country, there is no published data from these centres available and recently these sites have been shut down. While PIC's and hospital data form the major data source for poisoning focussed studies, reports of mortality due to poisoning have also been reported through the utilization of National Injury Mortality Surveillance System (NIMSS). Although this is a national registry, and data sourced through this initiative is valid, the data solely represents the number of fatalities through poisonings. Many cases of poisoning, which are non-fatal go by unreported and therefore these figures

do not represent a complete picture. This begs the question of what is the scenario of accidental poisoning in South Africa's populated provinces of Gauteng and Kwa-Zulu Natal. Does the lack of data imply an unimportant phenomenon? Or has there never been an initiative for an organized surveillance of national poison information data. Data from other countries are more representative of the entire country due to a consolidated network of PIC's and do not rely on information stemming from PIC's in a single location. Furthermore, the data available in other countries are complemented with follow up qualitative data representing parents and guardians. This mixed method approach provides a new dimension in understanding the issue of poisoning.

In South Africa, there are no studies that qualitatively focus on childhood poisoning. As poisoning is one of the top five unintentional injuries among children world-wide, a qualitative study by Munro and colleagues (2006) addressing unintentional childhood injuries in low-income areas, is the only study providing a brief insight from the parental/guardian narrative into factors affecting childhood poisoning. A plethora of data exists for studies focussing on injuries amongst children, and in this manner, the occurrence of poisoning in children has been briefly explored through differing methodologies. However as poisoning incidences are ranked lower to road traffic injuries, burns, falls and drowning's, the emphasis on poisoning is subdued. Therefore in addition to utilizing quantitative methods, there exists an opportunity to explore poisonings and the management of poisonings from the parental/guardian narrative and from the view of the healthcare professional to improve our understanding of the phenomena of accidental childhood poisoning occurring within the household and the correct management thereof.

2.5.3 Recommendations for future research in South Africa

The recommendations arising from the 12 studies follow their individual conclusions based on the gaps identified and earmarked for future research. Collectively emphasis was made on the immediate household environment as the area where most accidental poisonings take place, with household substances topping the list of substances involved in poisonings. In addition, prevention initiatives are called upon, to raise awareness in an effort of reducing this often preventable accident.

The way forward

From the above critique, the main points to consider are:

a. What is the current status of childhood poisoning in South Africa. However, as a central network does not exist, obtaining this statistic is inaccessible. Information housed by the two PIC's in the Western Cape are fairly representative of this region, however do not represent the other provinces. By acknowledging that there is no information available for South Africa's most populated provinces like South Africa and Kwa-Zulu Natal, this is an area to uncover by trying to obtain some sort of information, through the major hospital networks.

b. As most poisoning cases were reported around the household environment, a focussed study on household poisonings could reveal more information about the dynamics within the home in relation to these substances. In addition, as there is a low mortality rate associated with poisonings in South Africa, and most cases can be managed at home, focus on management procedures by parents/guardians should be explored. As this management is often coupled with seeking the help or

validation of a healthcare practitioner, the role of healthcare practitioners plays an important part in this management.

c. The repeated call for vigilance, prevention initiative and awareness, highlights the concern that accidental poisoning can and should be prevented at all costs, especially since most cases occur in the household environment.

2.5.4 Implementation of areas of research

By taking into account the three factors mentioned above, status of poisoning in Gauteng, focus on household poisoning and increased calls for awareness, these areas were investigated to understand the present situation.

As no studies have been found to investigate poisoning cases in urban areas of South Africa (eg: Gauteng), the quantitative methodology was probed, to ascertain whether meaningful data could be obtained as previously demonstrated in other areas of South Africa. As Gauteng houses several private and public healthcare facilities (hospitals and clinics), obtaining valuable hospital records seemed attainable. Unfortunately, upon investigation and consultation with stakeholders and members of staff at the various emergency departments in both private and public hospitals, it was apparent that the state of hospital records was in disarray, and such data was neither documented nor available.

It was thus decided to alter the approach in obtaining data for the said population, by utilizing other methods of injury data collection. According to the WHO, several sources exist for compiling injury data such as, national statistic systems, hospital records, surveying communities and selective research studies (WHO, 2004). As there

is no national statistic system in South Africa and hospital records do not have a system for recording poisonings in Gauteng, the community-survey method was therefore adopted in an effort of gaining some insight. It was therefore decided to survey a sample of the population, as a case-study, to provide in-depth information of the occurrence and management of poisoning cases among children. However, as Gauteng is home to a diverse social spectrum, a richly diversified community was required to understand the nature of this problem among all social spectrums. Lenasia, a suburb in the southern region of Gauteng was selected, as it houses a large community of individuals of differing social classes. In order to obtain the necessary information of poisoning incidents among these children, parents were to provide the necessary information and therefore, contacting parents through schools was the most cost-effective and time-saving approach. In addition to obtaining data regarding poisoning cases amongst children, the management employed in treating these children was also necessary to obtain. Healthcare providers play a crucial role in providing optimal healthcare, and therefore health care practitioners were included as a second leg of the study to provide a complete snapshot of the situation in a community. This led to the development of a mixed- methods study.

2.6 Motivation for the study

In light of the above discussion, and paucity of information regarding accidental childhood poisonings in the urban areas of South Africa coupled with the lack of a regional PIC, this study was undertaken to provide a snapshot of the current situation of accidental childhood poisonings in an urban province of South Africa. Data and findings generated from this study,

could help to improve awareness among parents/guardians and aid in the prevention of accidental poisonings among children.

2.7 Aim

Through the use of mixed-methods, the aim of this study was to establish the storage levels of potential toxins, the occurrence of accidental household poisonings among children in Lenasia (south of Gauteng), and the management thereof by parents and healthcare practitioners.

2.7.1 Study objectives

The objectives of the study were,

1. To quantitatively determine:

- the types of poisonous substances stored at home and the level of accessibility of these substances to children
- the number of poisons-related cases encountered in the home, at school or in a social environment and the response management employed in relation to such a poisoning
- the risk factors associated with the occurrence of a poisoning case
- demographic details of the participant and family members residing in the household

2. To qualitatively explore the local practice of healthcare practitioners in order:

- to establish the types of accidental poison cases healthcare practitioners encounter and the frequency of such cases

- to identify the management protocol healthcare practitioners follow
- to elicit their views of how accidental poisoning cases could be:
    a. better managed by healthcare practitioners
    b. reduced in the community

Chapter 3 METHODOLOGY

To achieve the aforementioned aims and objectives, this chapter describes the study design, sample selection, ethical considerations, research instrument utilized and statistical methods employed to analyse the data.

3.1 Study Design

The research design for this study is a mixed-methods, descriptive, case-study design, which follows the sequential explanatory model, comprised of the following components:

a. A quantitative component, through the medium of a cross-sectional survey design, as a case-study approach of a single suburb was used to snapshot the occurrence and management of accidental poisonings among children.
b. A smaller, qualitative semi-structured interview design, among healthcare practitioners practicing in Lenasia, to assess the management of childhood poisonings.

Case studies are characterised by the manner in which they focus on the occurrence of a single phenomenon existing in real-life, through various data collection methods, allowing quantitative and qualitative methods to contribute to the holistic understanding of the focus of the study (Yin, 1999). Therefore, a case-study design was suitable for this study, to understand the occurrence and management of accidental poisonings amongst children from the lens of the parents/guardians as well as the healthcare practitioners.

3.2 Mixed Methods Research Paradigm

A mixed method study is defined as a study in which both quantitative and qualitative approaches are used, during the data collection, data analyses and inference phase, to address the research question (Tashakkori and Teddlie, 1998).

3.2.1 Background of mixed methods

Quantitative research methodologies, underpinned by positivism, view the adoption of scientific methods, through rigorous hypothesis testing by data of the quantitative form (Atkinson and Hammersley, 1994). In contrast, qualitative researchers follow constructivism (Lincoln and Guba, 1985), and believe that mental constructs of the phenomena are developed through the lived experience. Theories are developed through the process of the research as opposed to the positivist research paradigm which commences with a theory (Creswell, 2014).

For many years, quantitative methods were predominantly supported, until qualitative methods gained prominence and structure in the early 1960's. With the eminence of qualitative research, constructivists criticised the positivists' paradigm, citing the superiority of the constructivist paradigm of research (Teddlie and Tashakkori, 2009).

The ongoing debate highlighted dichotomies between the two paradigms and paved the way for incompatibilities between the two research methodologies to mutually exist in one study. However, this dichotomous view was counteracted by pragmatic mixed methodologists in the 1980's, who believed in the compatibility of the two methods, and were of the view that integration of the data of the two methods was a useful way of answering the same question from different angles (Teddlie and Tashakkori, 2009).

The choice of utilising a mixed-methods design can be one of many as listed by Greene and colleagues (1989). To triangulate data, discover complementarity of different facets of a phenomena, to unearth contradictions, to guide development of secondary methods, to compensate weaknesses found in one data set, expansion of a study by adding depth to the research, and ultimately to achieve confirmation and completion of a study.

Mixed-methods research has developed structure and form over the years. Depending on the type of research enquiry, and rationale for utilising mixed-methods, one can plan research methodology based on the guidelines of the various mixed-method designs classified by Creswell (2014).

3.2.2 Mixed Method designs

Within the mixed method research paradigm, there are three basic study designs (and more advanced strategies) (Figure 3.1) a researcher can select in addressing the research question (Creswell, 2014). These designs demonstrate the order of the combination of methodologies used in the mixed method study. Each design holds strength to its own classification, in an attempt to inform each data set and provide a deeper meaning to the analyses and inferences.

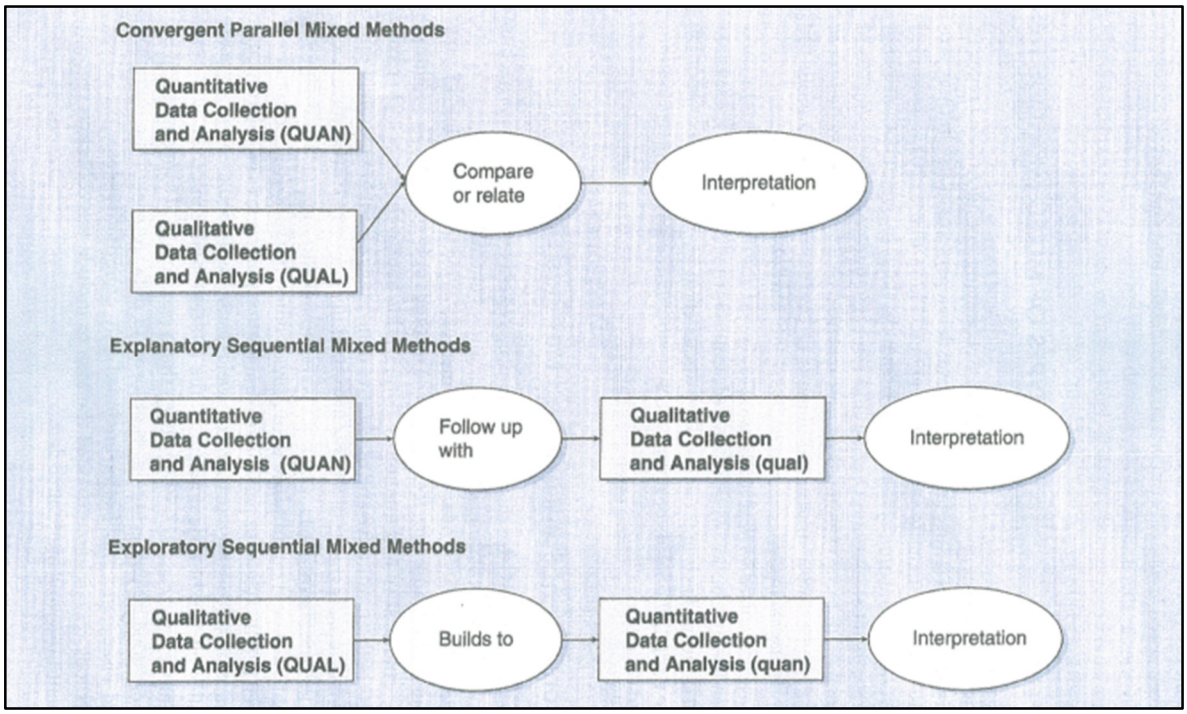

Figure 3.1 Designing and conducting mixed methods research based on Creswell 2014.
Figure republished with permission from SAGE Publications – see Appendix P

In this study, the explanatory sequential design was selected. Quantitative survey data was first collected and analysed. Analyses of the data informed the follow up qualitative phase of the study, wherein semi-structured interviews were held with healthcare practitioners. This designs allows for the qualitative results to add depth to the data sought during the quantitative phase (Creswell, 2014).

A visual sequential explanatory model (Ivankova *et al*., 2006) detailing the order of methodology followed in this study is depicted in Figure 3.2.

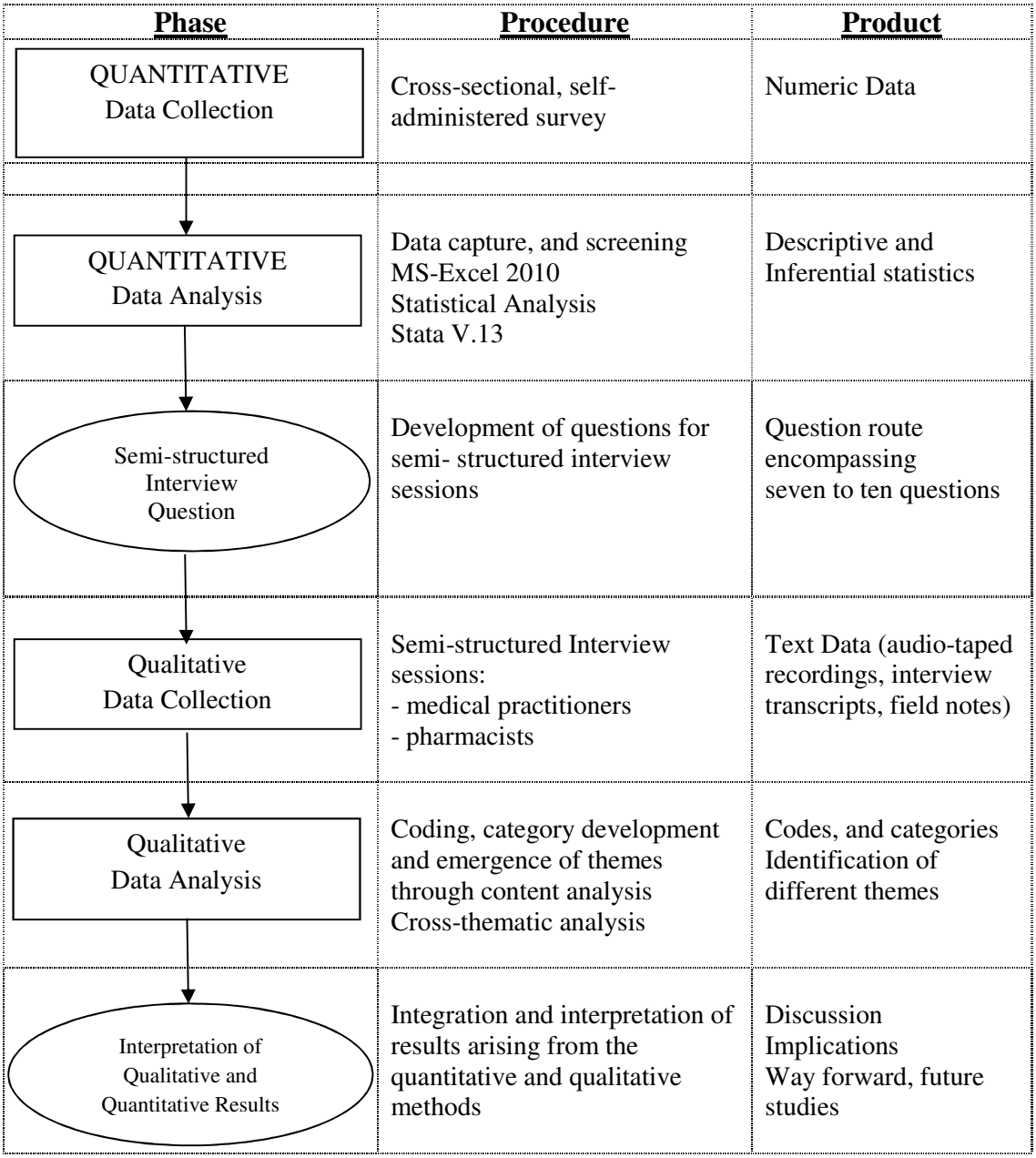

Figure 3.2 Visual model detailing the sequential explanatory mixed-methods design used in the study

3.2.3 Rationale for using a mixed-method study

Mixed-method studies inspire creativity within the researcher in fashioning a study consisting of both qualitative and quantitative approaches that will best answer the various dimensions of the research question. The dual approaches allows for synergy between the data sets and builds on the confidence of the emanating results and

enriches the inferences and findings (Jick, 1979). In addition, the mixed-method approach provides the opportunity to offset the weaknesses that both quantitative and qualitative approaches present. Furthermore, a variety of visual models are available to strengthen the presenting the evidence, through the medium of pictorials, narratives and spoken text (Johnson and Onwuegbuzie, 2004).

In this study, the sole use of a quantitative method, would not enable the researcher to delve further into the issue of poisonings, as a qualitative method would offer. Strict quantitative data would merely highlight the situation by numbers, without tapping into the circumstances surrounding childhood poisonings. The addition of the qualitative phase, allows for the discussion of this phenomenon, and enables the researcher to unearth different facets of the issue.

Whilst the strengths of mixed-methods are recognised, weaknesses of the method are not to be discarded. Methodologists critique the mixed-paradigm method, believing that a study should be situated in one paradigm only. Furthermore, the length of time required for a study to complete both data phases has been noted, feasibility of the study, as well as the researcher requiring knowledge of both paradigms and experience to be able to merge the two, as required in mixed-methods designs. Whilst these weaknesses have been acknowledged, the researcher has tried the best to understand the two paradigms independently, and further familiarised herself with the guidelines of the mixed-method paradigm, in an effort to marry the two paradigms in a cohesive manner that best depicts the scenario of the research question.

The data collection and data analysis methods for the quantitative and qualitative methods employed in this study will be detailed in section 3.4 and 3.5 respectively.

3.3 Ethical considerations

Permission to conduct the study was obtained from the University of the Witwatersrand Human Research Ethics Committee (HREC) before commencing with the research. Ethics clearance certificate number: M110723 (Please refer to Appendix A, for a copy of the University of the Witwatersrand HREC: Clearance certificate).

As per the University of the Witwatersrand HREC request of seeking permission from the relevant authority responsible for education, permission was sought from the Gauteng Department of Education (GDE), to conduct the study among parents/guardians of children attending Gauteng primary schools. (Please refer to Appendix C, for a copy of the GDE research approval letter).

In upholding the ethical considerations of research, participants in the survey were adults over the age of 18 years. Participation was anonymous and voluntary and submission of the survey was taken as consent to participate in the study.

For the semi-structure interviews, signed informed consent was obtained to participate in the study, and to be audio-recorded. The tape recordings were kept in a locked cupboard and will be destroyed after six years, or two years following publication of the study results.

3.4 Phase One - Quantitative Phase

A cross-sectional survey design was used, as surveys allow for the collection of empirical data, and allows the researcher to tap into a large sample frame in a short period of time through cost-effective measures (Kelley *et al*., 2003). Furthermore, they allow the researcher to investigate various variables related to the research question in one setting (Check and Schutt, 2011). As this was a self-administered questionnaire sent home with the students in sealed envelopes, interviewer bias was eliminated and anonymity was assured.

3.4.1 Study sample

The study sample was chosen from a population of parents/guardians of children attending primary schools and crèches in the southern Gauteng suburb of Lenasia.

3.4.1.1 Location

Lenasia is a suburb situated in Gauteng, approximately 35 km's south of the Johannesburg Central Business District. It is a multicultural suburb composed of approximately 150 000 people of differing socio economic strata. It is a rapidly growing suburb with shopping malls, schools, many places of worship, banks and various commercial and industrial sectors. The suburb of Lenasia services many informal settlements, which are located on the periphery of Lenasia. The residents of these informal settlements commute to Lenasia for their employment, schooling, day to day amenities and basic healthcare services.

3.4.1.2 Sampling Procedure

Simple random sampling was used to select primary schools and crèches from a sampling frame devised from a complete list of the applicable schools in Lenasia. A computer generated list of randomised numbers was used during the selection process. (Please refer to Appendix D, for the table of randomised numbers and the list of crèches and primary schools in Lenasia)**.**

The principal/headmaster of the randomly selected crèches and schools were invited to participate in the study. A letter inviting the school to participate and detailing the purpose of the study was handed to each principle/ headmaster. (Please refer to Appendix E, for a copy of the School Participation

Information Letter). In addition, a copy of the GDE approval letter, endorsing the study was attached, as per GDE rules and regulations. Upon acceptance of the invitation, they were requested to sign an informed consent form, authorizing the schools participation in the study. (Please refer to Appendix F, for a copy of the School Participation Consent Form). The study commenced once approval had been received from all selected crèches and schools.

3.4.1.3 Sample Size

The sample size calculated for this phase of the study totalled 4530.

Population	±150 000
Confidence Level	95%
Margin of Error	2.5%
Initial Calculated sample size	**1522**

As response rates in survey administration varies, and there is no agreement of an acceptable response rate for survey research, previous studies utilising survey research have reported response rates of anything between 32.6% to 75% (Nulty, 2008). Low response rates of 30% were reported in studies wherein surveys were not handed out face-to-face, a feature prominent in this study. As a result a conservative figure of a 35% response rate was adopted in calculating the final sample size, resulting in a larger sample size of 4348. This amount was rounded of to 4530.

3.4.1.4 Inclusion and exclusion criteria

All crèches and primary schools in Lenasia area were included in the sampling frame. Respondents to the questionnaire (parents/guardians) were 18 years and older.

3.4.2 Instrument

The self-administered four page questionnaire was designed, based on a similar study (Patel *et al*., 2008) and development was guided by a South African emergency medicine specialist and a pharmacologist for clarity, face validity, applicability of data sought regarding the South African context and to remove any ambiguities. The survey was composed of closed-ended questions, comprised of questions eliciting continuous variables and categorical variables composed of dichotomous, nominal and ordinal categories, by answering the following questions: demographic information, range of poisonous household substances stored and the level of storage of these substances in the home, occurrence of poisoning, management of poisoning incidents, and knowledge of PIC's. The participant information sheet detailing the premise of the study, addressing anonymity issues and researcher contact details was attached to the front of questionnaire. (Please refer to Appendix G, for a copy of the participant information sheet and Appendix H for a sample of the questionnaire).

For purposes of this study, food poisoning, plant poisoning and animal stings and bites were not included in the study, as the occurrence of these incidents are difficult to prevent.

The concluding question of the self-administered survey was crafted as an open ended question, 'any other comments'. The rationale for concluding the survey with an open ended question was to allow the participants to leave any comments they had pertaining to the premise of the study. Open-ended questions have been found to be a valuable aid in survey administration, as participants are allowed an opportunity to share any information they feel pertinent to the premise of the study which has not been addressed in the close-ended questions, resulting in new issues being raised or providing complimentary explanation of the results of the closed-ended questions (O'Cathain and Thomas, 2004)

3.4.3 Pilot Study for survey

A pilot study was conducted among ten randomly selected parents/guardians from Lenasia, to indicate how the questions may be interpreted and answered and to remove any ambiguities. Findings from the pilot study were not used in the final data analysis and discussion.

3.4.4 Procedure of survey administration

Parents/guardians of children between the ages of 0-12 years, who attend the randomly sampled crèches and primary schools in Lenasia were invited to participate in the study. The questionnaire was sent home with students in a sealed envelope, and a covering letter (participation information sheet) was attached. The letter detailed the purpose of the study, explained the concept of anonymous participation, and requested the consent of parents/guardians to participate in the study. If the parent/guardian wished to participate, they filled out the form and returned it to the

school. If they had declined to participate, it was explained to them, that they need not fill out the form. Forms were handed out on a Monday, and parents/guardians were requested to return the completed forms by the end of the week (Friday). Contact details (email address and mobile number) of the researcher were made available in the covering letter for any queries pertaining to the study.

3.4.5 Data Management

A comprehensive data management plan was developed to implement a structured procedure in correctly handling the collected data and is illustrated in Figure 3.3. By following the steps outlined during this process, important ethical features such as confidentiality, anonymity, secure access to data, quality and transparency of data were ensured. In addition, the execution of this process prepared the data for statistical analysis. A coding sheet was developed, to facilitate the capturing of data from the surveys. Please refer to Appendix I, for a copy of the Coding sheet.

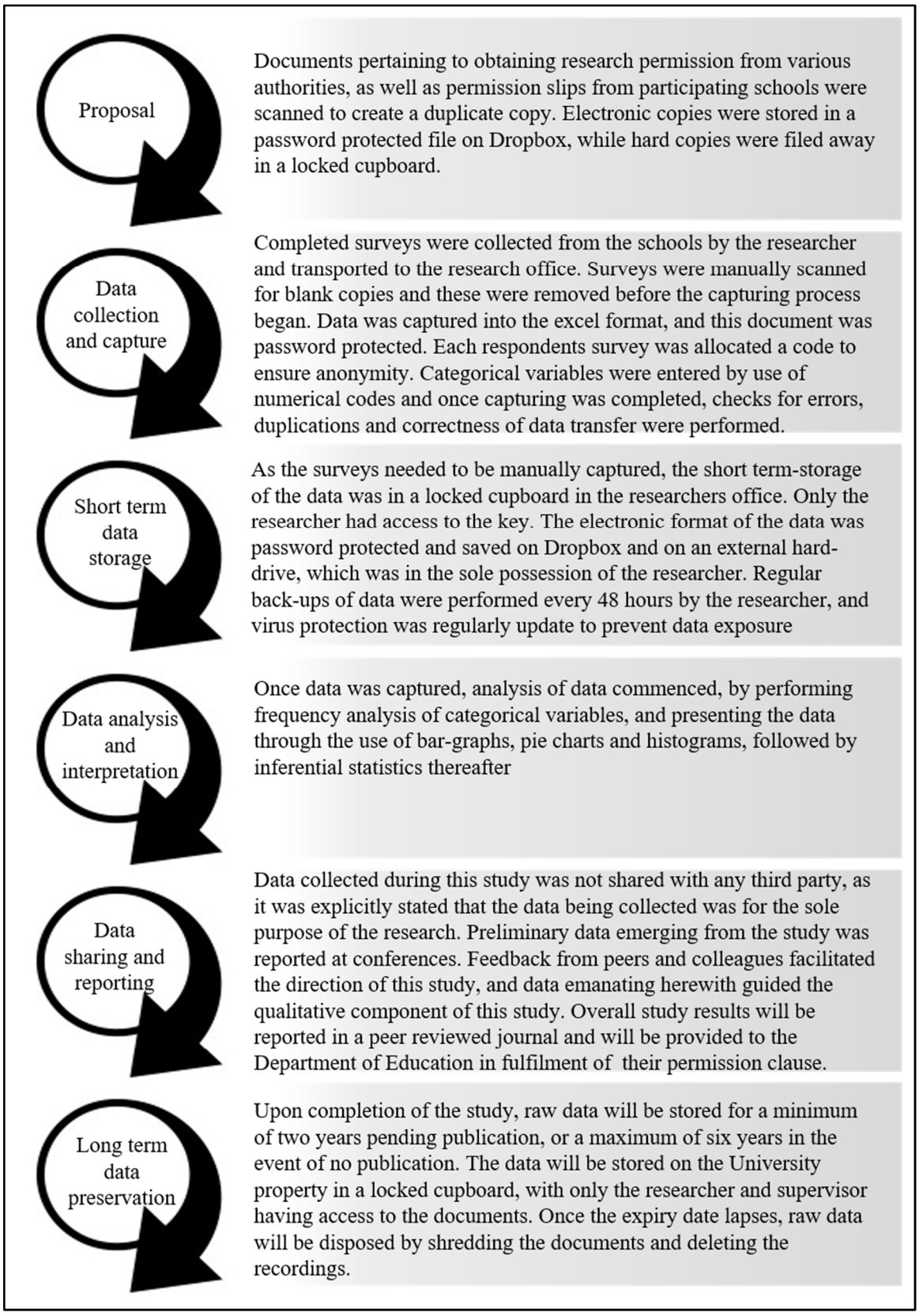

Figure 3.3 Data management process employed throughout the study period

3.4.5.1 Study objectives and survey items

The following table describes how each objective will be answered through items on the survey.

Table 3.1 Association of research questions and survey items

Research question	**Item on Survey**
Objective 1: Determine the types of poisonous substances stored at home and the accessibility of these substances to children	Section B: Table 1. Storage of household substances and level of storage
Objective 2: Determine the number of poisons-related emergencies encountered in the home, at school or in a social environment and the response management employed in relation to such a poisoning	Section B: Table 2. Ingestion of substances by child Section C
Objective 3: Determine the demographic details of the participant	Section A

Qualitative objectives were answered through the semi-structured interviews

3.4.6 Data Analysis

Once data was captured and examined for any capturing errors and processing duplications, analysis of data commenced.

3.4.6.1 Return rate and response rate

The return rate and response was calculated and is presented in the results section in chapter four, page 67.

Although self-administered surveys are known to be associated with low response rates and bias as a result of the non-respondents, Dillman (1991) argues that may not always be the case when the characteristics of non-respondents mirror the respondents. Nutley (2008) mentions cases of low-response rates reported by Watt and colleagues (2002), which were justified by the mode of distribution of the survey (through mail). Similar characteristics may be found in this study, as the survey was not administered face-to-face, but rather through the medium of the school. Nevertheless, the responses received from the survey, provided information of characteristics of the population that were previously unknown (Dillman, 1991), and will provide the groundwork that will guide future studies involving parental response through the medium of survey use.

3.4.6.2 Statistical Analysis

Following the coding structure developed earlier (Appendix I), data collected through the survey administration was assigned variable codes.

Age is a continuous variable, and was calculated by subtracting the respondents' date of birth from the date of data collection. The mean, and standard deviation was calculated.

Age of children, was reported as a categorical variable, as children were grouped into one of two categories. Category 1: children attending a crèche/ day-care or pre-school, Category 2: children attending primary school. This allowed for comparison of poisoning cases amongst different age categories of children.

Categorical variables included Gender, Marital status, Relationship to child, Employment Status and Ethnicity.

For the data collected in Section B, variables for each household substance was created, and then grouped into categories as per poisons classification defined by the South African Medicines Formulary, 12th edition (Rossiter, 2016). Substances were classified into drug-chemicals and non-drug chemical categories, with the non-drug chemical category further classified into three sub-categories (irritants and corrosives, general non-drug chemicals and pesticides). Please refer to Appendix J for the grouping of substances into categories.

Categorical variables included the presence of a substance and the occurrence of poisoning, and the management of a poisoning.
Level of storage of the substance was classified as an ordinal variable.

The last section of the questionnaire, comprised of categorical variables. These included Contact person in case of a poisoning, Contacting Poison Information Centres, Knowledge of Poison Information Centres and Usage of the Internet.

Descriptive statistics were determined for categorical variables, and were presented through the use of bar graphs, pie charts and tables.

Inferential Statistics were applied to test the association between categorical variables, by using Pearsons chi-square tests. A p-value of <0.05 was

considered significant, and when the assumptions of chi-square were not met (observations less than 5) the Fishers exact test was used.
Significant values obtained were then inserted into a logistic regression model to test for any associations between the variables.

The open-question included at the end of the survey, was analysed through content analysis, following the process of initial reading, coding, deriving categories and themes. A detailed explanation of the qualitative analysis used will be described in section 3.5 to follow.

3.5 Phase Two – Qualitative Phase

The Central research question (CRQ) of the qualitative phase of the study was,

To qualitatively explore the local practice of healthcare practitioners regarding accidental childhood poisoning.

The following three objectives were set to facilitate answering the central research question:

- to establish the types of accidental poison cases healthcare practitioners encounter and the frequency of such cases
- to identify the management protocol healthcare practitioners follow
- to elicit their views of how accidental poisoning cases could be:
    c. better managed by healthcare practitioners
    d. reduced in the community

A qualitative approach was used to gain insight into the local practice of community healthcare practitioners of Lenasia. The qualitative research approach, underpinned by the interpretive and naturalistic approach, attempts to understand a phenomenon unfolding naturally in its environment (Patton, 2002), by interpreting the meaning of the factual descriptions based on the individual experience of the participant.

Guided by the principles of the consolidated criteria for reporting qualitative research (COREQ) checklist (Tong *et al*., 2007), the following section will report on the qualitative component of this study.

3.5.1 Researcher disclosure

The first domain of the COREQ checklist, describes the importance of disclosure of the researcher, to account for any undesirable bias in the outlook of the research, adoption of methods, data analyses and reporting of the findings (Malterud, 2001). All interviews were conducted by the researcher for the completion of her masters degree. To be adequately prepared for the interviews, the researcher attended various qualitative workshops to understand the nature of qualitative research, gain skills in interviewing and qualitative analysis. The researcher is from Lenasia, the suburb in which the interviews were conducted and understands the dynamics of the community, in terms of access to medical facilities. As a result the researcher is familiar with some of the health practitioners practising in the area and their patient demographics. The participants were briefed with the background of the researcher, and understood the purpose of the research in light of the interests of the researcher.

3.5.2 Study Design

The qualitative method used in this study was semi-structured, face-to-face, audio recorded interviews. Interviews allowed the participants to focus and delve into the topic as the conversation gained momentum and rapport was established. Furthermore it allowed the researcher to gain clarification on particular answers, all the while eliminating the need of answering in a copious written manner.

Two methods of qualitative data collection were employed:

1. Audio-recorded semi-structured interviews

2. Ethnographic observations recorded in a field journal

3.5.2.1 Methodological Rigour

The trustworthiness (Lincoln and Guba, 1985) and integrity (Tobin and Begley, 2004) of data and reported findings emanating from qualitative research encompasses the term rigour. Rigour in research is achieved through the transparent detailing of the due processes during the data collection and analysis process. Explicitly unfolding these steps, builds on the credibility and augments the trustworthiness and integrity of the study (Morse *et al*., 2002). Lincoln and Guba (1985) suggest the inclusion of four established criteria as steps to attaining trustworthiness. In contrast, Morse *et al* (2002) critiques this viewpoint, as the criteria are imposed post-data collection and therefore lack strategies of rigour during the phases of data inception and collection. They stress the fact that rigour should be maintained throughout all stages of the research process through intuitive 'investigator responsiveness' and present various techniques of attaining validity and reliability in qualitative research (Morse *et al*., 2002)

While there is no concrete and agreed method among scholars regarding attainment of rigour or research integrity, the researcher incorporated techniques of both scholarly views in an attempt to maintain research integrity throughout the process. By comparing the two scholarly views and building on the strengths that each proposes, a combined method approach was utilised and is illustrated in Figure 3.4.

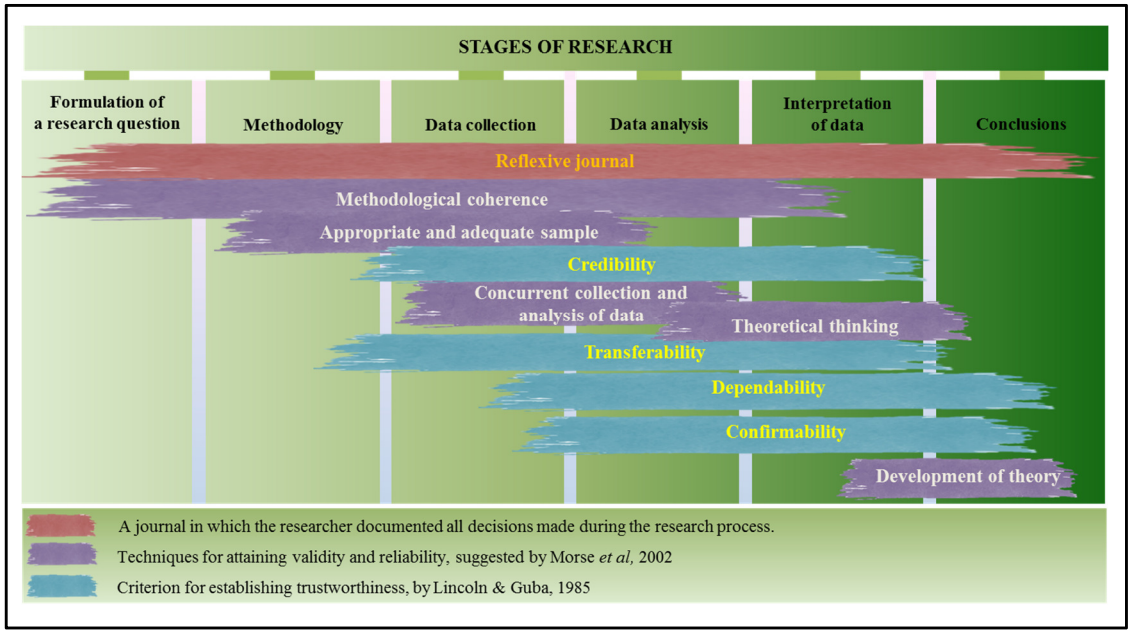

Figure 3.4 Outline of techniques available to ensure rigour during qualitative research

Implementation of validation techniques

Throughout the research process, the researcher applied the techniques mentioned in the figure above, to establish rigour. A brief outline of the implementation of these techniques is provided in the following table. A reflexive journal documenting all decisions of the research process was kept by the researcher.

Table 3.2 Validation techniques implemented to establish rigour, defined by Lincoln and Guba, 1985 and Morse *et al*., 2002

Technique	Method of Implementation
Methodological coherence - ensuring a match or fit between the research question, the chosen methodology to answer the research question and subsequent data analysis techniques.	Throughout the research process, the central research question (CRQ) and aims and objectives of the study were regularly referred to, to ensure that the manner in extracting information (methodology and data analysis) was coherent in answering the CRQ. This was an iterative process.
Appropriate and adequate sample - Sampling participants who are knowledgeable and experienced in the research topic, will contribute to attaining effective saturation of data, rich in quality. Adequacy of the sample is deemed sufficient through saturation and replication of data, counterbalanced by negative cases.	Healthcare practitioners who encounter accidental childhood poisoning cases in their daily practice were included in the study (general practitioners and pharmacists), through *comprehensive sampling*. Even though other practitioners such as dentists and physiotherapists, may be knowledgeable of such cases, they do not consult with such cases in their daily practice. The adequacy of the sample is evident through the saturation of data obtained through the semi-structured interviews.
Credibility - Assessing 'the fit' between the data and the description or representation of it. Achieved through prolonged engagement, persistent observation, and triangulation, peer debriefing, negative case analysis, referential adequacy and member checks.	Assessing the field of practise upon each visit to the various practices contributed to the ethnographic observations of this study. This engagement provided an insight into the factors influencing the practice of such healthcare practitioners. Variations among practices provided depth into the nature of these influencers. Through peer debriefing and member checks with the supervisor, regular reporting was maintained to ensure consistency among interviews, agreement of coding and emergence of themes, thereby maintaining objectivity and reducing the inherent bias of the researcher. The emergence of negative cases provided the grounding for anomalies arising in light of the data collected.
Concurrent collection and analysis of data and Theoretical thinking - Continually analysing data during the collection phase keeps the researcher abreast of the ideas developing and directs the course of the research, by identifying repetitions and negative cases emerging in the data.	After each interview was conducted, it was transcribed and field notes were included, to ensure the full context of the interview was represented. Interviews were also staggered, allowing for the researcher to be immersed in the data, transcript by transcript. This process allowed for the emergence of ideas, verification of new ideas against previous ideas, and assisted the researcher in refining the questions for the remaining interviews.
Transferability - Applicability of the data and generalizability is achieved by providing a 'thick description' - a detailed account of the field experience, participants and social and cultural relationships of the study site.	Detailing the demographics of the study site, the composition of its residents and health practitioners, as well as standardizing the questions utilised during the interview process, allows for the transferability/ replicability of the study
Dependability - The reliability of the study and its findings is traced through auditing. Through the use of a reflexive journal, wherein the researcher documents decisions about each step of the research journey, one is able to authenticate the logical process followed and the decisions supporting it.	The researcher documented all steps of the research process in a reflective journal. All thoughts of the research, ideas emerging from interviews, memos documented through coding, and decisions supporting progression through all phases of the research the process were documented.
Confirmability - to demonstrate that the 'interpretations of findings are not a figment of imagination'	Through the reflective journal, detailed decisions of the processes of data collection and analysis along with peer debriefing and member checking, eliminate bias and increase neutrality, thereby increasing confirmability.

3.5.2.2 Research Site

In keeping with the focus of a case-study of a particular area, and building on the aforementioned demographic situation of Lenasia, healthcare practitioners practising in Lenasia were interviewed. These healthcare practitioners practise independently in residential settings, or within shopping complexes in close proximity to the core centre of Lenasia, while others are located on the periphery of Lenasia, in close proximity to informal settlements (See circles in Figure 3.5). Some practices operate by appointment only, while others operate via-a walk in first-come, first-serve system. In addition, some practices are open either only during the morning or afternoon.

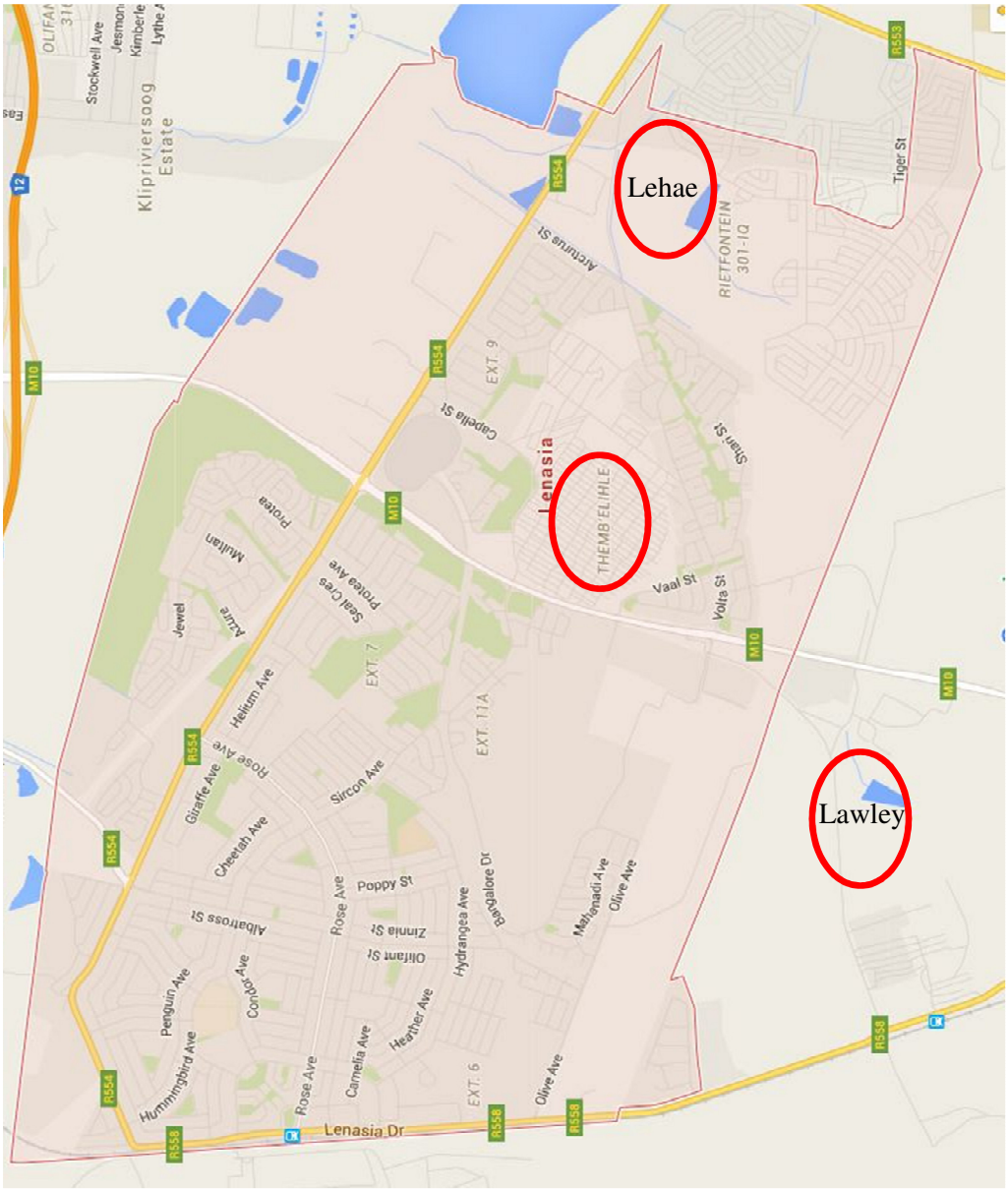

Figure 3.5 Map of Lenasia and surrounding informal settlements.
Map republished with permission from Google fair use policy – see Appendix P

3.5.2.3 Participants

Healthcare practitioners were incorporated into the study design, as both pharmacists and general practitioners form an integral part of the chain of management in the case of accidental poisonings. Many cases of accidental

poisonings are saved from emergency room visits owing to healthcare practitioners' immediate care. Previous studies of accidental childhood poisoning in South Africa have not been explored from the perspective of healthcare practitioners. In addition, the pharmacy or medical practice environment is an ideal platform for disseminating important information about the prevention and management of poisoning, as healthcare practitioners provide an advisory service regarding various medical aspects

All general practitioners and pharmacists practising in Lenasia were approached to participate in the study. These two groups of healthcare practitioners were selected through the process of 'purposeful sampling' (Patton, 2002) to obtain depth and richness in the emanating data. There are currently 15 general practitioners and 10 pharmacists practising in Lenasia. A total of 10 healthcare practitioners (see Table 3.3) consented to participate in the study. For clarity, details of healthcare practitioners consenting/ declining to participate are detailed below, and their demographic details are presented in Table 3.4.

Exclusion criteria:

a. Healthcare practitioners who were in practice for less than 6 months

Table 3.3 List of healthcare practitioners consenting / declining to participate in the study

Category of participant	Consent to participate	Reason for declining to participate
Pharmacists (11)		
Pharmacist 1	✓	
Pharmacist 2	×	Has not seen poisoning cases in a while
Pharmacist 3	×	Has not seen poisoning cases in a while
Pharmacist 4	×	Has not seen poisoning cases in many years, as business has been 'slow' due to the establishment of newer pharmacies
Pharmacist 5	✓	
Pharmacist 6	✓	
Pharmacist 7	✓	
Pharmacist 8	✓	
Pharmacist 9	✓	
Pharmacist 10	✓	
Pharmacist 11	×	Too busy to participate, did not wish to contribute
General Practitioners (15)		
GP 1	✓	
GP 2	×	Too busy to participate
GP 3	✓	
GP 4	×	Does not attend to poisoning cases and therefore cannot contribute to the study
GP 5	✓	
GP 6	×	Has not seen poisoning cases in a while
GP 7	✓	
GP 8	×	New in practice and has not seen any poisoning cases
GP 9	×	Works by appointment only, and refers all cases to the emergency room
GP 10	×	Only practices for two hours in the morning and does not see any poisoning cases
GP 11	×	Is mostly at the hospital and does not see any cases
GP 12	×	New in practice and has not seen any cases
GP 13	×	Declined participation
GP 14	×	Declined participation
GP 15	×	Declined participation

Table 3.4 Demographic details of participants

Gender	Professional qualification	Years in practice
Female	BPharm	21
Female	BPharm	13
Male	BPharm	33
Male	BPharm	40
Male	MBBcH	13
Male	BPharm	28
Male	BPharm	31
Male	MBBcH	46
Male	MBBcH	26
Male	MBBcH	44

3.5.2.4 Pilot study for interviews

A pilot study was conducted among three pharmacists prior to the interview process, to gauge the effectiveness of questions asked in the interview schedule. Questions were fairly answered, and deemed appropriate for continuation of the study. One participant from the pilot study was excluded, as she was working for the first day in Lenasia. Data emanating from the remaining two interviews conducted during the pilot study were included in the findings as the participants met the inclusion criteria and none of the questions were modified for the study.

3.5.2.5 Data Collection Procedure

Qualitative data collection took place over a two-month period. The staggering of interviews over this period enabled transcription to take place post each interview, and allowed the researcher to reflect upon the interviews, and conduct preliminary data analysis as the interviews progressed.

Audio-recorded interviews

Face-to-face audio recorded interviews guided by an interview schedule of predetermined semi-structured, open-ended questions (Britten, 1995) formed the basis of the qualitative component of the study. All interviews were performed in the healthcare practitioners practice, without any non-participants in the interview room. Questions were constructed to elicit various types of information pertinent to the central research question, by utilising the guide of Pattons six-types of questions to ask in an interview (Patton, 2002). This ensured that information elicited from the participant encompassed the constructs of background information, knowledge, coupled with opinion/beliefs and personal experience. Please refer to Appendix K for the list of predetermined open-ended questions used in this study.

The researcher personally approached each health practitioner in Lenasia and invited them to participate in the study. A brief synopsis of the study was verbally provided, accompanied by a letter describing the premise of the study and an Informed Consent form for their perusal. Please refer to Appendix L for a copy of the Informed Consent Form and Participant Information sheet. The reason for inviting the health practitioners in person by the researcher was

to provide an immediate face to the study and pave the road of establishing rapport between the interviewer and interviewee. Rapport is an essential characteristic to establish during interviewing and is defined as the process of building trust within a safe environment, thereby ensuring the safety and confidentiality of the information shared by the participant (DiCicco-Bloom and Crabtree, 2006). An in-person approach, enabled health practitioners to understand the purpose of the study and gain clarity in any aspects that were not understood. Participants were under no pressure to immediately provide their consent or decline to participate in the study. They were allowed time to think about participating and were given the option to contact the researcher, if they wished to participate.

The number of interviews conducted per week varied, according to the appointments scheduled by the healthcare practitioners. In some instances, the interviews took place immediately upon meeting the healthcare practitioner, in other instances, follow up appointments were scheduled. No more than four interviews per week were conducted. Interviews lasted between 10-20 minutes, depending on the nature of the participant to provide information.

Before the interview began, participants were required to sign the informed consent form which indicated their understanding of the research motives, voluntary participation and agreement to dissemination of data and findings emerging from the study. In addition, they were requested to sign a second consent form, consenting to be audio-recorded. The researcher then also signed the consent forms in front of the participant. Participants were informed again about their voluntary participation, guaranteed confidentiality, the right

to remove themselves from the study at any given time, and were asked if they had any questions to ask before the interview began.

Before commencing with the interview, the audio-recorder was tested for suitable functionality and speaker quality. Once the recorder was switched on, participants were asked again whether they consented to participate in the study, and once approval was given, the interview formally began. Through the progression of the interview, important concepts were mentioned by the participant, key-words were noted and follow up questions were asked to clarify and elaborate on these concepts. As the interview reached closure, participants were asked if they had any further information to provide in relation to the study, and were subsequently thanked for participating in the study. Upon conclusion of the interview, a study number was assigned to the interview schedule. The list linking the participant names to their study numbers was stored in the department in a password protected file. Only the researcher and supervisor, had access to these documents. Meta-data pertaining to the interview were documented, such as location, date and time of commencement and conclusion of the interview. Audio-recordings and data transcripts were securely stored according to the guidelines of Health Professionals Councils for South Africa (Appendix M).

Ethnography

Rooted in social anthropology, ethnography is a qualitative method that focusses on the meanings embedded in a participants actions or spoken word in context of their everyday environment (Savage, 2000). In healthcare settings, ethnography offers cross referencing in organisational systems by

comparing the actions of people in relation to what they say (Savage, 2000). The ethnographic observations of the daily environment and information displayed in pharmacies and medical practices formed a small component of this study. During visits to the various pharmacies and medical practices, a reflexive journal was kept by the researcher, in which field notes detailing ethnographic observations of the environment and process of medical encounters were documented. These observations were used to supplement the findings emerging from the semi-structured interviews.

3.5.3 Data analysis

Analysis of qualitative data comprised three phases, with the first two phases further sub-divided into three and two steps respectively as depicted in Figure 3.6 below.

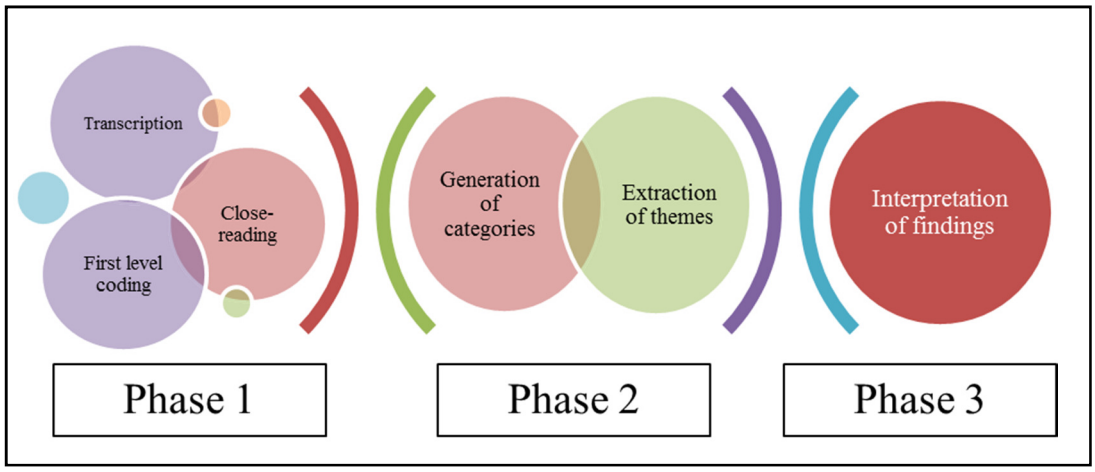

Figure 3.6 Schematic representation of the qualitative data analysis phases

3.5.3.1 Phase 1

Transcription

All transcription was performed by the researcher. Transcription and preliminary data analysis took place concurrently with the data collection. As interviews were completed, transcription ensued immediately, and preliminary data analysis began. This enabled an "emergent understanding" (DiCicco-Bloom and Crabtree, 2006) of the data in relation to the research questions. Audio-recordings were downloaded and labelled with their corresponding participant study number. The audio-recordings were transcribed verbatim, to ensure that all exclamations, hesitations and thought provoking moments were captured. The Philips SpeechExec Pro Transcribe v.7.1 software was used to assist in accurate transcription. Thereafter transcripts were read through twice to ensure congruency with the audio-recordings.

Close-reading

Each transcript was read 'closely' several times to attain an understanding of what was said, in light of the objectives set out to meet. The close reading step practised by (Miles and Huberman, 1994) allows for interaction with the data, thereby obtaining an apparent feel for the emerging content (De Wet and Erasmus, 2005). It allows the researcher to be fine-tuned with what is being said, by paying attention to commonalities emerging from the data while keeping an eye for the surprise deviations. The ability to delve into data with an open mind, able to exercise insight and flexibility is the strategy termed by (Morse *et al*., 2002) as 'investigator responsiveness'. Investigator responsiveness is a necessary element in ensuring reliability of the study.

Thematic content analysis underpinned the close reading process. This was the chosen principle of analysing the data. Thematic content analysis is an analysis tool utilised in qualitative research that seeks to identify the underlying themes that string together the most significant findings emerging from the data (Dey, 2003). All coding was performed by the researcher without the use of any software.

First level coding

Also referred to as Open-coding, this step is the beginning of coding, by splitting up the raw data into codes (Saldaña, 2009).Codes are words or phrases that succinctly represent a larger body of language data or visual data (Saldaña, 2009). Using an inductive analysis strategy (data-driven) (Patton, 2002), codes were constructed based on the data and ideas emerging from the data. Coding categories were defined to contain specific features thereby streamlining the process of aligning data with the correct code. The process of coding allows for the establishment of links amongst various segments in the data (Coffey and Atkinson, 1996). The resulting data fragmentation (Dey, 2003) and data reduction, was key to identifying the broader categories that encompass the codes, as coding not only reduces the data, but also expands the data, thereby 'opening them up' for further interrogation (Coffey and Atkinson, 1996). Each transcript was analysed and coded in totality before proceeding to the next transcript, in an effort to maintain quality control integrity and minimising the cross- over of ideas between transcripts (De Wet and Erasmus, 2005). Engagement in peer-debriefing with the supervisor during the analysis

phase allowed for discussion of ideas and preliminary assumptions emerging from the data, thereby reducing bias, and building on credibility (Creswell and Miller, 2000).

3.5.3.2 Phase 2

Generation of categories

The second phase of the analytical process involved the assemblage of codes into broader categories by engaging in second- level coding. Codes representing similar ideas were grouped together into second level codes. A cluster of similar ideas emerging from second level codes were then morphed into sub-divisions within broader categories. Categories were developed during the data analysis process, and were representative of a set of codes characteristic of similar ideas and relatable concepts (McMillan and Schumacher, 2014). The development of categories linked together various codes across the data set. Figure 3.7 below, illustrates the process of grouping codes into categories.

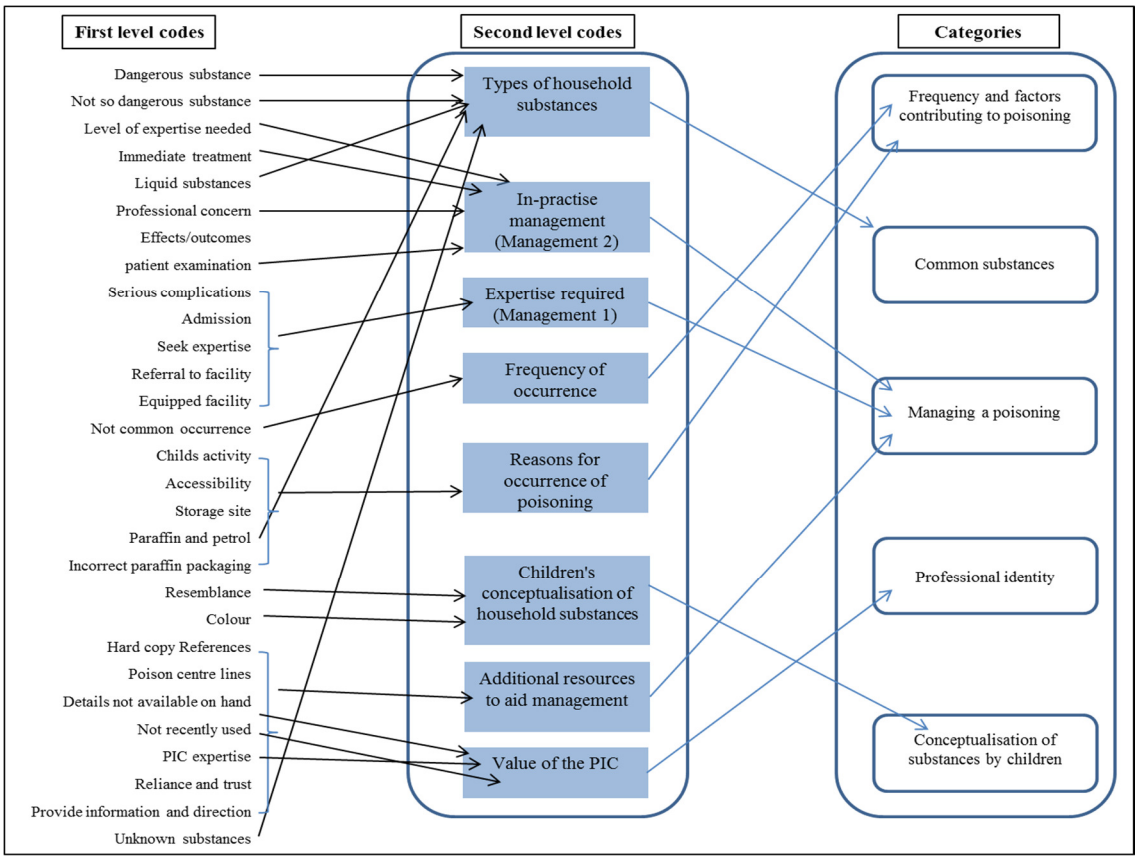

Figure 3.7 Extract of the development process of second level codes and categories from first level codes

Extraction of themes

The final product of coding and categorisation is the emergence of themes. Themes are defined as the 'core meanings' discovered through the analysis (Patton, 2002). The creation of a theme is a means of stringing together discrete meanings of categories (Graneheim and Lundman, 2004)

Themes were constructed according to the common responses of participants with regards to occurrence of accidental poisoning cases among children, factors contributing to accidental poisoning, management of poisoning cases, compliance with medicine-taking instruction and conceptualisation of

medication and household products, professional identity of the healthcare professional and awareness and education.

These themes provide insight into the current situation of childhood poisonings in an urban environment.

As transcripts were analysed, codes and categories were developed and underlying themes emerged, until no new categories or themes were identified. At this point, saturation was reached. In this study, saturation was reached after eight interviews.

Following the analysis process, each transcript was summarised exposing the key matters emerging from the interview.

3.5.3.3 Phase 3

Interpretation of the findings as a result of the preceding two phases will be presented in the findings section to follow in Chapter 5. These findings will be supported with text quotes from the participants.

An in-depth description of the methodologies utilised during this study has been outlined in this chapter. The mixed-method design, was comprehensively defined to provide insight into the background theory of the quantitative and qualitative components of the study and analysis methods utilised. In the chapter to follow, the results of the quantitative phase will be presented, followed by the findings emanating from the qualitative component of the study.

Chapter 4 RESULTS

Chapter Four provides the results of the data collected through the self-administered survey of the quantitative phase of study. Results of the descriptive analysis applied to the data set will be presented in the following order:

1. Demographics of the respondents who filled out the self-administered questionnaire
2. Frequencies of commonly stored household substances and their level of storage
3. Number of poisoning cases reported in association with their level of storage, and the management response of parents/guardians of such situations
4. Insight of parents into the existence of PIC'S, by reporting on their use and knowledge of PIC's

Following the results of the descriptive statistics, results from the application of inferential statistics will be presented. Data was imported from Excel 2010 into Stata V.13, to determine the relationship between factors associated with:

a) the occurrence of a poisoning
b) categories of substances related to reported poisoning cases

Comparisons between categorical variables were tested through the use of the Pearson Chi squared statistic or Fishers exact (when observations were less than 5), and statistical significance was set at $p< 0.05$. Significant values were then entered into a logistic regression model to test the association between variables. The chapter will conclude with a summary of the results.

Response Rate

A total of 4530 questionnaires were distributed to parents/guardians of children under the age of 12, and 1812 (40% return rate) were returned. From this amount, 82 (1.8%) were not completed in entirety resulting in exclusion, and 1730 were returned completed (38.2% response rate).

4.1 Description of the respondent profile

Demographic information of respondents was collected in Section A of the survey. The following results provide an overview of the respondents who returned completed surveys. Of the total number of respondents (n=1730), 1300 (75%) were females and 430 (25%) were males. The average age of the respondents was 37.4 years ± 7.12, with the youngest respondent aged 20 years and the oldest aged 76 years. Additional demographic markers were analysed and their frequencies are summarised in the following Table 4.1.

Table 4.1 Demographic profile of respondents (N=1730)

	N=1730	%
Gender		
Male	430	24.9
Female	1300	75.1
Marital Status		
Married	1305	75.4
Single	313	18.1
Divorced	75	4.3
Widowed	29	1.7
Undisclosed	8	0.5
Relationship to Child		
Father	418	24.2
Mother	1220	70.5
Guardian	91	5.3
Undisclosed	1	0.1
Ethnicity		
Indian	948	54.8
African	719	41.6
Coloured	48	2.8
White	2	0.1
Undisclosed	13	0.8
Ages of children represented through respondents		
0-5 (attending crèche)	208	87.0
6-12 (attending primary school)	1505	12.0
Undisclosed	17	1
Employment status of Mother		
Unemployed	106	6.1
Employed	812	46.9
Home executive	538	31.1
Not applicable	107	6.2
Undisclosed	167	9.7
Employment status of Father		
Unemployed	42	2.4
Employed	1246	72.0
Not applicable	217	12.5
Undisclosed	225	13.0

As seen in Table 4.1, 75.4% of the respondents were married, with single-parent families comprising the remaining 24.1%. Over half (54.8%) of all respondents were of the Indian ethnic group, with 41.6% of respondents being African, and just under 3% of respondents representing the coloured and white minority ethnic groups of the selected sample area. Less than 50% of the mothers were employed, with 37.2% of mothers reported to be unemployed or stay at home mothers. A total of 15.9% (n=174) mothers employment status was unknown.

More than one-third (72%) of fathers were employed, 2.4% were unemployed, while the employment status of one-quarter (25.5%) of fathers was unknown.

4.2 Profile of household substances

The first half of Section B of the self-administered survey collected data regarding the presence and storage of common hazardous household substances and the level at which these substances were stored, which provided insight into the storage practices of parents/guardians.

4.2.1 Presence of household substances stored

A total of 24 588 substances were stored amongst the 1730 respondents, averaging approximately 14.2 hazardous substances per household. Drug chemicals (n=9376) comprised of 38% of the substances, followed by irritants and corrosives (n=6912) 28.1%. Less than one-quarter (24.4%) of substances were general non-drug chemicals (n=6005) with pesticides (n=2295) being the least stored substance accounting for 9.3% of all substances, as depicted in the following Figure 4.1.

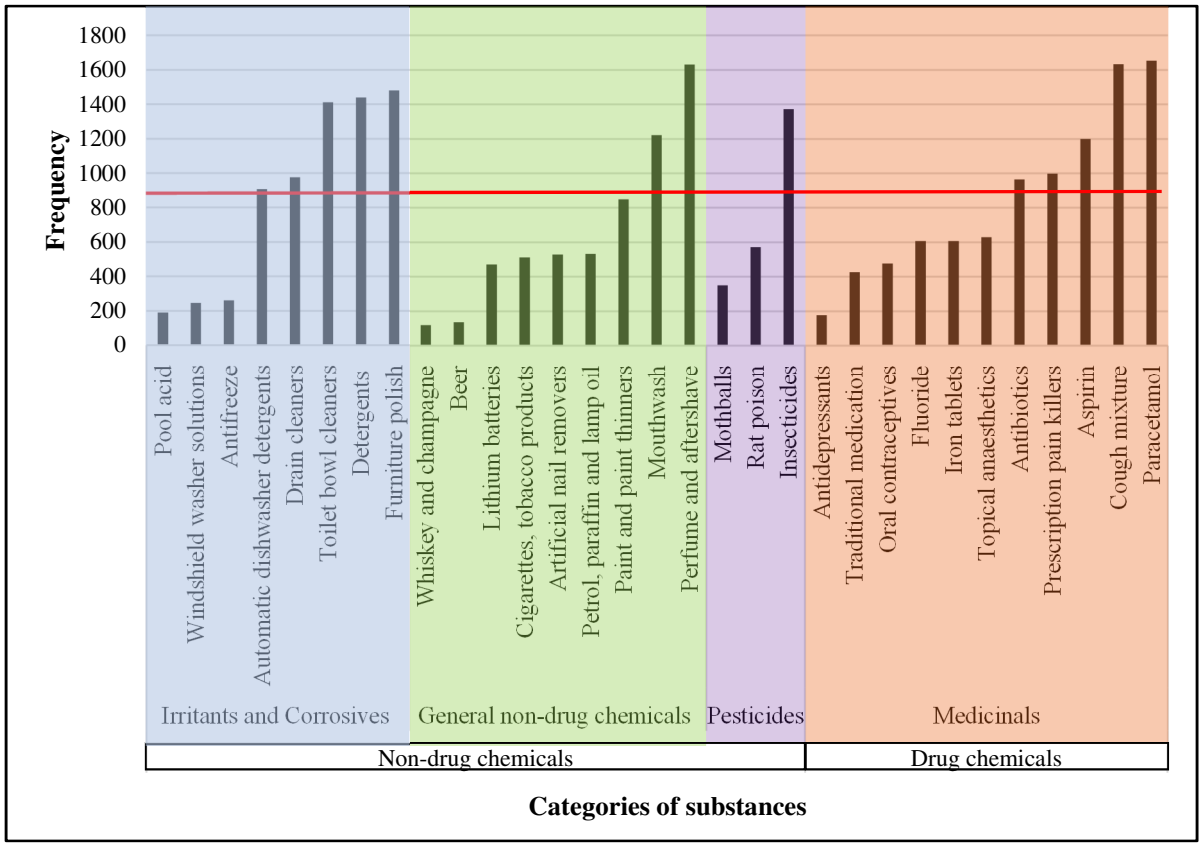

Figure 4.1 Frequency of substances stored in the household per category

From the above figure, the most commonly stored substance was paracetamol (95.6%), followed closely by cough mixture (94.5%) and perfume and aftershave (94.3%). The least common substances stored included alcoholic beverages (6.9% and 7.9% for whiskey and champagne and beer respectively), pool acid (11.0%) and antidepressants (10.3%). More than 50% of the respondents reported storing 12 or more substances, with medicinals and irritants and corrosives being the most frequently stored items.

4.2.2 Storage level of household substances

Storage levels of the substances were divided into three levels, with *Very easy* indicating that the item was in open reach of the child, *Easy* indicating that the item may be slightly elevated or behind a door, but was accessible to the child through an aid, and the third level *Difficult* indicating that the child was unable to reach the item as it was out of reach in a locked cupboard.

In Table 4.2 to follow, the number of stored substances is presented alongside the level of storage to provide an overview of the storage practices of parents/guardians.

Table 4.2 Presence of hazardous substances stored in the household and their level of storage

Substance	Stored in the household		Level of storage					
			Very Easy		Easy		Difficult	
	N	%	N	%	N	%	N	%
Irritants and Corrosives								
Pool acid	190	(11.0)	14	(7.4)	52	(27.4)	**124**	**(65.3)**
Windshield washer solutions	246	(14.2)	43	(17.5)	91	(37.0)	**112**	**(45.5)**
Antifreeze	261	(15.1)	48	(18.4)	70	(26.8)	**143**	**(54.8)**
Automatic dishwasher detergents	907	(52.4)	305	(33.6)	**354**	**(39.0)**	248	(27.3)
Drain cleaners	976	(56.4)	160	(16.4)	377	(38.6)	**439**	**(45.0)**
Toilet bowl cleaners	1412	(81.6)	393	(27.8)	**605**	**(42.8)**	414	(29.3)
Detergents	1440	(83.2)	472	(32.8)	**580**	**(40.3)**	388	(26.9)
Furniture polish	1480	(85.5)	534	(36.1)	**577**	**(39.0)**	369	(24.9)
Non-drug chemicals								
Whiskey and champagne	120	(6.9)	18	(15.0)	50	(41.7)	**52**	**(43.3)**
Beer	137	(7.9)	32	(23.4)	**61**	**(44.5)**	44	(32.1)
Lithium batteries	471	(27.2)	121	(25.7)	**184**	**(39.1)**	166	(35.2)
Cigarettes, tobacco products	512	(29.6)	172	(33.6)	**207**	**(40.4)**	133	(26.0)
Artificial nail removers	529	(30.6)	157	(29.7)	**187**	**(35.3)**	**185**	**(35.0)**
Petrol, paraffin and lamp oil	532	(30.8)	67	(12.6)	154	(28.9)	**311**	**(58.5)**
Paint and paint thinners	850	(49.1)	97	(11.4)	239	(28.1)	**514**	**(60.5)**
Mouthwash	1222	(70.6)	**540**	**(44.2)**	467	(38.2)	215	(17.6)
Perfume and aftershave	1632	(94.3)	621	(38)	**643**	**(39.4)**	368	(22.5)
Pesticides								
Mothballs	351	(20.3)	47	(13.4)	118	(33.6)	**186**	**(53.0)**
Rat poison	571	(33.0)	45	(7.9)	111	(19.4)	**415**	**(72.7)**
Insecticides	1373	(79.4)	319	(23.2)	**612**	**(44.6)**	442	(32.2)
Drug-chemicals								
Antidepressants	178	(10.3)	23	(12.9)	52	(29.2)	**103**	**(57.9)**
Traditional medication	427	(24.7)	70	(16.4)	**183**	**(42.9)**	174	(40.7)
Oral contraceptives	477	(27.6)	65	(13.6)	159	(33.3)	**253**	**(53.0)**
Fluoride	607	(35.1)	222	(36.6)	**252**	**(41.5)**	133	(21.9)
Iron tablets	608	(35.1)	90	(14.8)	**264**	**(43.4)**	254	(41.8)
Topical anaesthetics	630	(36.4)	142	(22.5)	**274**	**(43.5)**	214	(34.0)
Antibiotics	964	(55.7)	150	(15.6)	378	(39.2)	**436**	**(45.2)**
Prescription pain killers	998	(57.7)	130	(13.0)	392	(39.3)	**476**	**(47.7)**
Aspirin	1199	(69.3)	202	(16.8)	**506**	**(42.2)**	491	(41.0)
Cough mixture	1634	(94.5)	322	(19.7)	**719**	**(44.0)**	593	(36.3)
Paracetamol	1654	(95.6)	294	(17.8)	**723**	**(43.7)**	637	(38.5)
Total number of products	*24 588*							

4.3 Reported poisoning cases

From the 1730 respondents to the survey, a total of 256 cases of poisoning were reported. As these cases are reported by the parent/guardian and not from a healthcare practitioner post-examination, the cases cannot be graded as per the WHO Poisoning Severity Score. As a result, for some cases it is unknown whether the child experienced a poisoning or an exposure. For clarity, *cases of poisoning/ incidents of poisoning* used in this context will refer to both poisonings and exposures.

In Figure 4.2 below, a breakdown of the 256 cases reported are presented in terms of the location of poisoning and categories of poisonous substances.

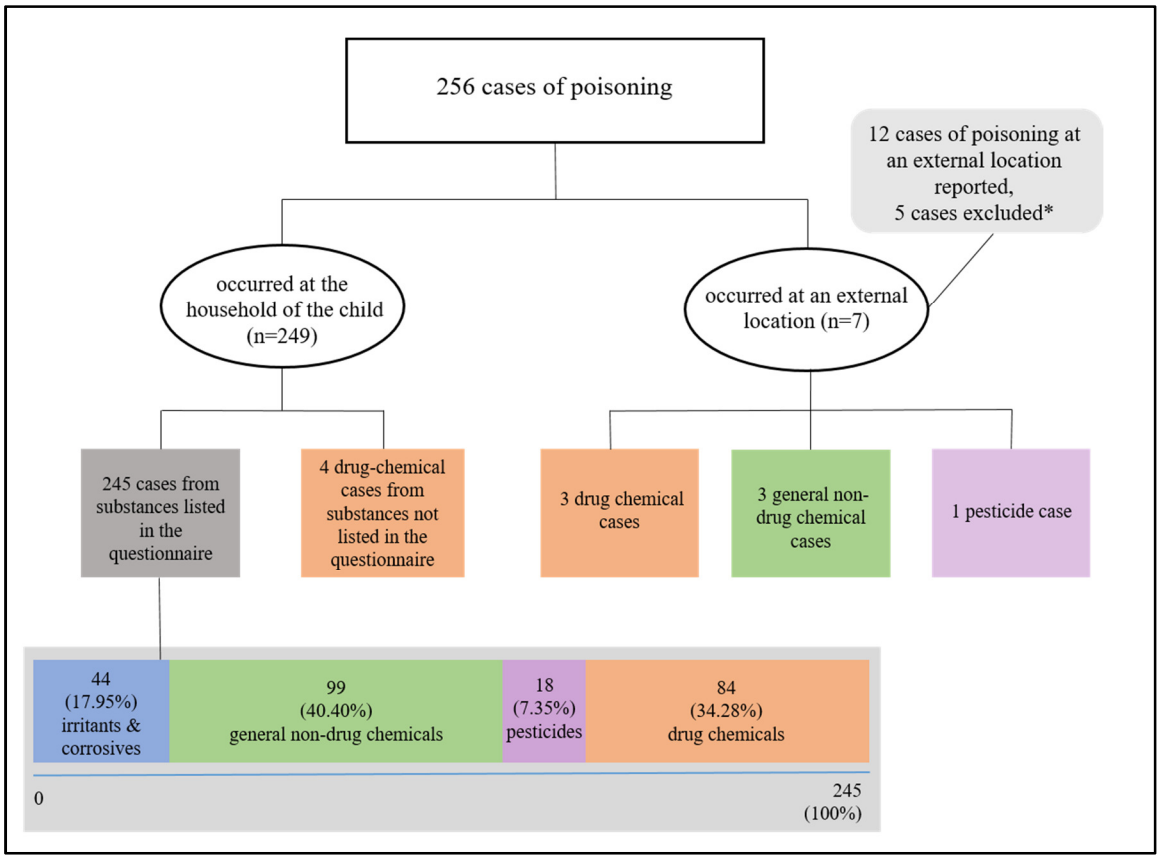

Figure 4.2 Reported cases of poisoning according to location and classification of poisoning substances

*The substance responsible was unknown in four of the cases, and one case was due to a spider bite.

Of the 256 reported cases, 249 (97,26 %) occurred in the immediate household of the child, with 7 cases (2,7 %) occurring in an external environment. A summary of the external poisoning cases, substances involved and management sort is provided in Table 4.3 below.

Table 4.3 Characteristics of poisonings occurring outside the household

Location	**Substance**	**Management**
Alternative Household	Antidepressants	Hospital with admission
Alternative Household	Cholesterol medication	First Aid
Alternative Household	Sleeping tablets	Consulted the doctor
Work	Rat poison	Unknown
Alternative Household	Methylated Spirits	Contact emergency medical services
Alternative Household	Perfume	First Aid
School	Silica packets	First Aid

Poisonings occurring in the household (n=249) consisted of a varying range of substances according to their substance classification, with four reported cases of drug-chemical substances (medicinals) not listed in the survey. These four substances included antihistamines, asthma medication, and ‘blood pressure’ tablets. As these substances were not part of the listed categories on the survey, their storage levels were unknown, and therefore will not be reported on in further analysis.

Of the total household poisoning cases (of substances as per survey list, n=245) general non-drug chemicals accounted for 99 (41%) of all cases, followed by drug-chemicals both western and traditional medicinals responsible for about one-third of all cases, 84 (34%). Irritants and corrosives composed of detergents and cosmetics were responsible for 44 (18%) of all cases with pesticides accounting for less than one-tenth of all poisonings 18 (7%) (see Figure 4.3).

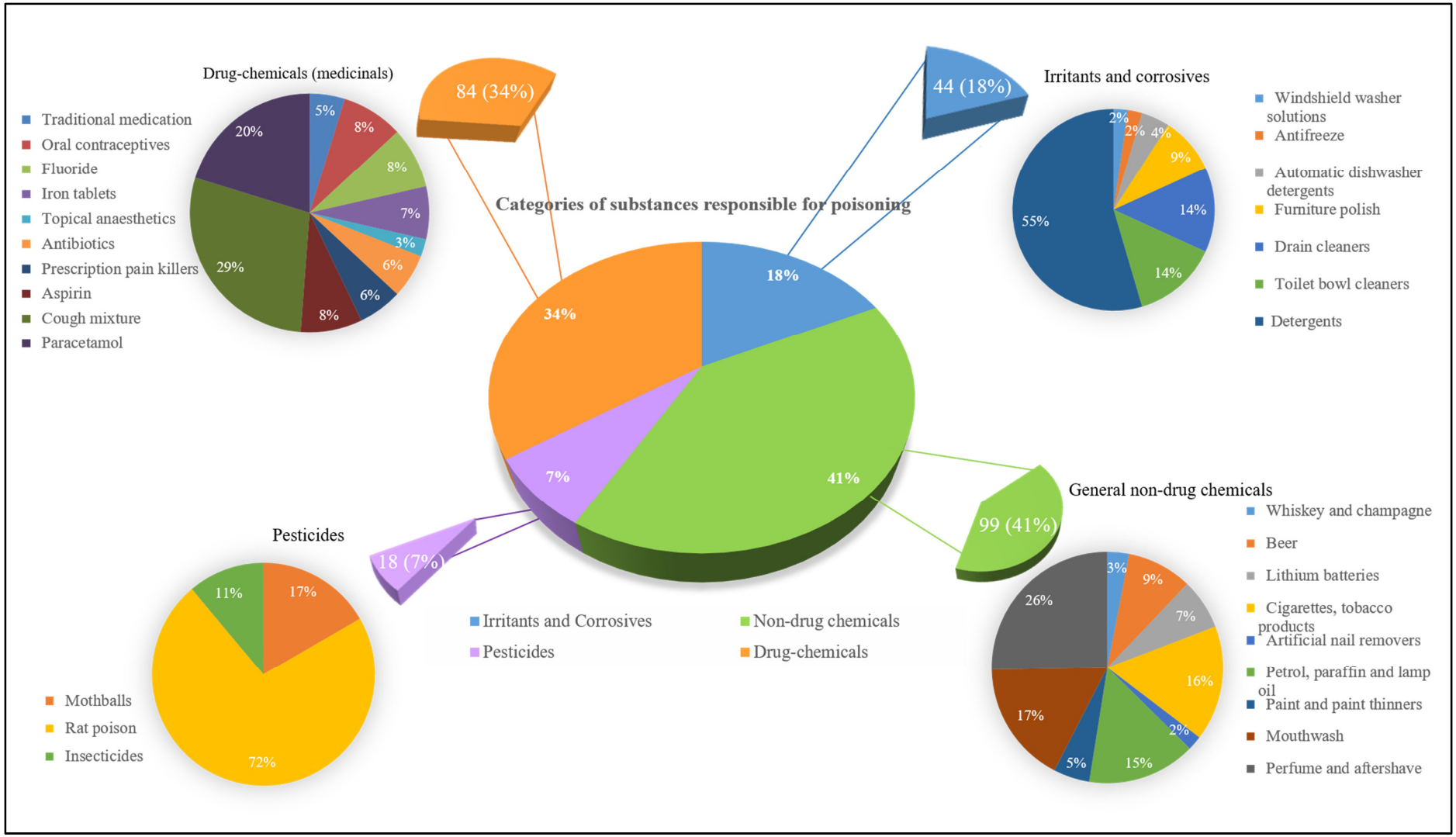

Figure 4.3 Inner pie chart - Schematic representation of frequencies of substances (categories) reported in poisoning cases (n=245) Outer pie charts – Schematic representation of frequencies of sub-categories within each category.

A comprehensive breakdown of the most common substances reported for each poisoning category (as depicted in the preceding Figure 4.3), will be presented in relation to its storage level within the household. Thereafter the response management followed by parents/guardians in such circumstances will be reported.

4.3.1 Irritants and corrosives

Of the eight listed irritants and corrosives subcategories, pool acid was the only substance not reported in a case of poisoning. Detergents accounted for more than half (55%) of all cases reported for irritants and corrosives, and was predominantly reported to be stored at a level accessible to children. In Figure 4.4 below, more than 20 respondents (80%) reported storing detergents at a level of access to the child, with only 4 respondents storing detergents at a *difficult* level, inaccessible to children.

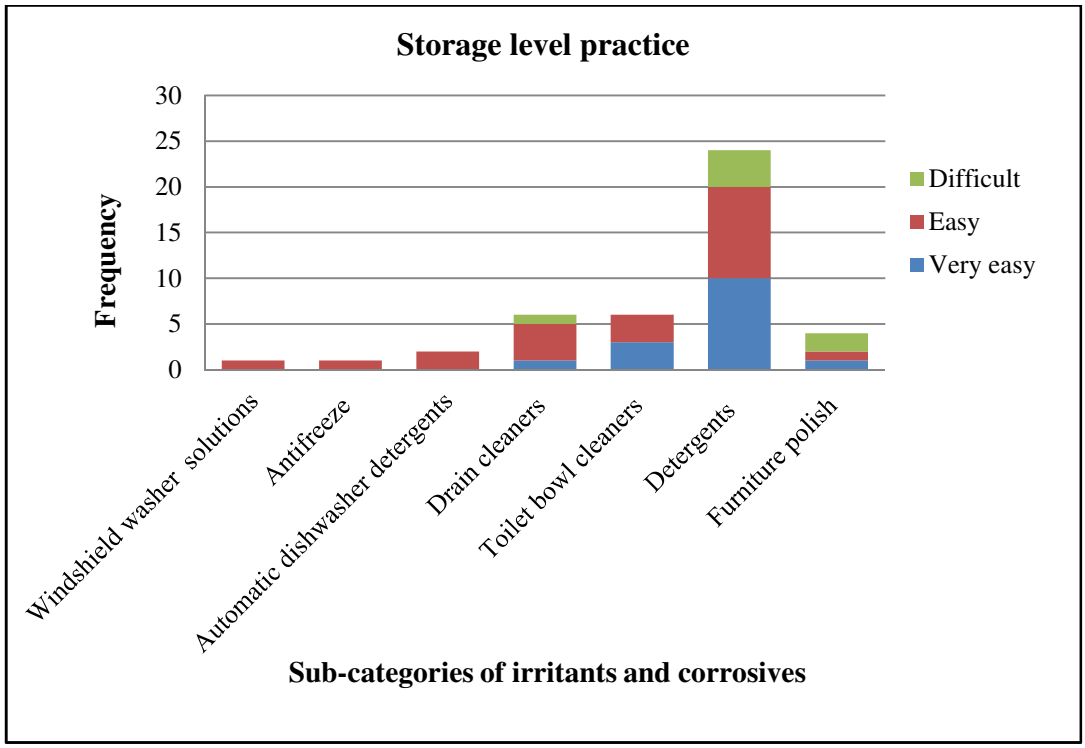

Figure 4.4 Household storage level practice of respondents reporting poisoning cases due to irritants and corrosives

Other commonly used household substances such as toilet bowl cleaners, furniture polish and drain cleaners accounted for over one-third of all cases (37%). Less commonly used irritants were responsible for the remaining 8 cases (8%). Other less common irritants and corrosives were found to be stored at a level accessible to children, with only three other respondents reporting safe storage for furniture polish and drain cleaners.

The respondents' management sort for the above mentioned cases comprised of various responses and is presented in Figure 4.5 below.

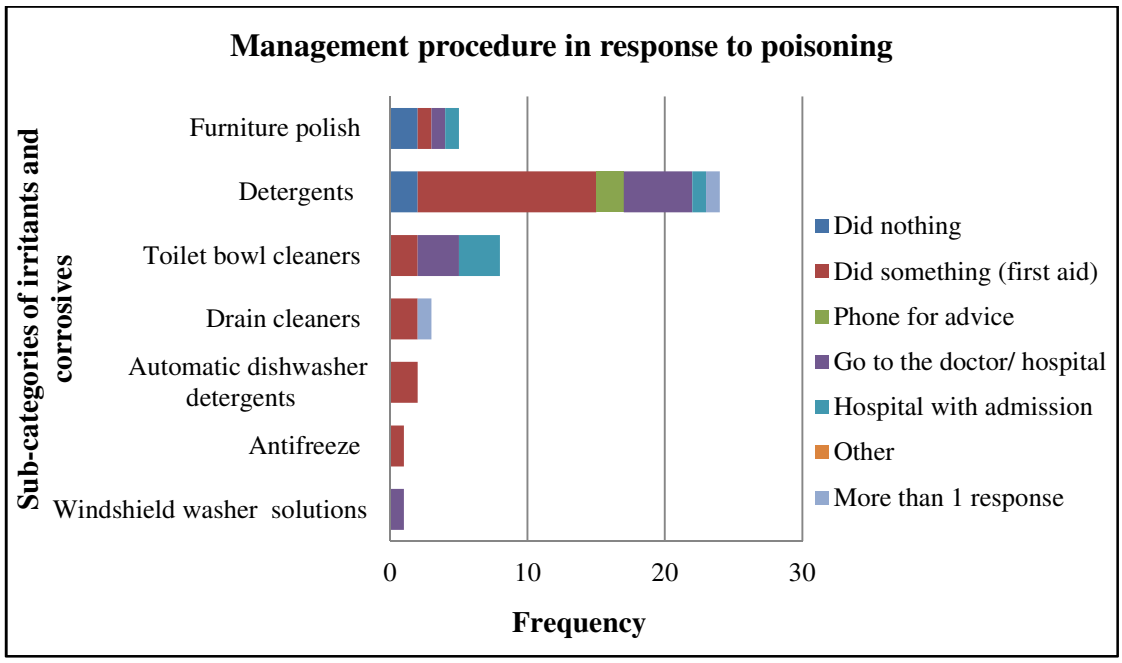

Figure 4.5 Response management of parents/guardians in reported cases of poisoning due to irritants and corrosives

The most commonly reported response to managing a poisoning case due to irritants and corrosives was performing first aid. This is evident from Figure 4.5 above, wherein first aid was administered in over half of all detergent cases (13 of 24 cases), as well as being the most common form of management for other substances within

this category. In total, first aid was performed in just under half of all irritant and corrosive cases (48%), followed by a visit to the doctor or hospital (23%). There were 5 cases (11%) of irritant and corrosive poisonings resulting in hospital with admission.

4.3.2 General non-drug chemicals

Of the 245 poisoning cases reported, 99 cases (41%) were due to general non-drug chemicals. Perfume and aftershave was responsible for 25 cases (26%), followed by 17 cases of mouthwash (17%) and 16 cases of cigarettes and tobacco products (16%) and paraffin accounting for 15 cases (15%).

In Figure 4.6 to follow, the storage levels of the reported substances are presented, indicating that the majority (84%) of substances within this category were reported to be stored at a level accessible to children (32% stored at a *very easy* level and 52% stored at an *easy* level), with only 16 respondents (16%) reporting storage of the substances at an inaccessible level.

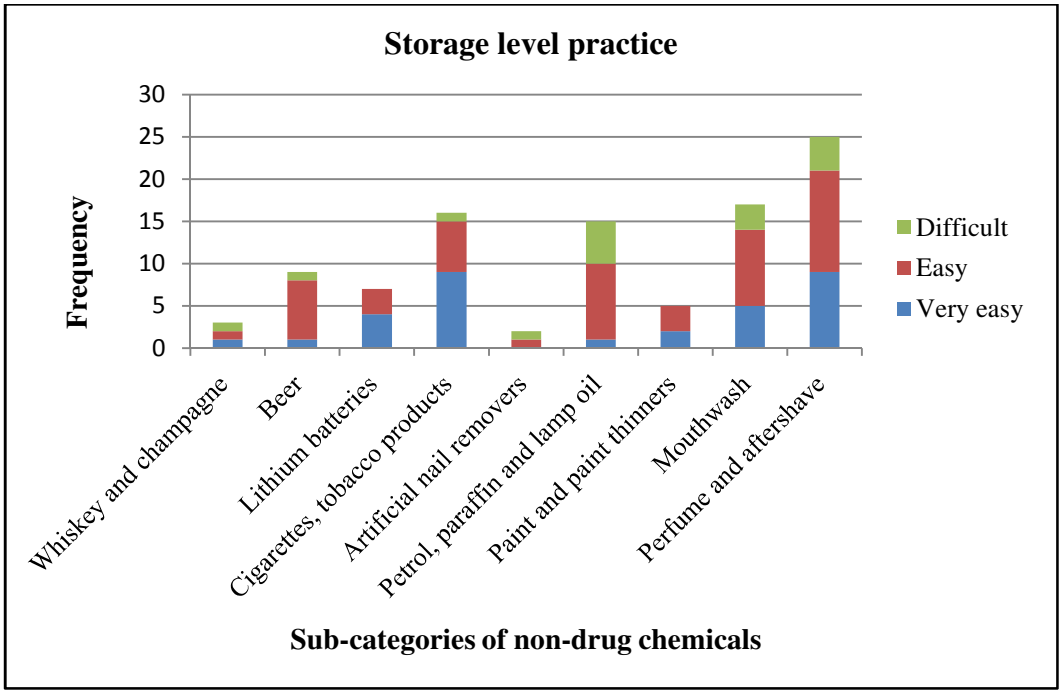

Figure 4.6 Household storage level practice of parents reporting poisoning cases due to general non-drug chemicals

The associated response management of parents/guardians in poisoning cases due to substances within the general non-drug chemical category are represented in the following figure.

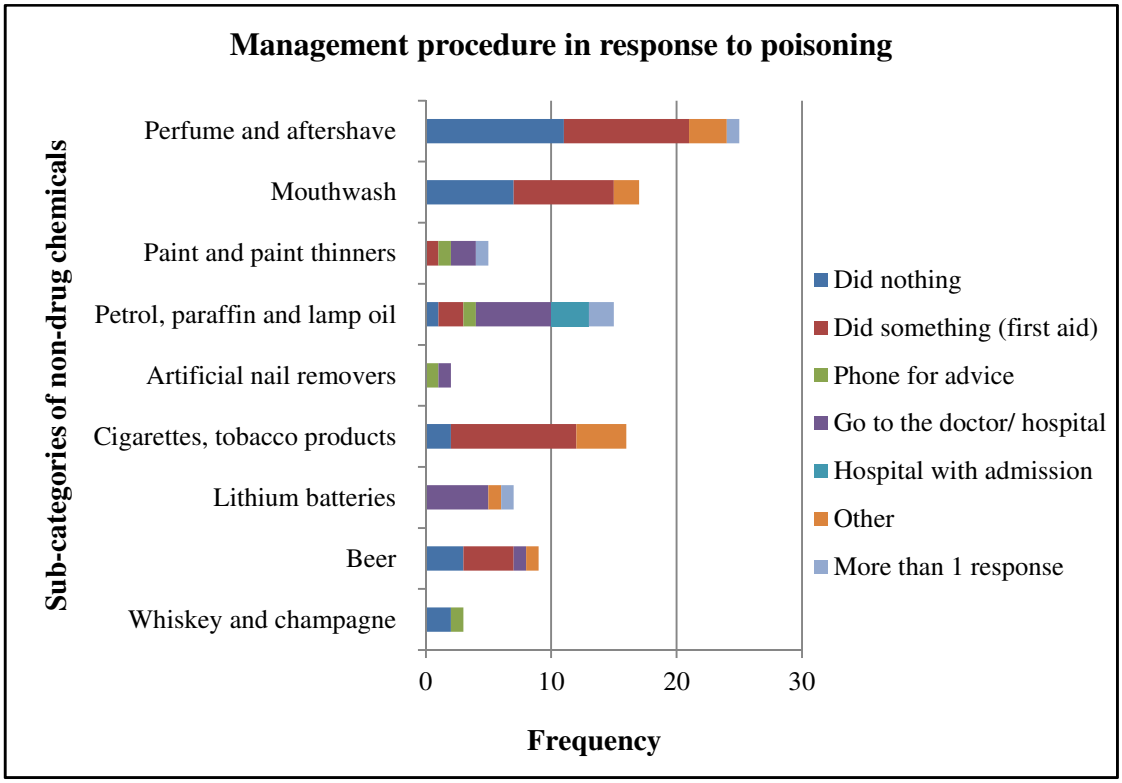

Figure 4.7 Response management of parents/guardians in reported cases of poisoning due to general non-drug chemicals

Performing first aid, was the most common management response in over one-third (36%) of all cases in this category, and was most commonly reported in managing poisoning cases due to perfume and aftershave, mouthwash and cigarette and tobacco products. In just over one-quarter of cases (26%), respondents reported not doing anything, and this was most commonly reported in incidents involving perfume and aftershave, mouthwash, and alcoholic beverages. Consulting a doctor or rushing to a hospital was reported for 15 cases (15%) with the most common involving paraffin and lithium battery reports. Only 3 cases (3%) resulted in hospital with admission, and these were for incidents involving paraffin.

4.3.3 Pesticides

Pesticides were the least reported substance responsible for poisoning, comprising of 18 (7%) of the 245 poisoning cases reported.

Of the 18 cases reported, rat poison accounted for 13 incidents (72%), with mothballs and insecticides responsible for the remaining five reported cases.

The associated storage practice of parents/guardians regarding pesticides responsible for 7% of all poisoning is represented in Figure 4.8 below.

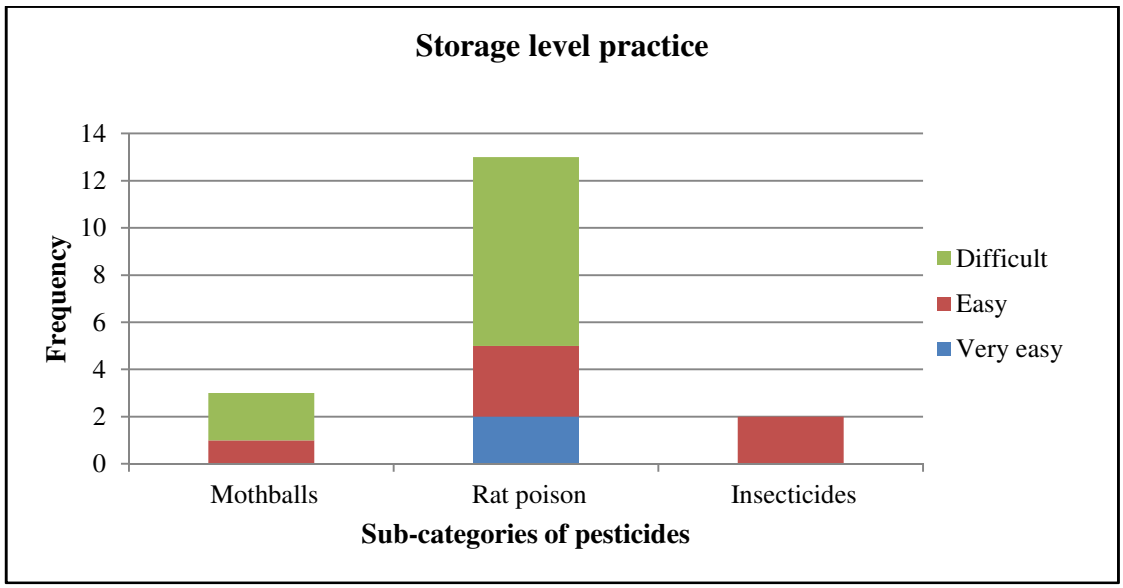

Figure 4.8 Household storage level practice of parents/guardians reporting poisoning cases due to pesticides

Unlike other substance categories, more than half of all pesticides (56%) were stored at a *difficult* level, inaccessible to children. Of the remaining eight substances (44%) six (33%) substances were stored at an *easy* level and only two (11%) substances were *very easy* to reach.

Management of pesticide poisoning cases were encountered with more visits to the doctor or hospital (39%) for treatment, when compared to other management procedures, as depicted in Figure 4.9 below

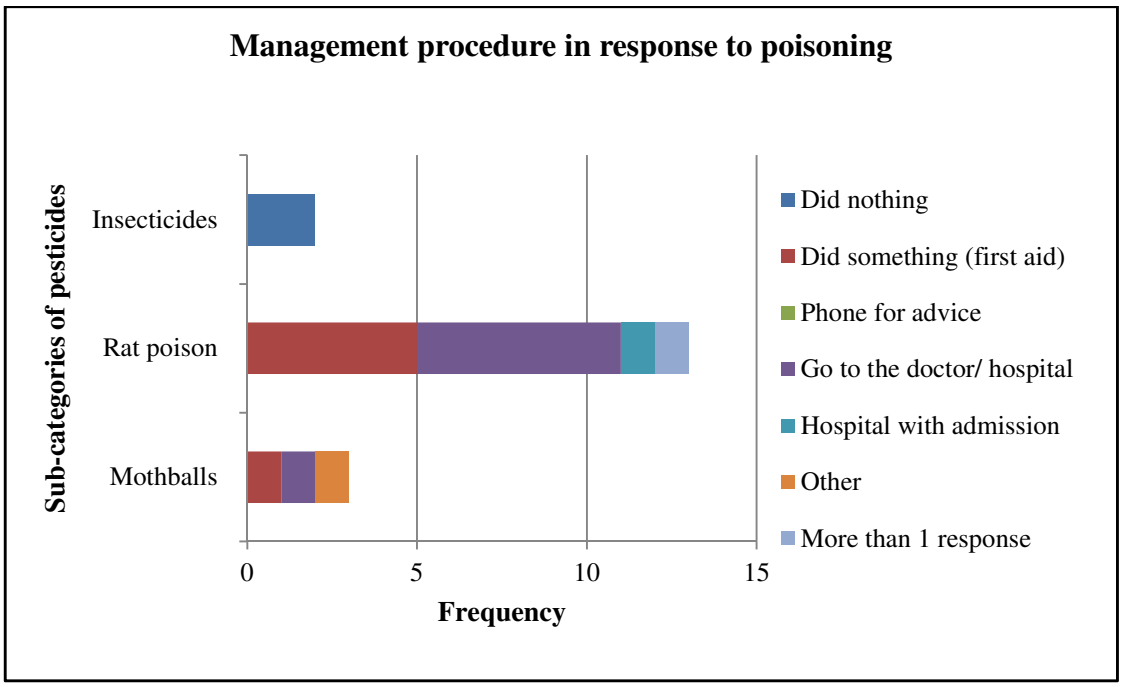

Figure 4.9 Response management of parents/guardians in reported cases of poisoning due to pesticides

Performing first aid, accounted for 33% of all management procedures reported, and was commonly practiced in cases involving rat poison and mothballs. Only one case of poisoning due to rat poison resulted in hospital with admission, while poisoning due to insecticides was the only sub-category wherein respondents *did nothing* to manage the incident.

4.3.4 Drug-chemicals (Medicinals)

Medicinals were the second most common category for all poisoning cases, with a total of 84 (34%) incidents reported. Cough mixture and paracetamol were responsible for just under half, 41 (49%) of the medicinal poisonings. Aspirin, fluoride and oral contraceptives were equally responsible for 7 (8%) incidents each. The least reported substance was topical anaesthetics, responsible for only 2 (3%) medicinal poisoning cases, whilst antidepressants was the only substance in the category that was not reported in a case of poisoning.

The level of storage of the various medicinals within the household is similar to the first two categories (irritants and corrosives and general non-drug chemicals), and is evident in Figure 4.10 below, wherein majority of the substances are stored at a level accessible to children.

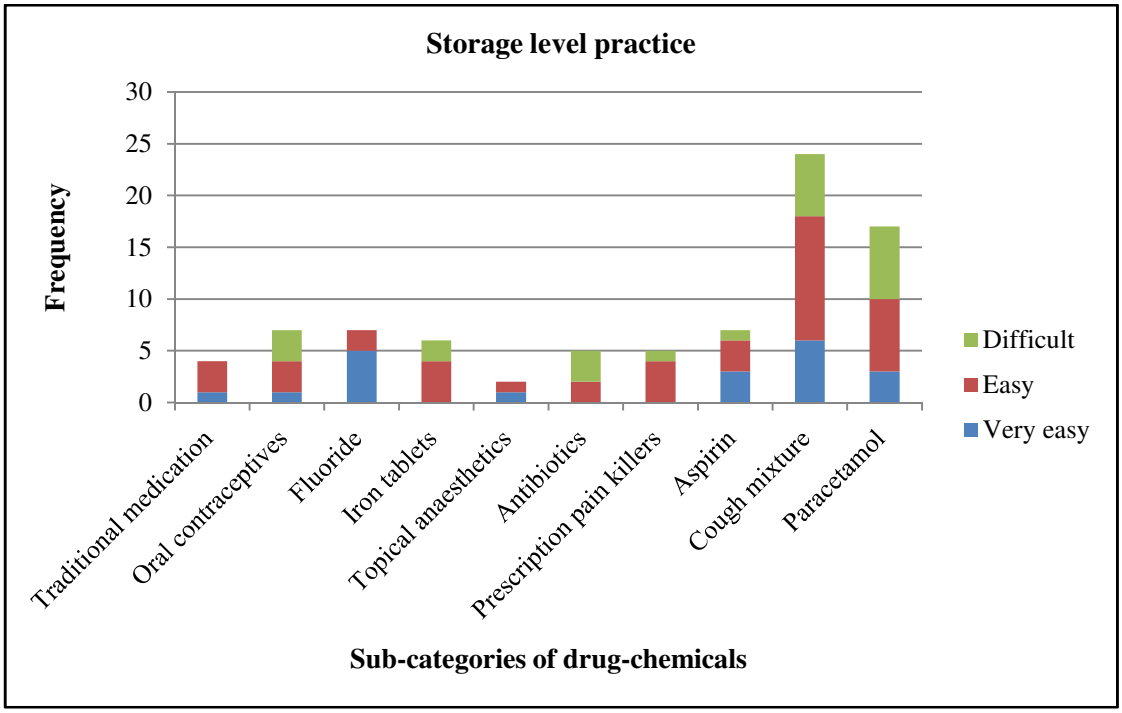

Figure 4.10 Household storage level practice of parents/guardians reporting poisoning cases due to drug-chemicals (medicinals)

At a level of accessibility to children, 61 medicinals (73%) were reported to be stored, with 41 (49%) of medicinals stored at an *easy* level and 20 (24%) of medicinals stored at a *very easy* level. Medicinals stored at a *very easy* level included items used on a daily basis such as paracetamol, cough mixture, fluoride, aspirin and oral contraceptives. Only 23 (27%) medicinals were stored out of reach of children at a *difficult* level, and more commonly included, oral contraceptives, antibiotics, cough mixture and paracetamol.

The management of medicinal poisonings follows the trend of other categories reported, with first aid being the most common management procedure reported, as represented in Figure 4.11 below.

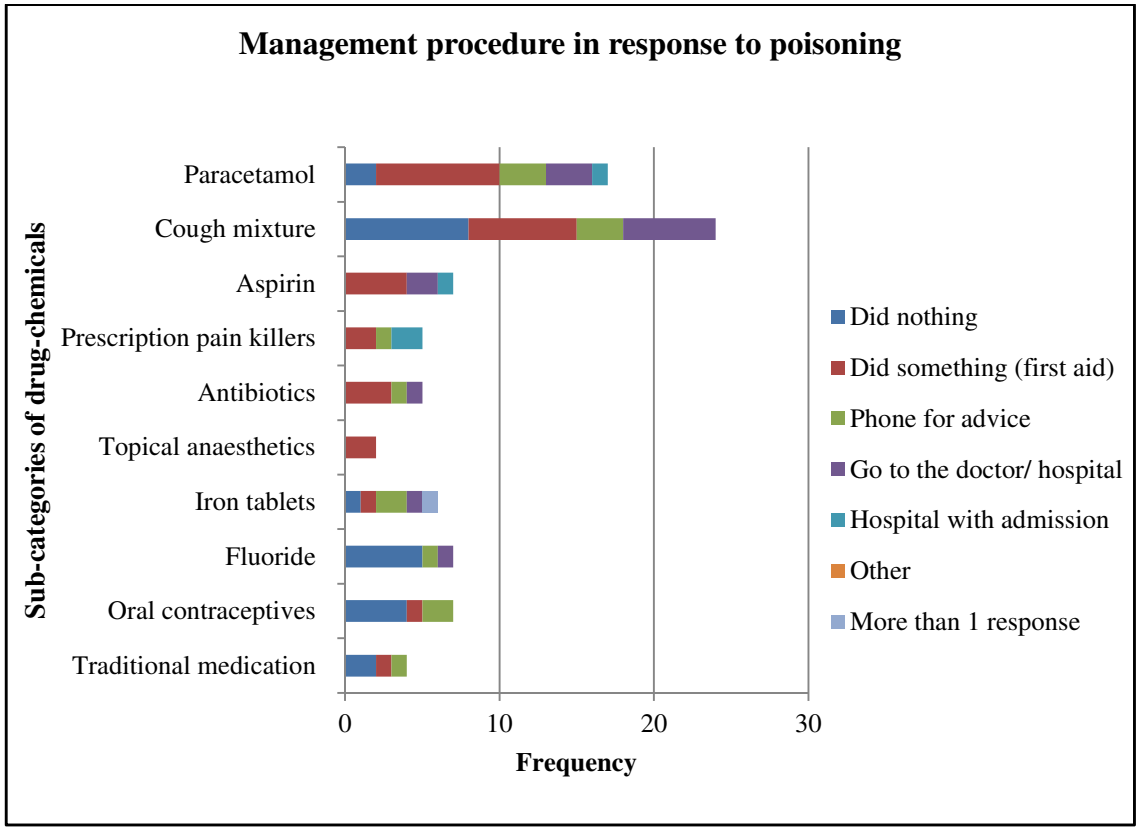

Figure 4.11 Response management of parents/guardians in reported cases of poisoning due to drug-chemicals (medicinals)

Of the 84 medicinal poisoning cases reported, 29 (34%) cases representing each of the medicinal sub categories, with the exception of topical anaesthetics and fluoride, was managed through first aid. In 22 (26%) cases, respondents reported doing nothing, and this was in all medicinal sub categories excluding aspirin, prescription pain killers, oral contraceptives and topical anaesthetics. A total of 14 cases (17%) were managed by visiting the doctor or hospital, with four (5%) cases resulting in treatment through a hospital admission, as seen in paracetamol, aspirin and prescription pain killers.

Overview of storage levels and management procedures

Of the 245 poisoning cases reported as occurring in the household, 120 substances (49%) were stored at an *easy* level, followed by 69 substances (28%) stored at a *very easy* level and 56 (23%) substances stored at a *difficult* level.

The general trend of responding to a poisoning case was reported to be the performance of first aid. A total of 91 (37%) cases were managed through first aid, followed by 54 cases (22%) not receiving any management. Consulting with a doctor or visiting a hospital was the choice of management in 46 (19%) cases, with admission to hospital accounting for 13 (5%) cases. Phoning someone for advice, usually a friend, relative or healthcare professional was reported in 20 cases (8%).

4.4 Management of poisonings and knowledge of PIC's

The correct management of poisoning cases is crucial to a successful outcome, and as a result, it was important to highlight this to participants.

In Section C of the self-administered survey, participants were asked to answer questions relating to how they would manage a poisoning case by detailing what they would do, who they would contact and their insights into the existence and awareness of PIC's and their utilisation of such services were evaluated. The results of the data collected will be presented in the following section.

In Figure 4.12 below, the choices of emergency contact following a poisoning is presented, with healthcare practitioners (general practitioners or paediatricians) being the common choice of contact (51%).

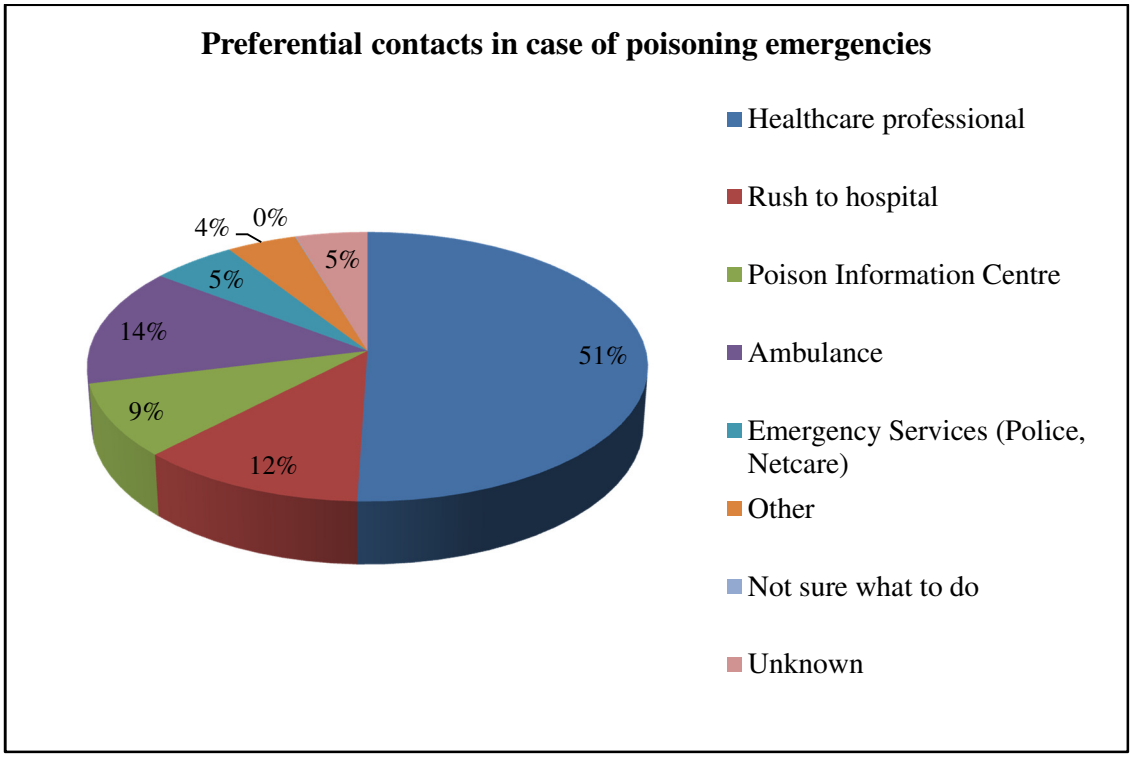

Figure 4.12 Respondents choice of contacts following a childhood poisoning emergency

Seeking emergency treatment from a hospital (12%) was the second most common response, with only 9% of all respondents reporting they would contact a PIC for assistance. Just over one-fifth (19%) of respondents reported contacting the ambulance or alternative emergency services were also reported.

4.4.1 Usage of Poison Information Centres

Apart from contacting healthcare practitioners, respondents were asked if they would contact a PIC in case of a poisoning emergency. A total of 78% (n=1352) reported they would not contact a PIC and their reasons for not contacting a PIC are presented in Figure 4.13 below.

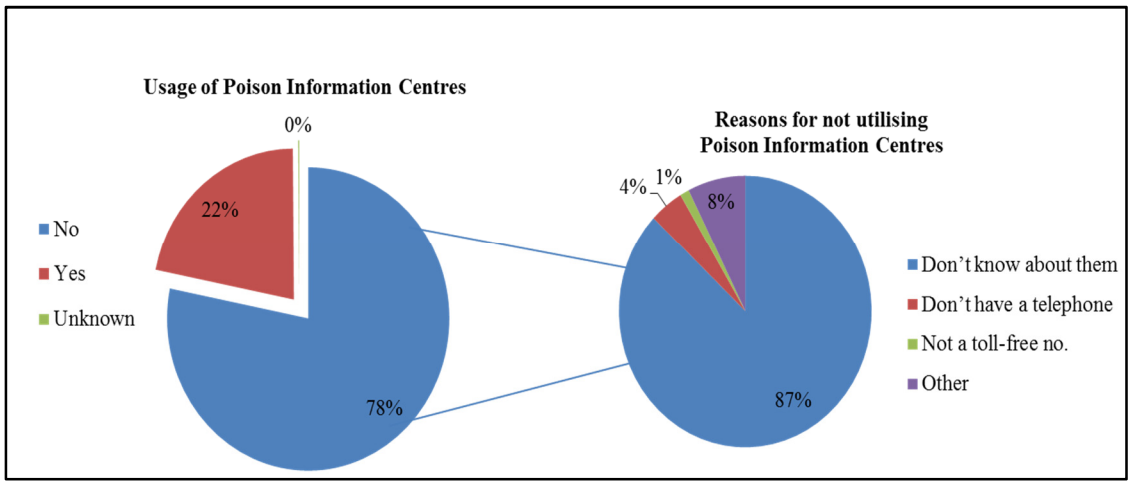

Figure 4.13 Utilisation of PIC's by participants and associated reasons for not utilising PIC services.

Among the reasons provided for not contacting a PIC, 87% (n= 1177) reported that they did not know about a PIC, while 5% (n=75) reported that access to a telephone and a paying line number were the reasons preventing them from contacting a PIC. Eight percent (n=100) chose other reasons for not contacting a PIC.

Less than one-quarter (22%; n=376) of respondents stated that they would contact a PIC, and provided an extensive list of PIC they would contact, as presented in Figure 4.14 below. Over 70% of respondents (73%; n=273) did not specify the exact name of the PIC but stated they would contact the number listed in the directory or on their emergency list/magnet. Tygerberg PIC and Redcross PIC was mentioned by 13% (n=49) of all respondents as the PIC they would contact. Other PIC's mentioned included UNITAS PIC, Johannesburg PIC, Rietfontein PIC and St Johns PIC. Drug information service centres such as Amayeza was also reported a centre of contact.

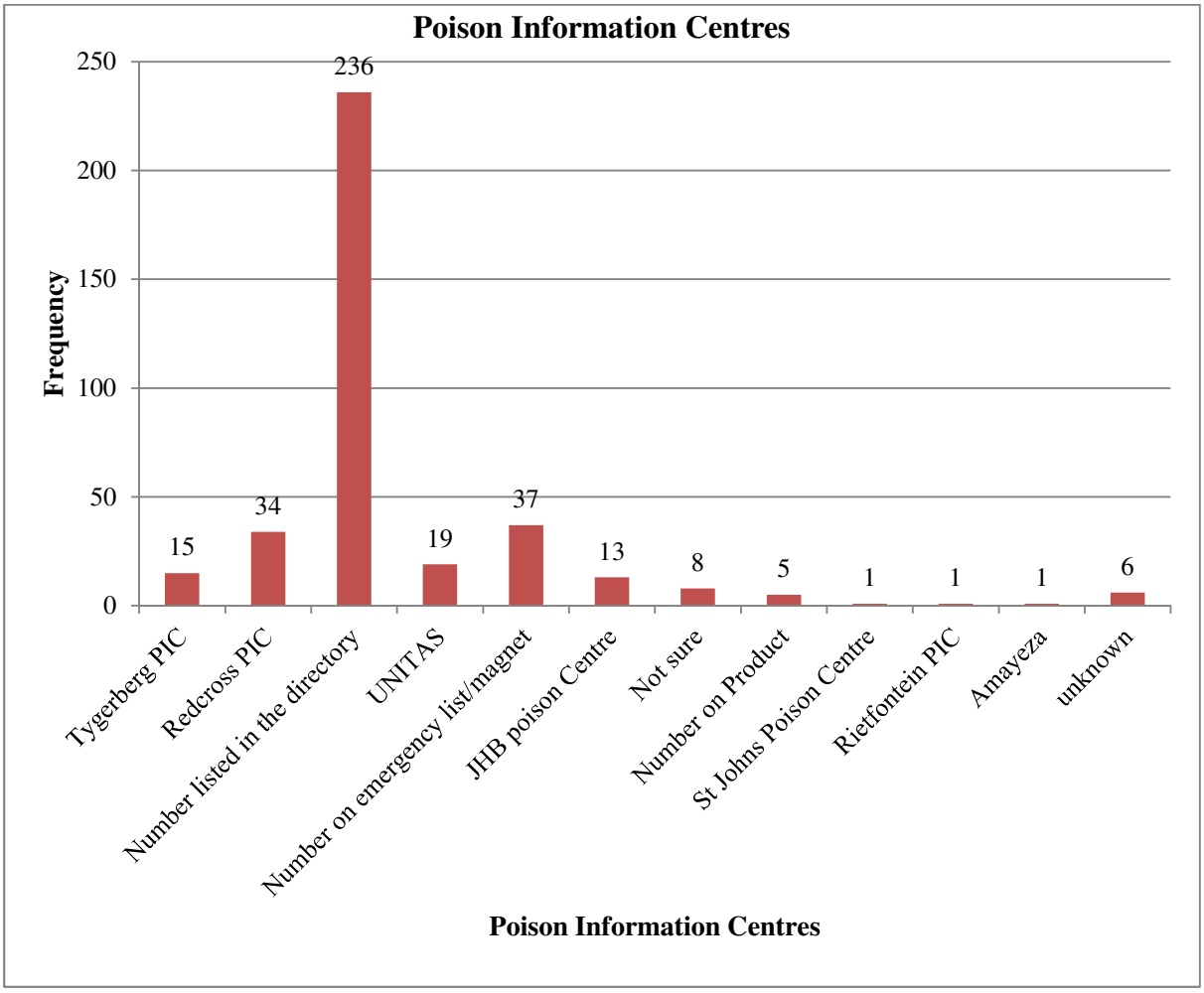

Figure 4.14 Respondents list of Poison Information Centres to contact in case of a poisoning emergency

4.4.2 Knowledge of PIC amongst respondents

The results of the knowledge of PIC's amongst respondents is presented in Figure 4.15 below.

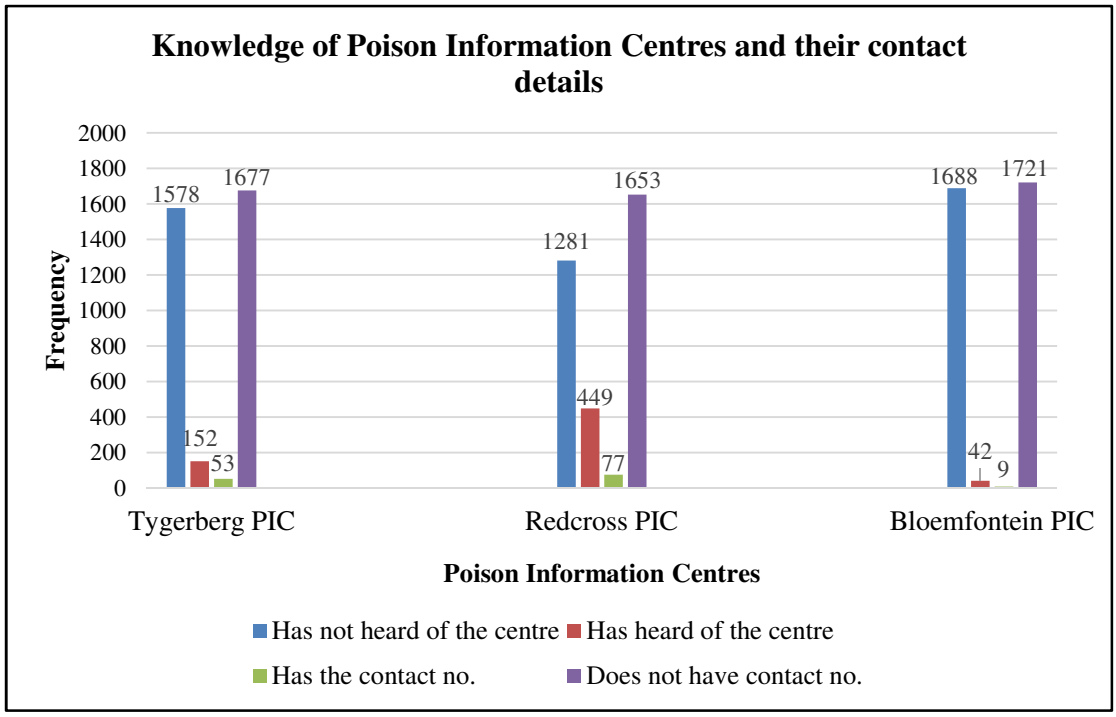

Figure 4.15 Respondents knowledge of PIC's and their contact details

The most commonly known centre amongst the respondents was the Redcross PIC, with 26% (n=449) of all respondents indicating they have heard of the centre. However, less than one-fifth (17%; n=77) of the 449 respondents stated that they have the contact details of the centre on hand. The Tygerberg PIC, was the second most commonly heard of PIC amongst the respondents with 8.7% (n=152) respondents indicating their knowledge of the centre. Just over one-third of these respondents (34%; n=53) of the 152 respondents have the details to contact the centre. The Bloemfontein PIC was the least heard of centre with only 2.4% (n=44) of all

respondents having heard of the centre, and less than 1% of these respondents having the contact details.

4.4.3 Usage of the internet in managing a poisoning case

Respondents engagement with the internet to obtain information related to poisonings was surveyed and 93% (n=1616) of respondents reported not using the internet for information seeking, while 7% (n=114) reported searching for information from a variety of websites, and search engines, including general Google searches, WHO site, www.schoolme.co.za, medical sites such as SAMA, SAMF, Medscape, Uptodate, Sabinet, Mayoclinic, Johnson & Johnson, Wikipedia, and poison information centre websites of the Tygerberg PIC and University of Pretoria PIC website. In some cases (44%; n=50), respondents could not remember the sites they searched and these were recorded as unknown.

The descriptive analysis of the data, provided an overview of the respondent demographics, highlighted the number of poisoning occurrences and described the most common substances stored in the house by highlighting the substances involved in poisonings, and emphasised the lack of knowledge of PIC amongst parents. Thereafter inferential statistics was applied to the data set to elucidate any associations between the variables and the analysis of the results of the test of comparisons (Chi squared) and the test of associations (Logistic regression) are presented.

4.5 Factors associated with the occurrence of a poisoning

Categorical variables such as age of the child, ethnicity, marital status of parents, employment status of parents, categories of substances and the level of storage of substances were tested to determine the relationship between these variables and the occurrence of a poisoning.

4.5.1 (a) Age of the child, ethnicity, marital status of parents

Age of the child was classified as a categorical variable, as the ages of children were split between those attending a pre-school /crèche and those attending primary school.

The three categorical variables (age of the child, ethnicity and marital status of parents) were not significantly related ($p > 0.05$) to the occurrence of poisoning and the results of the Chi-squared tests and Fishers exact test (for observations < 5) are presented in Table 4.4 below. Please refer to Appendix N for the complete Chi-square tables of the non-significant variables.

Table 4.4 Results of Chi-squared tests and Fishers exact test for non-significant variables

Categorical variable	Chi-squared statistic	P-value	Fishers exact
Age of the child	2.1651	0.141	n/a
Ethnicity	1.1607	0.762	0.688
Marital Status of the parents	3.6335	0.304	n/a

4.5.1 (b) Employment status of Parents

A Chi-squared test was performed to determine the relation between the employment status of the parents and the occurrence of a poisoning. A significant relation ($p = 0.034$) between employment status of parents and occurrence of a poisoning was found and is presented in Figure 4.16 below.

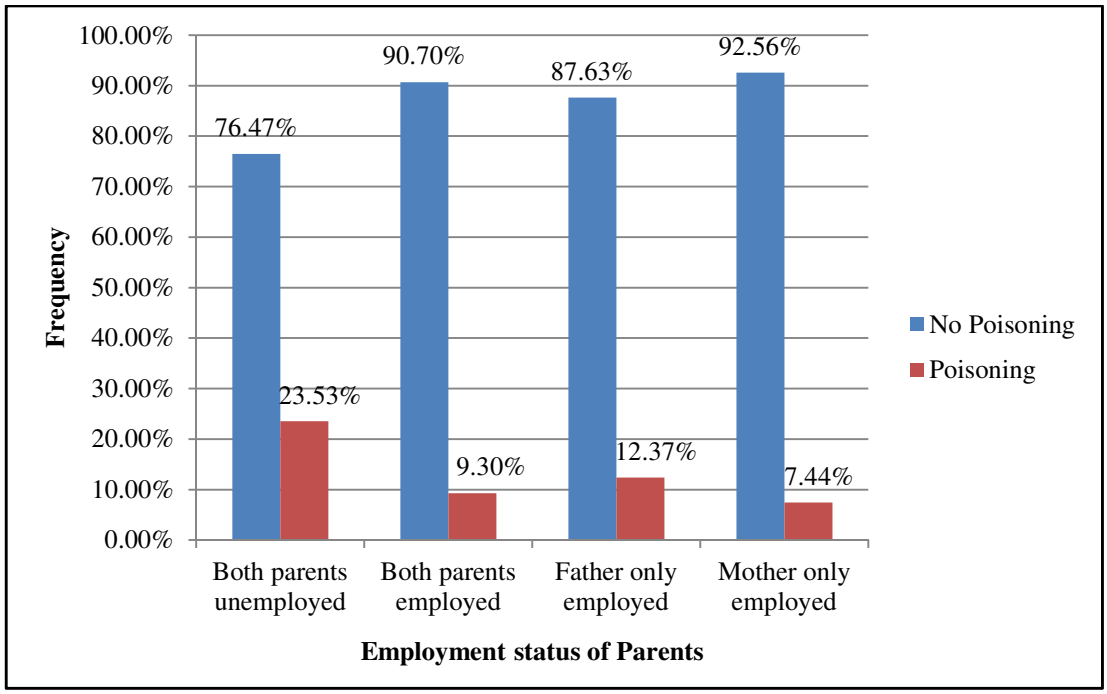

Figure 4.16 Graph* of Employment status of parents and occurrence of poisoning

Pearson $Chi^2 = 8.4918$, $Pr = 0.037$

Fishers exact = 0.034*

(Observations for cells = < 5, therefore the Fishers exact value was used)

4.5.1 (c) Category of household substances

Following the classification of substances into categories (Appendix J), a Chi-squared test was performed to examine the relationship between the categories of household substances stored and the occurrence of a poisoning. Categories of substances was significantly ($p<0.00001$) related to the occurrence of a poisoning, and is presented in Figure 4.17 below.

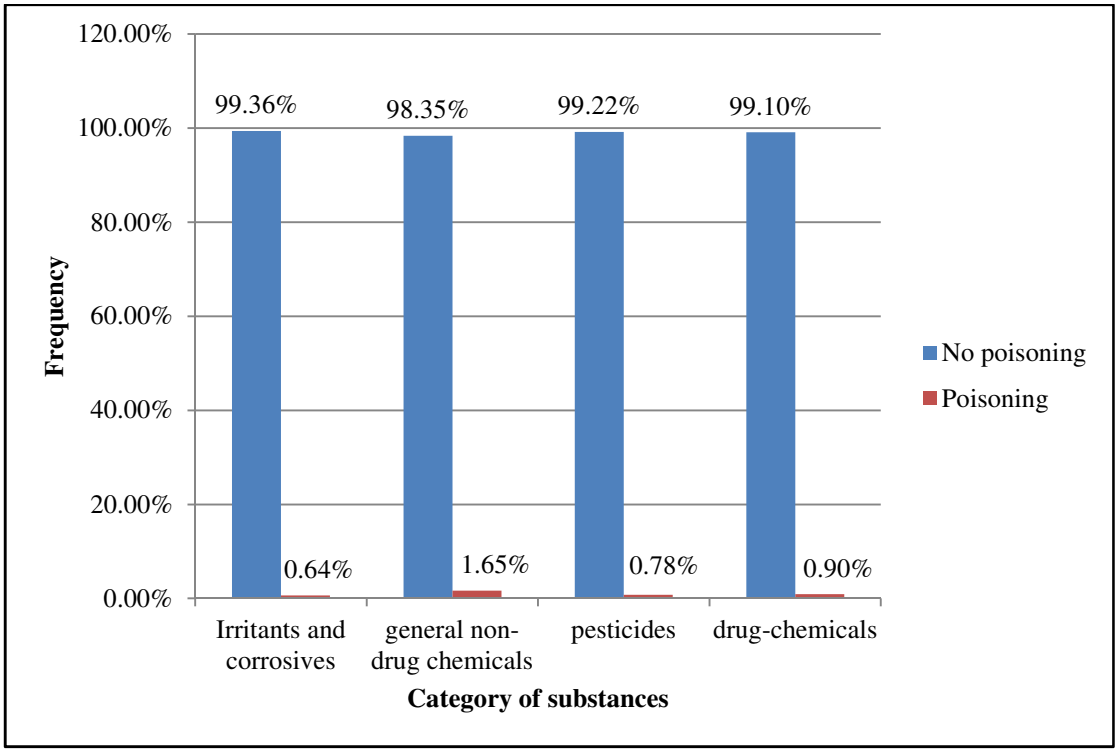

Figure 4.17 Graph* of the categories of household substances stored and the occurrence of poisoning

Pearson $Chi^2 = 36.9731$

$(p < 0.00001)$*

The significant relation between the categories of substances and the occurrence of poisoning, prompted an investigation of the level of storage of each substance to the occurrence of poisoning.

4.5.1 (d) Level of storage of each substance

Each substance listed on the questionnaire was tested to determine a relationship between the level of storage of the substance and the occurrence of a poisoning. The storage levels of paraffin and paint and paint thinners were significantly related to the occurrence of poisoning (p =0.037 and p =0.006 respectively). The significant results of the Chi-squared test are presented in Figure 4.18 and Figure 4.19 below. Please refer to Appendix O for the results of the Chi-square test to determine the relation between each substances level of storage and occurrence of poisoning.

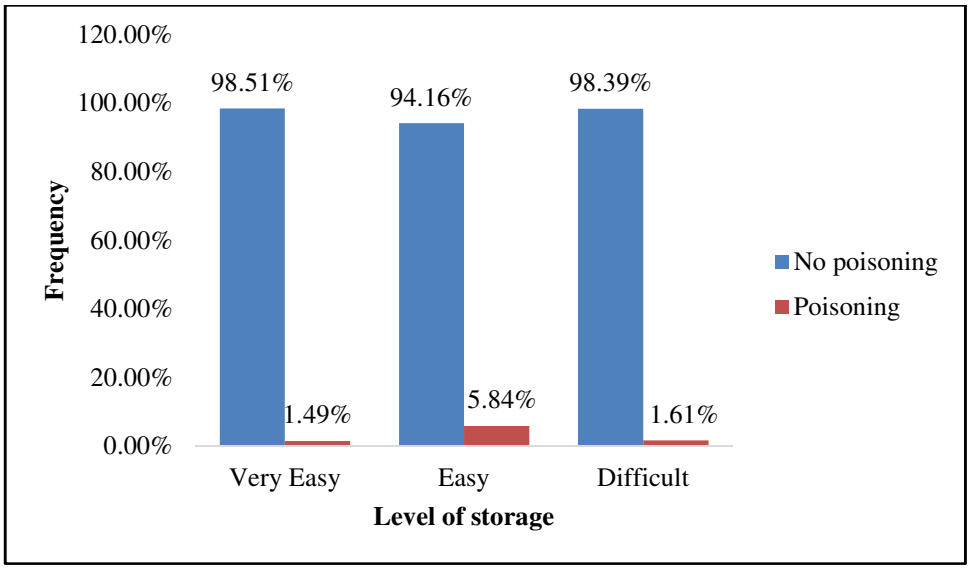

Figure 4.18 Graph* of Level of storage of Paraffin and occurrence of poisoning

Pearson Chi^2 = 7.2390 , Pr = 0.027

Fishers exact = 0.037* (Observations for cells = < 5, therefore Fishers exact value was used)

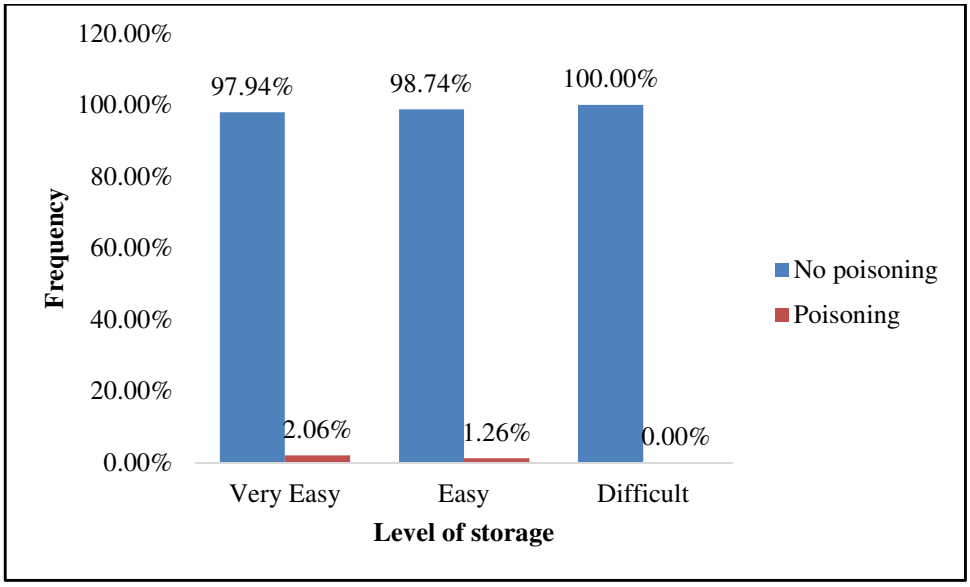

Figure 4.19 Graph* of Level of storage of Paint and paint thinners and the occurrence of poisoning

Pearson Chi^2 = 8.4618, Pr = 0.015

Fishers exact = 0.006* (Observations for cells = < 5, therefore Fishers exact value was used)

In view of the significant variables (Employment status of parents and category of household substance, further inferential analysis was applied. As the probability of a binary outcome (occurrence of poisoning) was tested, a logistic regression model was fitted to understand the association between the Employment status of parents, the category of poisons and the occurrence of poisoning.

4.5.2 Logistic Regression

Logistic regression was performed to test the association of one explanatory variable at a time to the binary outcome (occurrence of poisoning), and the results are presented in Table 4.5.

Table 4.5 Logistic regression values of factors associated with the outcome (Occurrence of poisoning)

Variable		OR	95% CI	P-value
Employment status of parents	Both parents unemployed	1		
	Both parents employed	0.33	0.10 – 1.05	0.062
	Father only employed	0.45	0.14 – 1.44	0.183
	Mother only employed	0.26	0.07 – 0.88	0.031*
Category of poisoning	Irritants and corrosives	1		
	General non-drug chemical	2.61	1.83 – 3.73	P < 0.001*
	Pesticides	1.23	0.71 – 2.13	0.454
	Drug-chemicals	1.41	0.97 – 2.03	0.065

The employment status of the parents had an effect on the odds of the occurrence of a poisoning. Children with a mother only employed were 0.26 times less likely to have experienced a poisoning than any other employment status of the parents.

The category of the poisoning had a strong effect on the odds of the occurrence of a poisoning. Substances belonging to the general non-drug category were 2.61 times more likely to be implicated in the occurrence of a poisoning than any other category of a poisoning.

4.6 Factors associated with the categories of substances of the reported poisoning cases

Following the significant result obtained for the differences between categories of substances and the occurrence of poisoning (Table 4.5 above), categorical variables such as level of storage and management response were tested to determine the relationship between these variables and the categories of substances related to the reported poisoning cases.

4.6.1 Level of storage

A Chi-squared test was performed to determine the relation between the level of storage and the categories of substances and is presented in Figure 4.20 below.

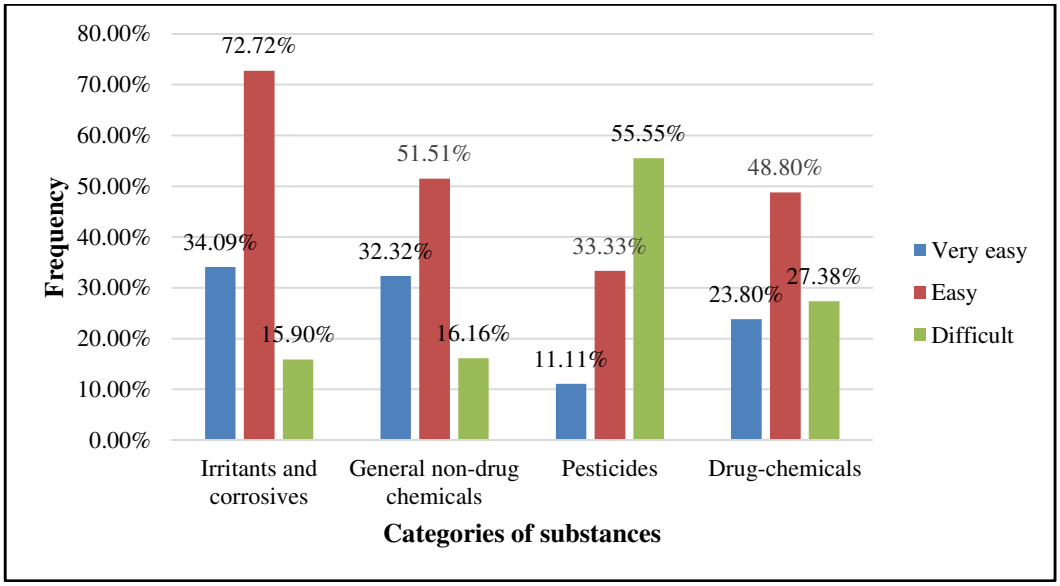

Figure 4.20 Graph* of level of storage and categories of substances

Pearson Chi^2 = 16.6635, Pr = 0.011
Fishers exact = 0.021* (Observations for cells = < 5, therefore Fishers exact value was used)

The results of the Chi-squared graph shows that a significant relation (p=0.021) exists between the level of storage and the categories of substances. This indicates that based on the category of a substance, and possibly through parental perception of the

hazardous nature of those substances, parents would store the item at an accessible or inaccessible level.

4.6.2 Management employed in response to poisoning cases

Figure 4.21 to follow presents the significant results ($p<0.001$) of the Chi-squared test performed to determine the relation between the variables management response (in relation to a poisoning case) and the categories of substances (of the reported poisoning cases).

The results show that a significant relation exists between the category of a poisoning and the management response of the parent/guardian, indicating that parents/guardians would react differently to an occurrence of poisoning based on the substance implicated in the poisoning incidence. This may be attributed to their perception of the effect of the substance on the child.

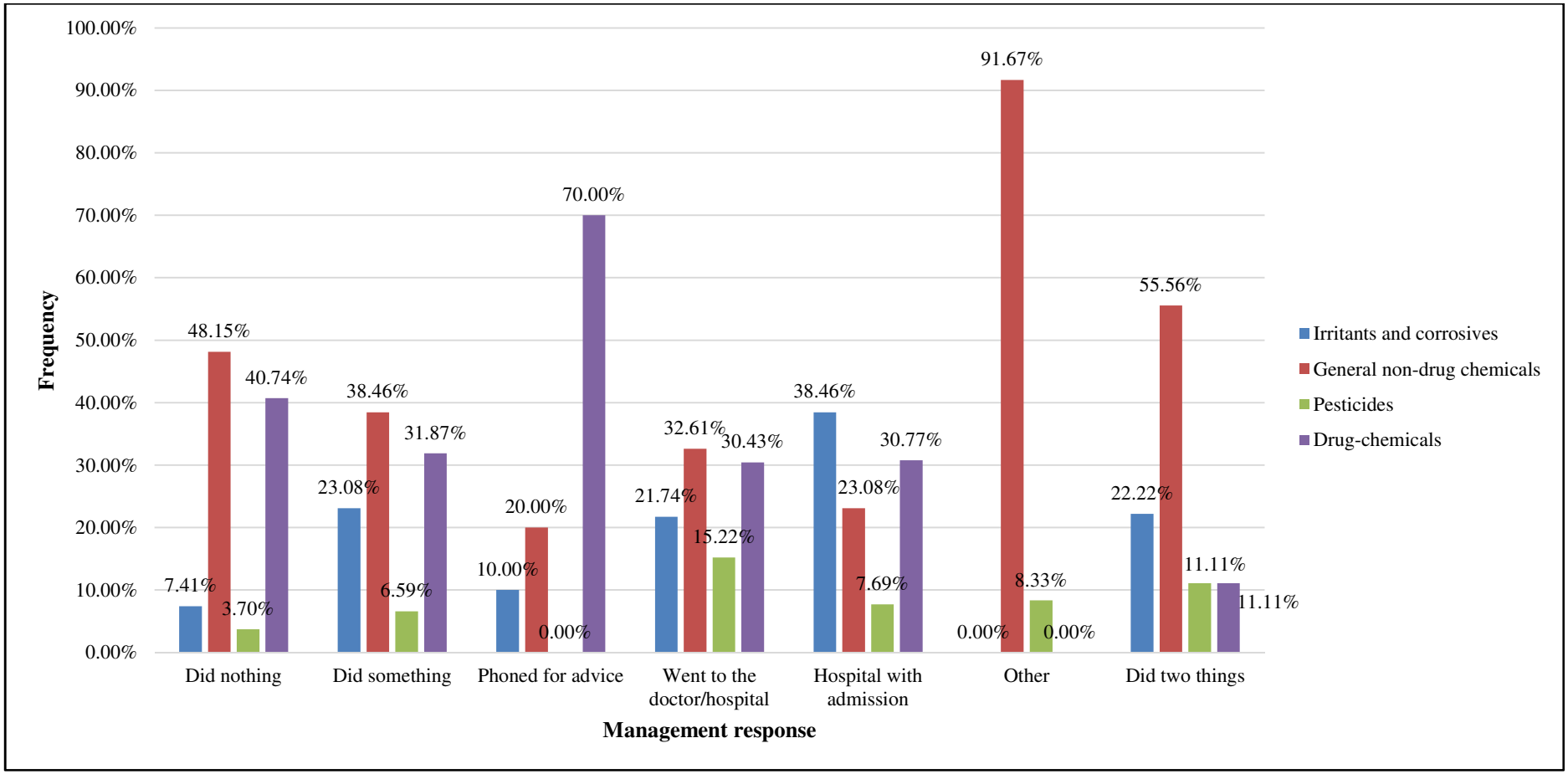

Figure 4.21 Graph* of management response and categories of substances

*Although observations for observed cells = < 5, a Fishers exact test was not used, as observations (proportions of management response) exceeded the memory limits of the Fishers exact test.

Pearson $Chi^2 = 44.5622$ ($p<0.001$) *

The inferential statistics presented in this chapter, examined the relationship between the outcome of this study (occurrence of poisoning) and various variables.

Significant relations were not found between occurrence of poisoning and the following variables: Age category of the child, Marital Status of the parents, and Ethnicity.

Employment status of the parents and the category of poisoning were significantly related ($p < 0.05$) to the occurrence of poisoning.

Additional analyses revealed a significant relation between the variables level of storage and management response and the category of poisonous substances.

4.7 Summary of Chapter

This chapter provided a description of the respondents to the self-administered questionnaire, an overview of the hazardous substances stored and the inappropriate level of their storage in the household. The amount of poisoning cases identified by the parents was reported in association with the management response employed. In addition, the lack of knowledge of PIC amongst respondents was highlighted. Factors associated with the occurrence of poisoning and categories of substances were elucidated. This section concludes the quantitative phase of the study.

An integrated discussion of the above reported results and the findings from the qualitative phase of the study will be presented in the next Chapter.

Chapter 5 FINDINGS AND INTEGRATED DISCUSSION

This chapter is divided into three sections. Section A will commence with an overview of the findings of the comments sections of the self-administered survey, followed by an overview of the findings of the Qualitative component of the study. Thereafter in Section B and Section C an integrated discussion of the data emanating from the quantitative and qualitative methods will follow (Figure 5.1 below). The reason for employing this technique is to present a cohesive discussion. The simultaneous discussion of the two data sets will allow for the exploration of the depth and breadth of emerging data. Presenting the quantitative data alongside the supporting data of the qualitative component adds meaning to the data and provides a clearer understanding of the occurrence of accidental childhood poisoning.

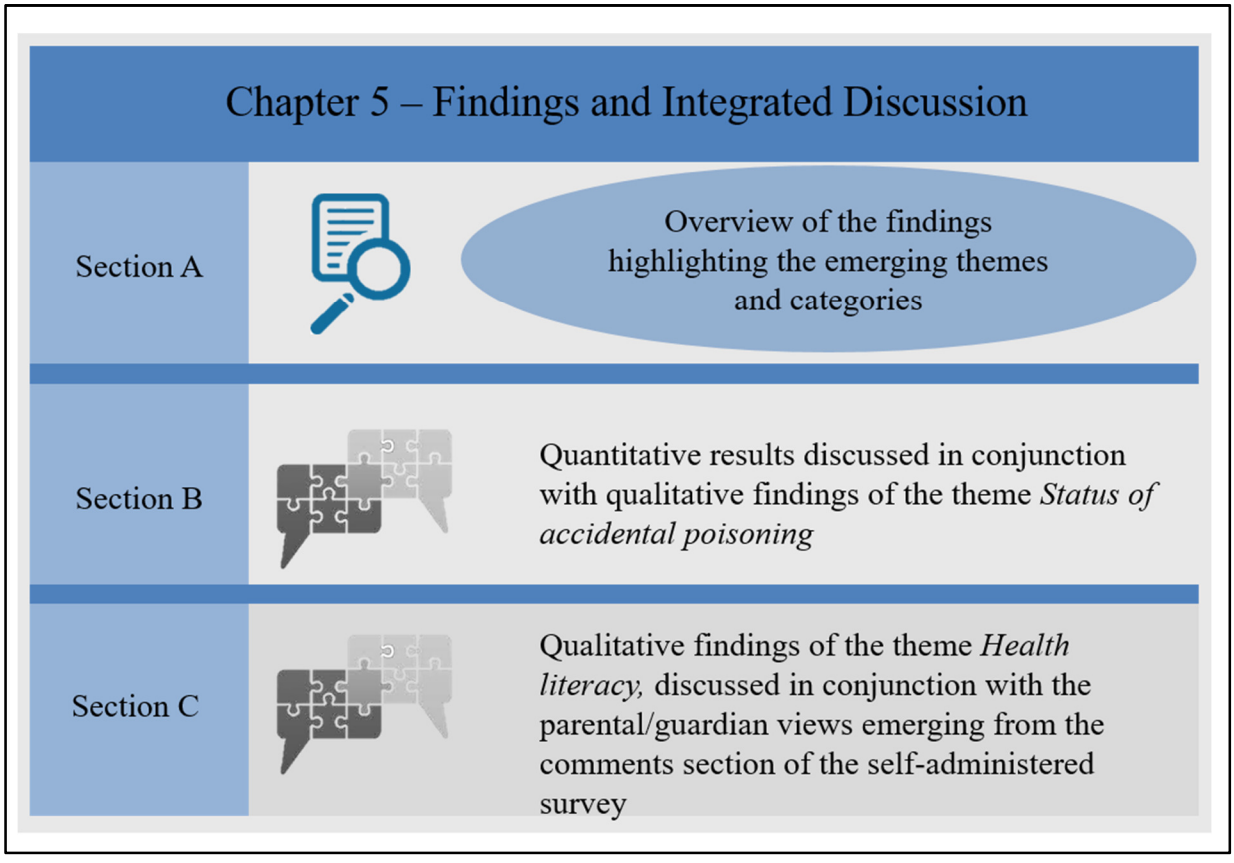

Figure 5.1 Detailed outline of the structure of Chapter 5

5.1 Section A – Overview of the findings

The overview presented below, uncovers the major findings of the comments section of the self-administered questionnaire, followed by the findings of the semi-structured interviews conducted during the qualitative component of the study.

5.1.1 Self-administered questionnaire - Phase One: Comments section

A short descriptive summary of the number of participants who filled out the questionnaire to the comments section will be presented using qualitative terminology in place of quantitative numbers. Thereafter a summary of the findings emerging from the qualitative content analysis applied to the comments section will be presented by highlighting the themes and categories derived from the data.

To maintain rigour and transparency of findings, the response-rate will be calculated and the average number of lines of each comment will be reported, to indicate the depth of the content of the comments (Cassidy, 1998).

From the 1730 participants who responded to the questionnaire, 594 (over one-third) of respondents completed the comments section. Most of these participants (over two-thirds) were females and less than one-quarter were male. Mothers accounted for most of the responses, with under one-third of responses coming from fathers and guardians combined.

Although this is a low response rate, comments may be of a valuable nature to the study. In order to ascertain the relevance of the comments to the study undertaken, an initial reading of the comments was undertaken to gauge the feelings expressed by the participants. Based on a large amount of respondents expressing strong interest in the topic of research, analysis was undertaken.

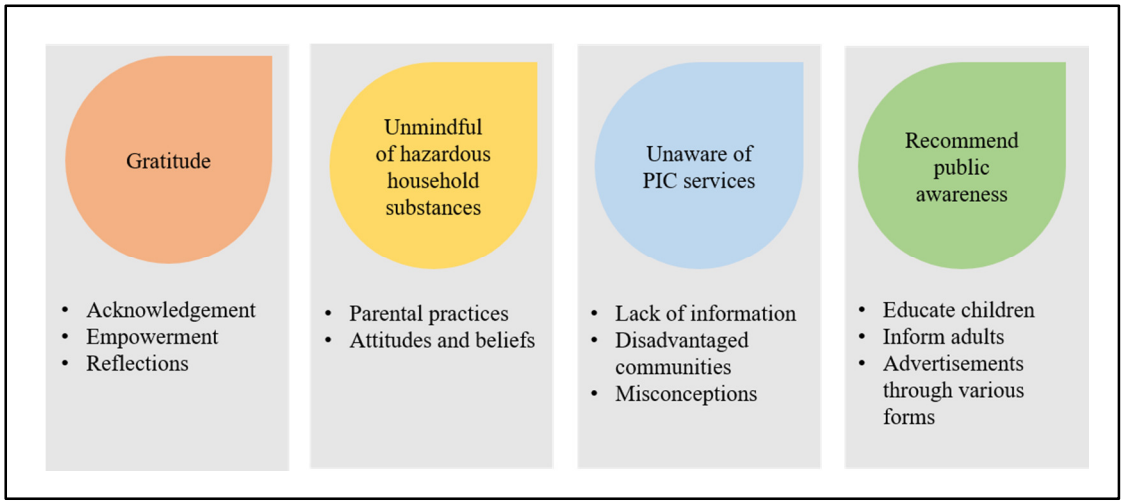

Figure 5.2 Themes and associated categories emerging from the comments section of the self-administered survey

Four major themes emerged from the comments section of the self-administered questionnaire. A strong sense of *gratitude* was conveyed through the comments, for bringing the topic to the fore, as participants felt empowered through the information conveyed in the questionnaire. Participants indicated that filling out this questionnaire made them self-aware of their lack of knowledge and encouraged them to empower themselves regarding the topic.

P/G 1054: *Thank you. I have now become aware of the dangers of these substances. "surprised at my ignorance"*

P/G 1299: *Thank you for the research, I am now alert and will start researching poisoning amongst children*

In addition, respondents admitted to their lax attitude and behaviour regarding poisonous substances and the occurrence of poisoning amongst children, and these

views formed the basis of the second theme – *Unmindful of hazardous household substances.*

The third theme, *Unaware of PIC services,* emerged as parents strongly conveyed their lack of knowledge of these centres and the services provided by them, by indicating that they have not been informed or educated about them.

The last theme, *Recommend public awareness*, was the take home undertone suggested by the participants, so that children, adults and the community at large may benefit from the valuable information and be correctly educated regarding the safety of their children.

The findings of the last three themes mentioned above will be discussed in combination with findings of the semi-structured interviews of qualitative component of the study, to understand the views and needs of the community central to this research.

5.1.2 Qualitative component: Phase Two

This section will provide a summary of the data from the ethnographic observations conducted at the healthcare practices followed by a discussion of the major themes and categories emerging from the semi-structured interviews. Following thematic content analysis, data collected through the qualitative semi-structured interview approach provided insight into accidental household poisoning among children and the management of poisoning cases by healthcare practitioners.

5.1.2.1 Ethnographic observations

Visiting each healthcare practitioner at their practice, personally inviting him/her to participate and holding each interview in the medical practice or pharmacy, allowed the researcher time to observe the healthcare practitioner in their healthcare environment. The field notes obtained during these observations are noted below, and lend a perspective to the on-the-ground management of poisoning encounters.

a. Some healthcare practitioners do not attend to poison emergencies and refer all patients directly to the emergency room at the local clinic / hospital.

b. No sign of Poison Information and emergency contact details

   All of the pharmacies and medical practices visited did not have any signage or posters of poison information in the medical waiting rooms, neither did they have emergency numbers of PIC's clearly visible and on hand on.

c. Healthcare practitioners do not keep updated with recent data of poisoning, and information from PIC and rely mostly on old reference books, some dating back to 20 years, or prior experience of treating poisoning cases symptomatically.

   Generally, the topic of poisoning *rang a bell* with most practitioners, indicating that it is almost a forgotten topic amongst health practitioners.

5.1.2.2 Semi-structured interviews

The following Figure 5.3 highlights the two overarching themes derived from the qualitative data collection phase, and expands in the sub-categories. Each theme and its encompassing categories were formulated based on the commonalities associated across the spoken words and ideas conveyed by the participants.

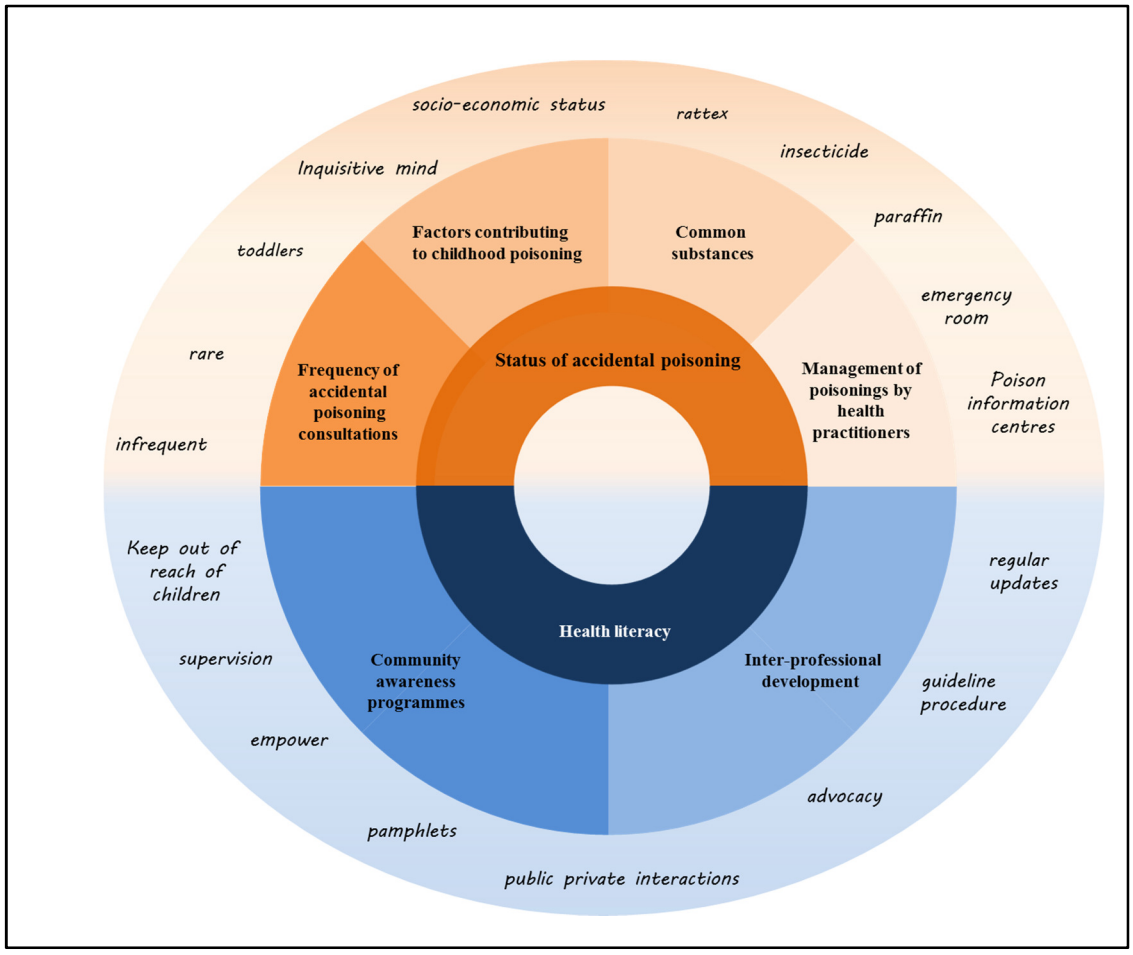

Figure 5.3 Themes (inner circle) and categories (middle circle) derived from the qualitative data. Examples of key codes from each category are displayed in the outer circle

Theme 1 – Status of accidental poisoning

This theme provides an understanding of the occurrence of accidental poisonings amongst children in the urbanised environment. Within the theme, there are various categories which unpack the nature of the occurrence of accidental poisoning. The frequency of the occurrence of accidental poisoning amongst children is discussed, in conjunction with various factors responsible for this occurrence. The most common substances associated with accidental poisonings are highlighted, and this provides a deeper understanding of the types of poisonous substances encountered within the community. The professional identity of the healthcare practitioner is explored with regards to the management of accidental poisonings and their responsibilities towards the community in prevention of this occurrence.

Theme 2 - titled Health literacy, is based on progressing the community in terms of awareness and knowledge capacity. Upon understanding the factors surrounding accidental poisoning (as depicted in Theme 1) educational strategies and inter-professional development is unfolded in terms of educating parents and guardians with respect to safety measures in order to safe-guard children from this unfortunate and often preventable occurrence.

While the two themes complement each other in portraying an overview of accidental household poisonings among children as described by healthcare practitioners, it is essential to understand these views in context of the parent/guardian views expressed during the quantitative self-administered survey. The understanding of the two data sets in light of each other will provide a comprehensive insight into accidental poisonings amongst children.

In the integrated discussion to follow, Section B and Section C, the themes will be explored and discussed independently, to understand the emerging meanings in relation to the data found during the quantitative phase.

Section B will cover the theme *Status of accidental poisoning* and, Section C will discuss the theme *Health literacy.* In cases where overlap occurs between the quantitative results and qualitative findings of each theme, further discussion will ensue to ensure the issue is clearly understood.

The use of mixed-methods allows for a multi-dimensional approach in interpreting the data. The merging of quantitative results and qualitative findings, a key feature of mixed-method studies, adds richness and depth to the emerging data. In this manner, a broader understanding of the occurrence and management of accidental household poisonings in an urban setting will be highlighted in relation to the set objectives.

5.2 Section B - Quantitative results discussed in conjunction with qualitative findings of the theme *Status of accidental poisoning*

Childhood poisoning research in South Africa has focussed on retrospective and prospective record reports emanating from hospitals and PIC. The present study is unique in its methodology, as it is the first study focussing on childhood poisoning through the lens of a community, engaging the key role players, the parents and healthcare practitioners, involved in the successful management of treating the poisoned child. Furthermore, it addresses factors contributing to the occurrence of poisoning and management practices by parents, and highlights the role of PIC's, both concepts which were never addressed before. Lastly, the inclusion of a qualitative phase of the study by addressing healthcare professionals is unique to this study, as no other study in South Africa has included the perspective of healthcare professionals in managing the situation on poisoning. The results provide an insight into the practices of parents and the professional identity of healthcare professionals. These findings may guide future research initiatives in understanding the situation of accidental household poisonings and its management.

The results obtained will be discussed in order to understand the context of the phenomenon in relation to other studies

In this Section, a discussion of the quantitative results (Chapter 4) will be presented in light of the objectives set out in Chapter 3. Where findings of the parent/guardian comments and semi-structured interviews overlap and offer support to the quantitative results, and integration of the results and findings will ensue.

5.2.1 Overview of demographics of respondents

The mean age of the respondents to this questionnaire was 37.4 years ± 7.12, range 20-76, with mothers being the primary respondent. Mothers who were unemployed (unemployed and home executives) accounted for 37.2% of the sample. The description of the sample in this study is similar to that of other studies conducted regarding the unsafe storage of poisonous substances in the household (Beirens *et al*., 2006)

5.2.2 Presence of poisonous substances stored

5.2.2.1 Profile of substances stored

This study has highlighted the most common substances stored in the household of the selected sample area. Self-medication and over the counter items such as paracetamol and cough mixture were the most commonly stored items in the immediate environment of the child. Substances used on an everyday basis such as perfume and aftershave, were the most common non-medicinal items stored in the household, followed by everyday cleaning agents such as polishes and detergents.

5.2.2.2 Occurrence of poisoning, and substances responsible for poisoning

A total of 256 poisoning cases were reported, of which 7 occurred in an environment external to the household, while 4 incidents were reported of substances not on the list. The remaining 245 cases were representative of substances across all categories, with a significant relation ($p < 0.00001$) found between the category of substances and the occurrence of a poisoning. In this study, majority of the poisoning cases were due to general non-drug chemicals (n=99) such as cosmetic and personal care

products, followed by drug-chemicals, irritants and corrosives and pesticides accounting for the least amount of poisoning cases.

Perfume and aftershave was reported as the most common agent (n= 25) among the poisoning cases. Detergents and cough mixture followed closely being responsible for 24 (10.2%) cases each with paracetamol, mouthwash and paraffin reported thereafter. Our findings of cosmetics and personal care products accounting for most of the poisoning cases, followed by drug chemicals and cleaning agents is similar to that reported in the 33rd annual report of the American association of Poison control centres (Mowry *et al*., 2016). Contrary to the latest reviews of poisoning cases in South Africa (Balme *et al*., 2012), antidepressants were not reported in any of the poisoning cases reported in this study. The reason for this difference could be attributed to the low presence of antidepressants stored (antidepressants were the least common drug-chemical stored, n=178) in the household of the respondents, as reported earlier in Chapter 4.

Emerging from the semi-structured interviews, a variety of substances were responsible for poisoning cases managed by the healthcare professionals, with paraffin most commonly reported.

L105: *mostly rat poisoning, eating rattex, paraffin ingestion, especially with the informal settlement down the road*

L109: *we see a variety, but not much. We do see paraffin, pharmaceuticals prescribed medication umm…we do see things like accidental ingestion of foreign bodies like especially batteries. Paraffin poisoning would be definitely your lower socio economic class, more common in winter months, that's about it. And because I don't service such a big low socio economic group, I see very little.*

L110: *paraffin poisoning right and the other insecticide, you know they keep it at home and this is what they swallow. These are the two, that's where they come from, from the squatter camps, from the location.*

The substances reported by healthcare practitioners appear to be related to the geographical location of their practice. Healthcare practitioners who are situated towards the periphery of the area, are in closer range of the outlaying informal settlements and therefore would see more cases of paraffin ingestion, as opposed to those healthcare practitioners situated deep within the residential areas of the suburb

The frequency of poisoning cases presenting to healthcare practitioners appears to be low, and this could be explained by either a decline in the occurrence of poisonings (Balme *et al*., 2012; Isaacs-Long *et al*., 2017) or a growth in the amount of healthcare facilities available, and parents parents/guardians rushing to the closest facility or emergency rooms for management, as suggested by these two pharmacists,

L103: *most people I think would rush their children either to a general family practitioner or straight to the hospital*

L105: *accessibility to the health professions across the field has changed over the years, much more, more health facilities, more doctors more accessibility, so the chances are that the possibilities that the person, the closest facility they went to, closest health professional, could not only be a pharmacist, could be the nurse practitioner, could be the doctor, and maybe a...that's a good thing, the fact that there are accessible sites. What happens at those sites unfortunately, that's the documentation and the statistics that we need to get.*

Factors associated with the occurrence of poisonings

In order to understand factors associated with the occurrence of poisoning, various variables were tested against the occurrence of poisoning.

In this study, employment status of parents was significantly related to the occurrence of poisoning. Similar trends were reported in an international study on injuries (Laffoy, 1996) in which the employment status of parents was significantly associated with the occurrence of an injury. However, results of other studies showed no significant association between these variables and as a result, the significance should be interpreted with caution.

Storage levels of substances reported in poisoning cases were significantly associated with the category of substance, indicating that more poisoning cases occurred with substances belonging to a specific category. This will be detailed in the following section 5.2.3.

A non-significant relation was found between the age category of a child, ethnicity of the child and the marital status of parents and the outcome of an occurrence of a poisoning. Our findings differ from other studies, wherein age was significantly associated with the occurrence of poisoning (Ellis *et al,* 1994; Parsotam S, 2001; Gupta *et al*., 2003; Manouchehrifar *et al*., 2016; Pac-Kożuchowska *et al*., 2016).

Healthcare practitioners, upon being interviewed, indicated that while they rarely or infrequently had to manage poisoning cases, the most common age group of children were toddlers (<6 years of age).

L100: *…I see cases in younger children, infants and toddlers, so I would say under 6 years.*

L106: *Generally with toddlers, because the toddlers are the ones that are crawling around, walking around and they tend to give us the 'curiosity killed the cat scenario'…between the ages of maybe about two months to about 5 years.*

The reason for the difference observed in the results from the questionnaire could be that only four crèches/day-care centres were randomly selected from the sampling frame, and therefore the amount of children represented through this age category differed substantially (due to the smaller classes) to the amount of children represented through primary schools.

Healthcare practitioners also suggested a range of reasons for the occurrence of poisoning, and these are presented in Figure 5.4.

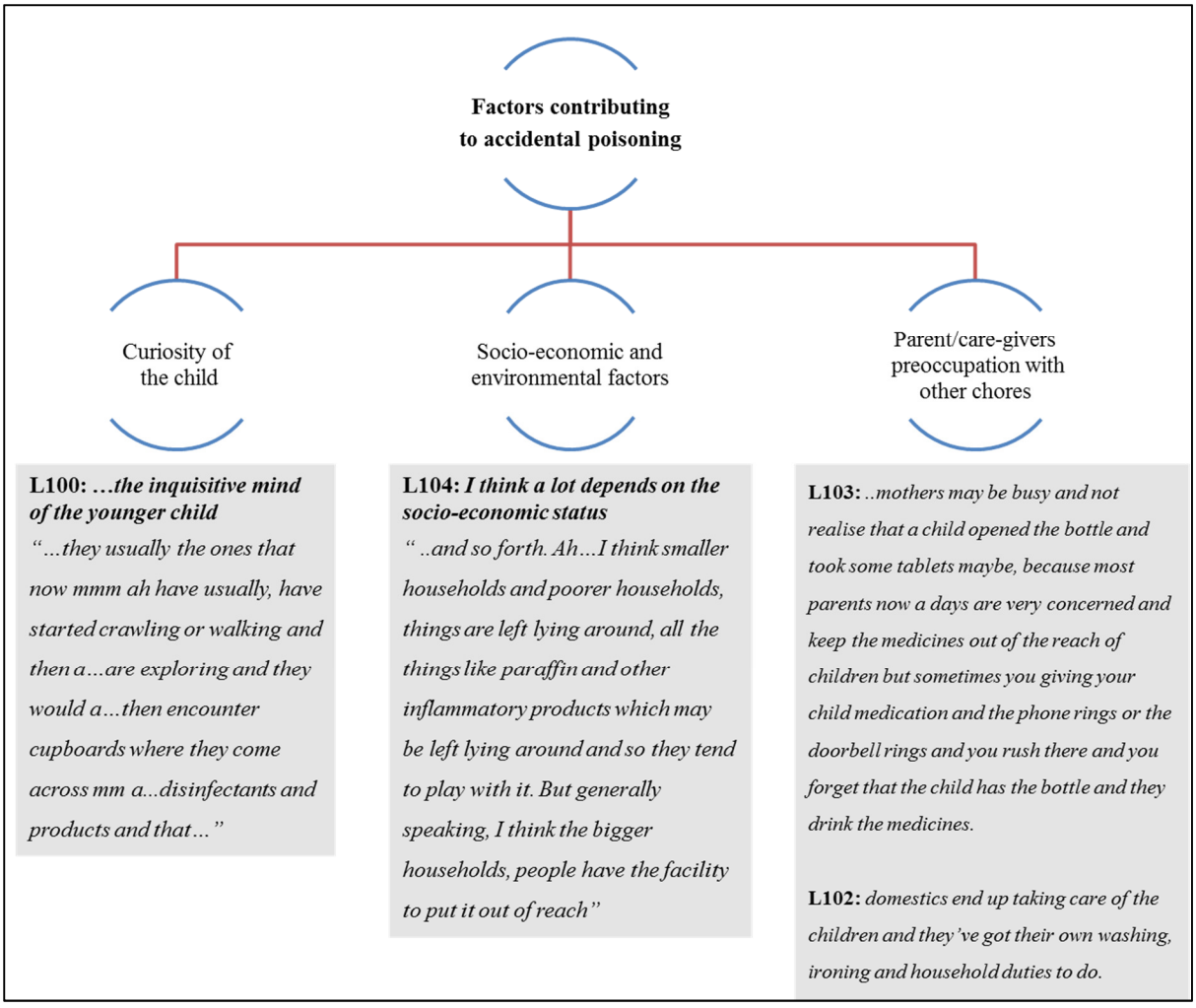

Figure 5.4 Healthcare practitioners views on factors contributing to accidental poisoning amongst children

Curiosity of the child and socioeconomic status have been documented in previous literature with the WHO report on child injury prevention reinforcing these two factors (WHO, 2008) as determinants for accidental poisoning amongst children.

Pre-occupation at the time of poisoning and unsupervised children have been reported in studies regarding access to poisonous substances (Ozanne-Smith *et al*., 2001).

The above mentioned factors suggested by healthcare practitioners are representative of what is experienced within the sample community, and may provide direction at

channelling community awareness initiatives when considering factors contributing to the occurrence of poisoning.

5.2.3 Storage level of substances

5.2.3.1 Storage of all substances

From the total of 24 588 substances reported to be stored in the households, 15 556 (63.26%) substances were stored at a level accessible to children, either in a *very easy (24.05%)* to reach or *easy* (39.2%) to reach level, while 9 032 substances (36.73%) of the substances were stored in a *difficult* to reach level. Pesticides and drug-chemicals were the only substances that had the lowest proportion of substances stored at a *very easy* level (17.9% and 18.23% respectively), and the highest proportion of substances stored at a difficult level (45.44 % and 40.14%). The pesticides most often stored safely was rat poison, followed by mothballs. Insecticides were found to be stored predominantly at an *easy level.* The medicinals most often stored correctly included prescription pain killers, antibiotics, oral contraceptives and antidepressants. Substances used on an everyday basis such as detergents, and cosmetics appeared to be stored in more easy to reach areas. Mouthwash was most often stored unsafely, along with perfume and aftershave, artificial nail removers and cigarettes and alcoholic drinks. Irritants and corrosives were mostly stored at an *easy* level, with drain cleaners, antifreeze, pool acid and windshield washer solutions stored most safely.

5.2.3.2 Storage of substances reported in a poisoning case

Upon analysing the storage practices of participants who reported poisoning cases, a similar trend to that mentioned above was found. A significant relation (p=0.021) was found to exist between the storage level of substances reported in a poisoning case and the category of the poisonous substance.

In the category of irritants and corrosives and general non-drug categories, both categories comprised substances that are used on a daily basis, the largest proportion of substances were stored at an *Easy* level, followed by the *very easy* level and the least proportion were stored at a level inaccessible to children. However, for pesticides, it was found that the greater proportion of substances was stored at a *difficult* level, followed by the easy level and the least amount of substances were stored at a very easy level, following the trend highlighted above. Likewise, for drug-chemicals, the smallest proportion was stored at a very easy level (as reported above), with the only difference that the greater proportion was stored at an *easy* level followed closely by the *difficult* level. The findings of our studies are congruent with other studies (Beirens *et al*., 2006; Smolinske and Kaufman, 2007) wherein parents/guardians were found to store medicinals and pesticides more safely than cleaning products and cosmetics.

To understand the nature of this relationship, further analysis was conducted to test the relation between the storage level of each substance reported in a poisoning case and the occurrence of a poisoning. The variable PARAFL (Petrol, paraffin and lamp oil-level of storage) was significantly related to the occurrence of a poisoning (p=0.037). In addition, the variable PAINTL (Paint and paint thinners-level of storage) was significantly related to the occurrence of a poisoning (p=0.006), while a

non-significant relation was reported for the remaining 27 substances storage level and the occurrence of poisoning. A logistic regression was then fitted for these two variables (PARAFL AND PAINTL) and the occurrence of a poisoning and a non-significant association was reported, indicating that while there is no association between the two variables and the occurrence of a poisoning, a difference between the proportions exists.

Overall, these storage level results indicate that parents who have reported cases of poisoning as well as those who have not, incorrectly store hazardous substances, thereby increasing the exposure of children to these substances. This practice has been reported in other studies (Patel *et al*., 2008; Ramos *et al*., 2010; Kendrick *et al*., 2016) wherein parents failed to securely store toxic substances.

The differing storage levels displayed amongst parents, can be attributed to various reasons as suggested by health practitioners during the semi-structured interviews and the participant comments:

a. **Socio-economic status**

The recurring issue of poverty and poor storage facilities, results in parents/guardians of children living in inadequately furnished homes, facing the challenge of storing hazardous substances in a safe space. The issue of socio-economic status has been documented in previous literature (Laflamme *et al*., 2010) and will be detailed in Section 5.3.1.2

b. Failure to recognise the toxicity of a substance, thereby incorrectly storing it

P/G 797: *This circular has brought to my attention the danger of daily detergents that we use and take for granted. Thank you.*

P/G 1320: *Thanks for making us aware of everyday household items that could be dangerous for our children*

P/G 1481: *Never thought that so many household products were poisonous and or dangerous*

c. General negligence in storing substances correctly

P/G 1213: *Having read the questionnaire, I confess that I am very negligent regarding the storage of certain poisonous substances.*

P/G 323: *Thanks for a very informative campaign. Makes mummys aware of how negligent we can be.*

d. Belief that children are at an age of understanding and therefore, parents do not need to be as cautious.

P/G 1275: *My kids are of an understanding age, so I no longer hide my detergents away.*

P/G 385: *This topic bothered me more when my kids were younger, therefore doors were locked, etc. however as they're older, I am more relaxed on the issue which I will definitely try to remedy, having completed this questionnaire*

P/G 255: *As parents we tend to be more lax with locking up most of household cleaning agents as the child gets older. eg: over ± 6 years.*

The above three explanations for poor storage levels, emerged from the comments section of the self-administered questionnaire. These quotes suggest a misconception amongst parents/guardians regarding the hazards of general possession of poisonous substances, and are congruent with findings from other studies regarding parental barriers in applying safety strategies (Gibbs *et al*., 2005).

Adults, irrespective of having children living in the household or not, should be aware of the dangers of toxic substances, and store these appropriately, as other children visiting the household are at risk of a poisoning. This finding has been reported in an international home visitation programme, wherein children were at risk of poisoning from toxic substances at the homes they visited (Coyne-Beasley *et al*., 2005).

5.2.4 Management of poisoning cases

At the time of a poisoning, there are two forms of management that are of importance, management of the parent/guardian of the child, and professional management by a healthcare professional.

This section will explain both forms of management exercised by the parents/guardians and the healthcare professionals by examining the results of self-administered questionnaire and the findings of the semi-structured interviews.

5.2.4.1 Management of the reported poisoning cases by the parent/guardian

Of the 245 poisoning cases reported in the household, the management for each case was reported by the parent/guardian. First aid was reported as the most common form of management response by parents (37%). Performing first aid is an innate response practiced by adults, in an effort of removing the contact time of the poison with the

body. Types of first aid initiated by parents/guardians included drinking milk or water to 'neutralise' the substance.

P/G 352: "*I find immediately giving milk always helps"*

P/G 1502: "*Fresh milk to reduce the strength of the poison"*

P/G 69: "*I know that if my child swallows a poison I should give him/her lots of milk to drink, don't force vomiting and I should phone my doctor"*

In addition, this pharmacist confirms the above mentioned practices and beliefs of parents in managing poisoning cases,

> L100: *"I think there's a misconception out there that mmm milk cures everything. So you more often than not would hear that people (say), "Oh I gave them milk to drink" which may not necessarily be the right thing to do depending on the ingested substance, but I have seen that"*

Administration of milk as a home remedy in managing childhood poisoning has been observed in other studies conducted in Africa (Chibwana *et al*., 2001; Oguche *et al*., 2007). In total, first aid was performed in 91 cases (37%), indicating that parents tried some form of emergency aid to remedy the situation. The reasons for this may be attributed to strong beliefs that milk 'reduces the strength of the poison', or that the parent/guardian may not necessarily have the means to travel to a doctor or hospital for help. The administration of milk in the management of childhood poisonings is not always warranted according to the *Poisons: Early and pre-hospital management chart* (2016) compiled by the Tygerberg Poison Information Centre. Interventions to correct this notion of practice are necessary, and will be discussed further in Section 5.3.2 under awareness and prevention initiatives.

Under one-quarter of poisoning cases (n=54) received no management or first aid and this trend has been reported by Chibwana *et al* (2001). As our study did not classify the nature of the poisonings, these incidents could be mild exposure to poisonous substances or parents believing that the amount ingested was not of a harmful quantity.

Seeking the help of a doctor or hospital, was reported in 46 cases (19%), suggesting that parents/guardians seek immediacy in managing the situation and trust the expertise of healthcare practitioners and healthcare practitioners understand this trust that patients have in them. This has been echoed by the healthcare professionals who understand the role they play in urgently managing the situation.

L108: "*I think they have, you see it's the confidence the patient needs to have, the parents need to have, that if I go here, my child will be safe, because it's not one of those things the child got a flu and sees doctor A or B, they need to feel confident"*

L107: *"I think their first line of action is if something happens they go to the chemist or the doctor immediately and if they can't find somebody they need to get to the hospital, they just get to it."*

In managing a case of poisoning, 874 (51%) respondents to the questionnaire indicated that they would chose the services of a healthcare professional as their first choice of contact or source of information/help in managing a possible poisoning, while 12% would opt to rush to the hospital, thus ensuring they would receive immediate medical attention. Only 153 (9%) of parents/guardians reported that they would contact a PIC, while calling for assistance from an ambulance service or other emergency medical services was reported by a combined 19% of respondents.

The reports of the respondents indicate that the only faces of management they identify with are those of health professionals and hospitals, and as a result of this, they are unaware of other means of care through the medium of PIC.

P/G 77: "*if something happens I only know that I must take my child to hospital"*

P/G 1503: "*try to do more advertisement based on poison centre, to research you guys because we know that when (a) child (has) taken a poison we take her to the doctor - I have not heard about any poison centre."*

P/G 735: *"I didn't know about this poison information centre"*

Similar findings were reported in a study exploring the barriers to utilising poison centres, wherein respondents cited trusting the healthcare practitioner as a reason for not accessing the poison centre (Kelly and Groff, 2000).

5.2.4.2 Knowledge and usage of PIC's

When asked if parents/guardians would use a PIC, 1 352 (78%) of respondents indicated that they would not, with 1 177 indicating that not knowing about a PIC was their reason for not utilising their services. Parents have strongly conveyed that PIC are unknown to them, and that parents/guardians should be made aware of this resource for their benefit.

P/G 231: "*From my area where I am staying we don't have much information. Our community doesn't know much about poisons centre except hospitals"*

P/G 389: *"We are not taught of poisonous centre, this is the first time I read about centres, please give us more information about what to do and who to contact"*

P/G 875: "*There is not much information given to the public about poison information centres"*

P/G 343: *"It would be very beneficial to know of poison information centres and how to use them"*

Other reasons reported for not using PIC services included not having access to a telephone, the number not being toll-free with a 100 respondents (8%) citing *other reasons,* such as:

P/G 117: "*safer to rush a child to the doctor than searching for a phone number"*

P/G 482: "*consumes time searching for information"*

P/G 278*: "(they) take too long to respond"*

P/G 333*: "I'm used to the doctors' orders"*

P/G 457*: "(Its) not in JHB"*

These factors are consistent with other reports for not accessing PIC's as reported in previous studies investigating the barriers to utilising poison information centres (Brannan, 1992; Vassilev *et al*., 2006).

These comments suggest that parents do not see the value of contacting a centre, having previously experienced waiting times (as indicated by P/G 278) and having full confidence in the service of the healthcare professional. Only one respondent

indicated the reason for not accessing the centre is because it is not based in Johannesburg. The misconception amongst parents that a PIC needs to be located in the area that one resides in, in order to make use of the services needs to be addressed. This belief has been reiterated by the general comments of the parents/guardians,

P/G 71: "*the above poison information centres are not accessible for residents living in the south of Johannesburg"*

P/G 90: "*it would be nice if every community knew their nearest centre and telephone numbers as it is 24hrs"*

P/G 97: "I *think Johannesburg should have its own PIC it does not have (one) at the moment"*

The role of PIC's need to be advertised so that they are seen as beneficial centres providing an important service to the country. PIC's should not only operate within their realm or in academic/medical spheres. They should be actively operating within the country and their services should be promoted. PIC's play a role in the prevention of poisonings and further measures to be a part of affording health literacy to individuals will be discussed in Section C, 5.3.2.

A varying range of PIC's were cited by the 376 (22%) respondents who indicated they may contact a PIC. The most common PIC mentioned was the Redcross PIC (34), and the Tygerberg PIC (15). A majority (236) respondents indicated that they would contact the number listed in the directory, while 37 respondents mentioned that they had a number on hand listed on a fridge magnet or emergency list. A total of 34 respondents mentioned PIC's that are no longer operational in South Africa.

It is evident that very few respondents are aware of functional PIC's in the country, while others rely on information distributed through local telephone or community directories or paraphernalia distributed at hospitals or clinics (fridge magnets / emergency lists). However, it is of importance to note that some of these avenues are not updated on a regular basis resulting in incorrect information distributed to parents.

Respondents appear to be more familiar with PIC's, when prompted by specific names of PIC. The PIC situated at the RCWMCH was the most identified centre with 449 respondents knowing about it, followed by 152 respondents knowing of Tygerberg PIC and a handful of patients knowing about the Bloemfontein PIC. However, although these centres were identified with, majority of the respondents did not have their contact details.

It appears that respondents may be familiar with certain centres, through media, paraphernalia distributed at some clinics or hospitals, reading baby/child care magazines or the local directory. Knowing about the existence of a PIC but not having their details readily available compromises the urgency at which a person needs to obtain the information. It is important for parents/guardians to have the contact details available in an easy to access area, so that any member of the household may gain access to the centre if the need arises.

5.2.4.3 Usage of the Internet

In an attempt to understand the full scope of parental management procedures, parents were asked if they accessed the internet for information regarding poisons

management. A staggering 1616 (93%) of respondents reported not using the internet, and the explanation for this could be multidimensional. The serious nature of a poisoning would not provide adequate time for a parent to search the internet for correct management details and parents would prefer to rush to the healthcare practitioner for immediate assistance, as mentioned previously. Some parents/guardians may not be computer literate or may not have access to the internet, due to socio-economic reasons, and this sentiment has been echoed by parents and healthcare practitioners alike,

P/G 261: "*I don't know how to use internet for searching"*

P/G 1702*: "Access to a computer, it's a challenge as most of people are computer illiterate and are not capable of utilizing the internet. Skilling most communities through skills education conducted by government, they are not catering for everybody, even in the cities as there are not centres offering those skills.*

L105: *"…those living in the informal settlement are not always you know, technology equipped to do these type of things"*

While a majority of the respondents reported not using the internet for poisoning related queries, we cannot generalise that parents on a whole do not use the internet for general health seeking purposes. International studies have found that parents find the internet a resourceful tool in obtaining health related information (Tuffrey and Finlay, 2002; Wainstein *et al*., 2006) and suggest the guidance of healthcare practitioners in directing their search of trustable sources of information (Khoo *et al*., 2008).

The findings of this study indicate that there is a low public awareness of the existence of PIC, as parents seek the services of healthcare professionals for poisoning emergencies. Contrary to findings of other studies (Rush and Reith, 2003) PIC were not the most accessed source of information in this study. However, the overall sources of information sought are similar to this study, wherein health practitioners or the emergency room was visited for management. The reason for increased knowledge and popularity of PIC's in other countries, especially North America may be attributed to the synchronised PCC network available, thereby promoting the services of PIC. Previous studies in South Africa have not investigated the information sources accessed by parents following a poisoning and could warrant further investigation.

5.2.4.4 Management of Poisonings by Healthcare practitioners

One of the objectives of the semi-structured interviews was to explore the management of poisonings by healthcare practitioners. Following the analysis of the semi-structured interviews, it emerged that healthcare practitioners do not have a standardised protocol to follow, as there is no established official protocol for poisoning management in South Africa, even though guidelines have been proposed (Van Hoving *et al*., 2011). The management procedure followed by healthcare practitioners participating in this study can be summarised as symptomatic management, and is presented in Figure 5.5 below.

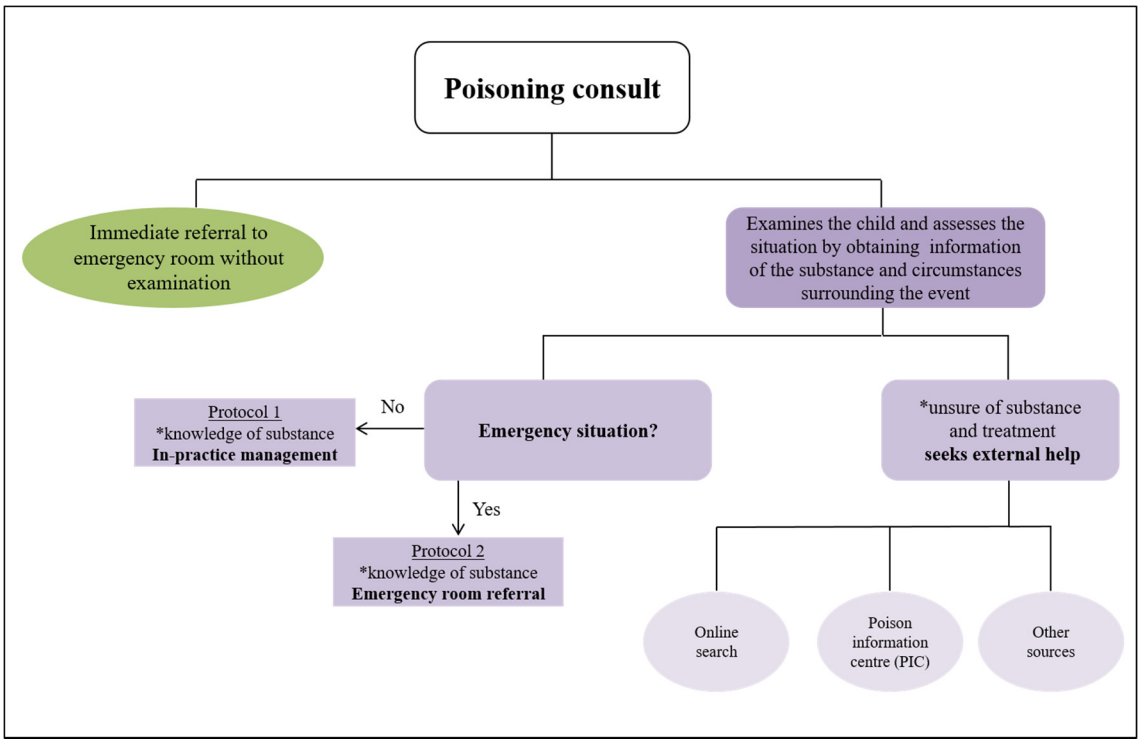

Figure 5.5 Management processes of poisoning cases presenting at a Healthcare Practitioner

The above figure was composed from the data emerging from the semi-structured interviews and the ethnographic observations. Four distinct management processes emerged:

1. **Does not treat the patient and immediately refers the patient to an emergency room**

   This was noted during ethnographic observations observed upon visiting the non-participating healthcare practitioners and inviting them to participate in the study. Some healthcare practitioners indicated that they do not attend to these emergencies, and immediately refer the patient to the closest emergency room. The reason for this may be attributed to healthcare practitioners feeling under-resourced or inadequately trained to manage these situations.

2. **Symptomatic management of a poisoning case, through positive identification of the substance**

> L105: *"Ok, first of all you look at what they've ingested, depending on the substance they've ingested first of all. If they've ingested something you can deal with as an outpatient, they'll be treated as an outpatient. Mostly your liquids you worried about aspiration pneumonia and all that, so you concerned about that, so you look at their chest and give them, you know you can give them oral agents to drink as well"*

3. **Referral to an emergency room, through positive identification of the substance and assessment of the severity of the poisonous substance.**

> L105: *"But when it comes to things like rattex and that then it becomes a bit more serious, because they can develop bleeding disorders and that when you concerned more about it and that's the cases you admit and you rather send them to a facility that can deal with them more than anything else."*

4. **Seeks external assistance for unknown substances in which the treatment is unknown or unfamiliar to the healthcare practitioner.**

When asked how healthcare practitioners attend to unfamiliar poisoning cases, the following resources were cited as information sources,

> L107: *"When we don't understand where this is coming from, we can say ok, lets phone somebody who might be able to know something or a poison division or one of those things or one of the pharmacies, somebody who we know, someone that may correlate with us. So you know, comparing notes."*

In addition, searching the internet, resources such as the MIMS, SAMF, and Martindale were cited as in-house go to resources to address the situation.

Of note, none of the healthcare practitioners mentioned any of the available drug poison database programmes that are currently available for reference, such as the Afritox database. This may indicate that these programmes are not useful in community pharmacy and for the general practitioner, as the general symptomatic management suffices for the cases that present.

Use of PIC by healthcare practitioners

Healthcare practitioners reported that they would consult a PIC in aiding their practice in cases of emergency, and found their services valuable, useful and of an excellent quality. However, there appears to be an undertone of declining familiarity of PIC's with healthcare practitioners due to past experiences.

L100: *"I have accessed the one in Cape Town before, cos mmm it wasn't easier accessing the one here in Johannesburg. I don't know if there was a problem at the time but they actually told me to call the one in Cape Town."*

L107: *"…they keep on closing up (down) and opening up. Because I normally keep their number on my cellphone, under emergencies and poison information centres… So when you phone them, they say no this centre is now closed. I think the two centres were Cape Town and Pretoria. I don't know which one is operating right now. I've got the numbers on my phone, but its not actively marketed, you know like in medical journals or laid behind in practices or there's very little marketing from the poison information centre people."*

L106: *"You actually brought back a part of my memory when you brought back poisoning centres, I'd actually forgotten about them, that's how bad it has become, so they've actually fallen off the radar…when you alerted me about your topic…I said hold on there was centres and we made use of them in the past and what happened? And now I'm asking the question, and I could be totally off the mark by saying I don't know, I'm sure that they there, I'm sure they performing a function, maybe I haven't utilised those channels, but I would like to see in our scope of practice and in our setting, a more visual outlook on them, a more…what can I say, a more continuous in your face kind of programme from them."*

The services of PIC's and the value they add to the country needs to be emphasised, so that they are better utilised to serve the purpose of their function. Successful initiatives of National Poison Information centres have been reported in various countries across the world (Pourmand *et al*., 2012) and have been positively linked with reducing the costs of national healthcare spending and enhanced patient outcomes (Galvão *et al*., 2011). The operational PIC's in South Africa are well established and have successfully gathered a poisons information database through their years of experience, however their services are unknown to a large majority of the country and should be actively integrated through healthcare networks.

5.3 Section C - Qualitative findings of the theme Health literacy, discussed in conjunction with the Parental/guardian views emerging from the self-administered survey.

In this section, the findings and discussion of the theme of *Health literacy* is presented in conjunction with the parental/guardian views on accidental household poisoning amongst children. The combined discussion of these two data sets allows for discussion of current primary knowledge among all role players of the community and coherently provides the means and methods for future educational initiatives.

In Figure 5.6 below, the convergence of thematic ideas emerging from the two data sets is presented, and the focussed area of discussion highlighted.

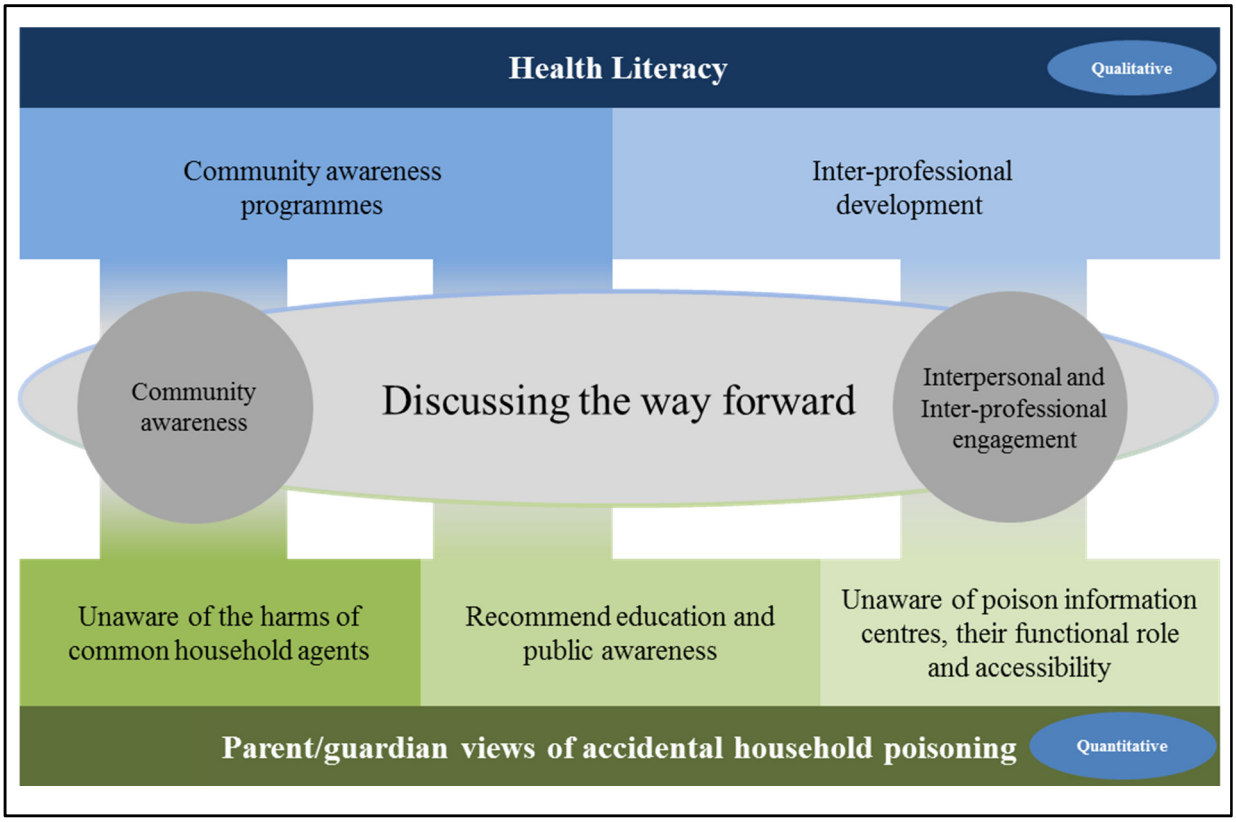

Figure 5.6 Convergence of the theme Health literacy from the Qualitative data set with the parental views poisoning emerging from the Quantitative data set

This theme was titled *health literacy*, as its respective categories and codes highlighted the need to implement educational initiatives which would inform and empower individuals. The concept of health literacy encompasses more than simply being able to read and write health information as defined by researchers in the early 1990's when the concept of health literacy was recognised (Kickbusch, 2001). The scope of this definition was later expanded to include more than fundamental literacy and the WHO then described health literacy as the ability to use various skills sets to understand information correctly, and to empower oneself to act upon the acquired information by correctly implementing in one's life what has been learnt. Furthermore health literacy not only benefits an individual, but rather serves to be of value to societies in an effort of developing communities (Nutbeam, 1998)

In fulfilling the definition of this theme, the two main categories of this theme emphasise the importance of community awareness programmes through various mediums and the inter-professional development between healthcare practitioners viz. pharmacists and general practitioners, authorities such as poison information centres, the DOH and the community.

Similarly, the views of the parents/guardians originating from the self-administered questionnaire, covered elements of the need of increased awareness and education amongst parents. As a result of the congruency of emerging ideas between the two data collection methods, a merged discussion, as depicted in Figure 5.6 above, will follow to uncover the deeper meaning of the data.

5.3.1 Community awareness

Awareness, defined as having the knowledge or perception of a situation or fact, is a key factor in the prevention and management of poisoning. Being knowledgeable regarding the types of substances that are harmful is necessary in ensuring a safe environment for children. However, this knowledge must be coupled with further education of how to exercise caution or avoid a poisoning from occurring and methods of being proactive in the event of an unfortunate situation. Therefore, awareness of poisonous substances comprises a three-fold dimension, as depicted in the following figure:

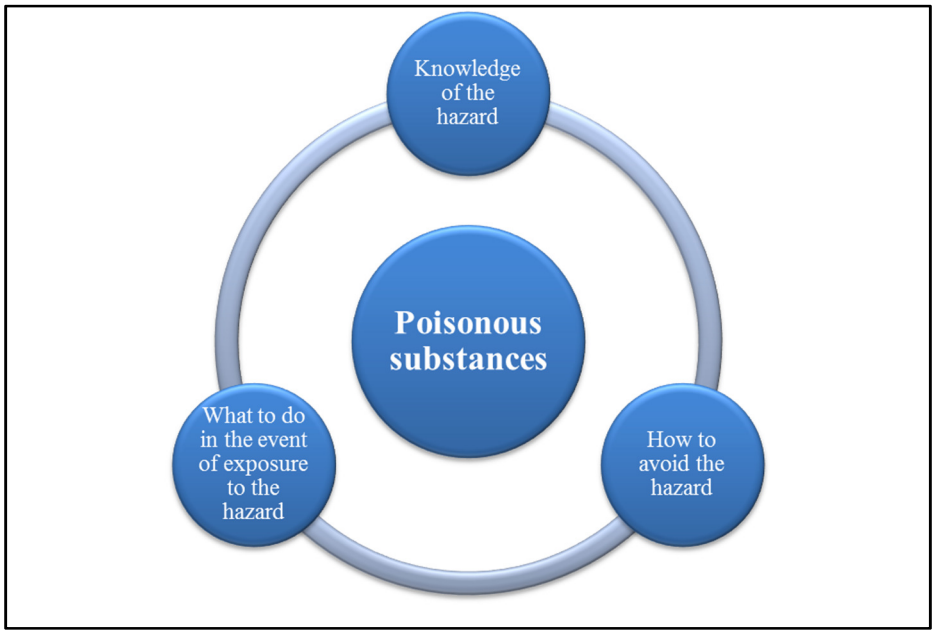

Figure 5.7 Three-dimensional approach in addressing community awareness regarding poisonous substances

This three-dimensional approach of awareness resonates with healthcare practitioners, who feel that awareness plays a key role in the prevention of poisoning. The following view of a pharmacist underlines the key features and importance of awareness.

L103: "*the bottom line, education is the key, you know, an informed individual right, can take better care than an uninformed individual, so I think education is the bottom line, it's the key on the proper use of the medication, of the proper storage of it, and then obviously how to approach a situation of abuse, of overdose, accidental poisoning of medication, you know overuse of medication whatever the case may be, and once they educated, people know exactly what to follow, they have a helpline"*

1

2

3

These constructs of awareness will be discussed further to highlight the role of the importance of community awareness in addressing and preventing accidental poisoning amongst children.

5.3.1.1 Knowledge of the hazard

"*the bottom line, education is the key, you know, an informed individual right, can take better care than an uninformed individual…"* (L103)

Lack of knowledge regarding the dangerous nature of a product can have detrimental effects on the safety of individuals. International studies have found that the inaccurate understanding of toxicity of certain household substances and medications have subsequently resulted in the incorrect

storage, thereby exposing children to these dangers (Patel *et al*., 2008; Lee *et al*., 2012).

In this study, while some parents reported safe storage practise, others acknowledged their unmindful nature of various hazardous household substances, and feel more educational initiatives should be set in place to address this issue, so they are able to act in the correct manner.

> P/G 1320: "*Thanks for making us aware of everyday using household items that could be dangerous for our children"*

> P/G 252: *It would be beneficial to parents to have and know (educate) about harmful poisons and how to help your child in a circumstance*

5.3.1.2 How to avoid the hazard

In the household, there are broadly two categories of ingestible hazardous substances, viz. pharmaceuticals and non-pharmaceuticals such as cleaning products, toiletries/cosmetics, pesticides, paints and plants (Wilkerson *et al*., 2005). Each of the substances within these categories varies in frequency of use within the household. Pharmaceuticals products may be used more than once a day, while household cleaning products may be used once daily or every alternative day. Similarly, pesticides and paints may be used very sparingly, sometimes just once a year. Regardless of the frequency of use of these substances, the manner of usage and subsequent storage and disposal is of vital importance in ensuring safety in the household. Parents need to be adequately informed on the correct and responsible manner of managing these products within the household environment.

"…so I think education is the bottom line, it's the key on the proper use of the medication, of the proper storage of it…" (L:103)

Storage

Correctly storing a hazardous product aids in protecting the child from an unfortunate circumstance. Ideally, pharmaceuticals and other non-pharmaceutical products should be stored in a locked away cupboard, out of reach of children. However, more often than not, it is found that parents/ guardians store these substances in unlocked or easy to reach areas.

When asked about advice they would impart to parents regarding prevention of household poisonings from occurring, this pharmacist strongly emphasised the importance of correct storage practices,

L100: *Storage, a...very important, obviously parents and care givers need to be educated on stor(ing) in storing medicines in the right places without easy access for the children...whenever we dispense medication to mmm store it mm appropriately and out of reach of children because they our first point of contact when we dispense medicines and a...I think would be ideally suited mm to provide that type of education and prevent future mishaps and accidents.*

In addition to fostering awareness, this general practitioner stated that healthcare practitioners should educate the care-givers regarding the hazardous nature of these substances.

L110*: yeah, obviously you have to educate them right, to tell the parent or whoever is at home, that these are the things you keep away from their children right. Don't leave it there right, this is it you know*

Admittedly, parents/guardians, have disclosed poor storage practices of hazardous substances within the household.

P/G 382: *This survey has brought to my attention the irresponsible manner of storage we currently using. I will be making some serious changes in my home.*

P/G 381: "*To be honest I don't think we anticipate this occurrence hence we are neglectful and complacent"*

International studies on storage of poisonous substances in the home have found that children are exposed to unsafe storage of medicines and cleaning products in more than just one location of the house (Gielen *et al*., 2001; Beirens *et al*., 2006). Parents often store medicines in the kitchen, bathroom and more often than not in areas where they will not forget to take their medication such as the bedside or in their handbags.

Whilst emphasis is made on the correct storage levels, often the low income South African household in an urban environment, finds itself in a predicament of a small home, or informal dwelling lacking basic necessities and infrastructure. In such homes, as much as parents would like to act in the correct manner, the circumstances do not always warrant for the correct storage procedures. In these conditions, often both parents are out working during the day, and the child is left at home with a sibling or a care-giver. Challenging living conditions has been found to be a common problem in low income countries. Lack of safe storage and inadequate space for play is responsible for the various injuries that children sustain (Bartlett, 2002).

Similarly, in a qualitative study conducted amongst parents in Victoria, Australia, environmental barriers such as limited infrastructure, or shared housing was cited as a the reason for unfavourable storage practices (Gibbs *et al*., 2005).

Healthcare practitioners, who are the first line of call in managing these poisonings, are of the opinion that living conditions which lack adequate space for storage contribute to poisoning injuries among children.

L108: *"You see I think the biggest…my understanding of the problem is that, one, the person that's using the particular substance is not aware, it could be poisonous to them or to their children. And as a result of this it may be left in an area that accessible and many many informal homes where they have a single room, where everything is one place, they don't have any storage facilities, I don't know how I can blame them, they may be aware yet they may not be aware that at the time of them leaving, that bottle is exposed to the child. I don't know, that's in God's hands. We can't, I don't know, I can't find any fault, but if they had proper facilities, then the education of the parent should be that certain things are harmful to them and poisonous and dangerous and possibly likely to kill them. And that word kill has to be there..."*

Correct usage of substances

Subsequent to correctly storing medicines and other household substances in a safe location, the correct usage of substances, in particular medication was an issue noted by healthcare practitioners as an important step in creating awareness amongst parents.

Health practitioners emphasise the importance of parents to supervise the administration of medication to children as opposed to children self-medicating, as this practise reduces any risk of the child over medicating.

L100: *"but generally what we need to do is just obviously tell parents that they should give the medication to the children, store it in an appropriate place that's without easy access and mm see that children are not left to self-medicate and take medication on their own"*

In addition to supervising the administration of medication, healthcare practitioners also raised the topic of the dangers of parents self-medicating the children. This has been documented in studies locally and internationally (Li *et al*., 2000; Yin *et al*., 2010) either through over-dosing of under-dosing. Of particular interest, healthcare practitioners raised the issue of educating parents on the dangers of administering combinations of medications such as over the counter cough and cold preparations and paracetamol.

L102: "*You know what I find a major problem with the medication problems especially is paracetamol. A lot of the cold and flu syrups have paracetamol in it and addition they don't know now that you can't give panado with that as well"*

L106: *and because paracetamol is so ubiquitous and so available, you find it in lots of formulations and sometimes as combinations formulations make it a bit more tricky, you get it in a…combination with your ibuprofens to drop a fever fast and then mothers are unfortunately unaware that paracetamol is also part of a lot of flu medications. and now you find that you adding flu medication, plus panado itself plus the so called fever medication and that's where the triplicate dosing comes in, so unfortunately pharmacists are...needed to advise and patients need to listen."*

Cough and cold preparations have been reported in previous studies as a common cause for poisoning among children due to its off-label use (Bronstein *et al*., 2012) and non-therapeutic administration by parents (Dart *et al*., 2009). These findings suggest a universal malpractice by parents seeking to remedy their children, without professional guidance.

5.3.1.3 What to do in the event of an exposure

"…so I think education is the bottom line...how to approach a situation of abuse, of overdose, accidental poisoning of medication, you know overuse of medication, whatever the case may be." (L:103)

The key to managing a poisoning emergency is to react quickly by identifying the substance, and assessing the quantity exposed to the child. However, often parents are left in a state of distress following an exposure and rush to the closest medical facility.

P/G 429: *Households should be given more info regarding what to do in such a situation. We take it for granted cos (because) it's never occurred to any of us. Telephone numbers should be made more freely available just like police, ambulance, etc.*

P/G 481: *all participants need to have full information on how to treat poisons, what to do? where to go and phone numbers please*

Providing parents/guardians with literature rich in information, will empower them to take control of the situation and act accordingly. There are centres

providing information pertinent to parents, however these are often not known to the general masses and are advertised in areas or avenues with limited access. Managing a poisoning case is a priority for all parents and information regarding this should be easily accessible or distributed to parents for future use or reference.

The suggestions offered by parents and healthcare practitioners, should be heeded in an effort of empowering individuals to be more health literate.

P/G 1418: *"Poison and the effects of poisons are not well advertised"*

Various possibilities exist to disseminate information to the masses, and these have been identified by both parents and healthcare practitioners.

P/G 45: "*I just heard about Redcross but no number, please advertise everywhere, where we can see it easily tv's, radios, newspapers or even giving children at schools papers with more information mostly phone numbers"*

P/G 85: "*I feel this is a very important topic which gets little or no exposure. I didn't even know such centres even existed. There should be more exposure through the media, adverts, local clinics, educating the public about this. Think of how many children die because of their parents' negligence. Thank you, you made me think of upgrading the security in my home, little things that seem so mindless. We rather be safe than sorry"*

International studies focussing on poison prevention strategies reported similar findings from participants of focus groups, stating the need for more information and literature informing them of which substances are dangerous

(Schwartz *et al*., 2003). Likewise, health practitioners in this study, advocated for the same,

L103: *"…people need to be educated, maybe there should be a poison information leaflet you know whereby commonly used substances, I know I said paracetamol, like panado, you know cough medicines, flu medications, in case children take it, what does it contain, what you should do, just guidelines to parents…Sort of a 1,2,3 guideline procedure that listen, if this happens this is what you look out for…"*

L105: *"If we had posters for example that we could put up in a practice and say these are things that we do in an emergency and handout to patients that live in these so-called low socio-economic areas, to say that if you using this, this is what you need to be aware of. If you ingest, this is what you need to be aware of, and this is what you need to do, just work it out.*

Community based educational initiatives directed at injury prevention have been the take home message from many studies focussing on injuries and childhood poisoning (He *et al*., 2014) . Successful initiatives through the combination of education, provision of home safety equipment and home visitations were found to be the most effective interventions in promoting poison prevention (Kendrick *et al*., 2008; Achana *et al*., 2015). However the cost implications of training healthcare workers and the time involved in facilitating home visitation programmes should be evaluated in a South African context. A more feasible scheme of reaching out to the masses through advertising effectively by making use of all media outlets should be considered. According to a recent South African report by Arnold and colleagues (2017) regarding the prevention of ingestion injuries, media

sources including social media are “untapped resources” and should be utilised in gaining the support of government to effect legislation regarding hazardous substances.

The inclusion of government in addressing these issues highlights the concept of integrated professional relations between health professionals, government and other statutory bodies and is the foundation of the second category of the theme Health Literacy: *Interprofessional Development.*

5.3.2 Inter-professional development

Effective public health services are the product of functional and strong inter-professional collaborations (D'Amour *et al*., 2005). In relation to this study, the term inter-professional development refers to the progression and growth of relationships between various professional constituencies (healthcare professionals, poison information centres, government organisations) towards servicing the public.

In identifying with their professional identity, healthcare practitioners recognised themselves as a means of disseminating information to the community, through integrated collaborations with other stakeholders.

L100: “*…I think we so busy as pharmacists with mmm with a…with tending to like prescriptions and giving out medicine to really ill people, other factors like these get left behind and to the way side and mmm maybe it’s something we need to take into consideration when dispensing to provide like you say that positive feedback to parents on how to deal with medicines and avoid situations and mishaps accidents.”*

L105*: "I think it has to come back again, I think these roadshows need to take place and I think this is the perfect example of a public/private interaction that can take place, where private sector can really get involved and assist public sector to make sure that these roadshows take place, especially at a district and rural level.*

L107: "And maybe if we highlight this as a package of poisoning as being a 'thing' and there being some kind of education sent to us regularly as awareness of certain things that are happening around us, that can help us even improve with our patients, help them to understand what kind of poisoning there is out there."

PIC'S should harness the opportunity of maximising their impact and versatility through interactions with healthcare practitioners, as healthcare practitioners are ideally positioned to bridge the gap of communication between professional bodies and the community. In addition to healthcare practitioners, collaborative relations with government health educators and organisations focussed on public education (Woolf, 2004)

L105: *I think community pharmacy is an ideal setting in the community especially because I mean we open, we accessible, we affordable and we provide this service for free and people once they see this also in our arena they would then ask the questions and then also take it away with them."*

Through these collaborations, PIC's should be initiating public poison prevention awareness as they are at the forefront (Ponampalam and Anantharaman, 2003) of monitoring trends and changes in the poisoning world. This has been documented in literature wherein PIC's established poison awareness programmes through various platforms including schools (Lall and Peshin, 1997).

The provision of literature regarding current trends, management procedures and lists of dangerous substances to healthcare practitioners from PIC's, can be disseminated to parents and care-givers through the healthcare facilities situated within communities, as healthcare practitioners are the choice of information sources as suggested by the results of our quantitative data.

L104*: "I would suggest that if they could have pamphlets relating to this subject topic and hand it out to different health practitioners, I think that would go a long way. And of course as I mentioned earlier if there is something we feel the person can overdose on and have a fatal consequence, the health practitioners, pharmacists, whoever, must bring it to the attention of the person buying the medication."*

The forging of inter-professional relationships will ensure that healthcare practitioners are kept up-to-date of the latest trends and developments (Glenn, 2015) not only within the sphere of poisoning but also with regards to general medication as well, as the role of PIC's is multifold. Over and above their information services and data management and collection, the use of PIC's have substantially contributed to reducing medical expenditure within a country (Miller and Lestina, 1997; Woolf, 2004; LoVecchio *et al*., 2008). In South Africa however, this comparison has not been established as there are no studies published on the cost-effectiveness of PIC's in South Africa. This is an avenue of future research within the country, which if found to be consistent with international findings, may influence the use of PIC among the public and professional communities.

The revitalisation of PIC's as an essential service to the country needs to addressed, to empower individuals in understanding the value of their role in the services they provide.

Overview of theme

The theme of Health Literacy is multidimensional and involves an integrated approach between professional bodies and the public in promoting awareness regarding poisoning amongst children. To facilitate this process, various interventions have been suggested and are presented in Figure 5.8. Central to the well-being of the child, the closest means of protection is afforded by the care-giver whose primary information sources are healthcare practitioners within the community. Since the lay individual does not have direct contact with health authorities, the healthcare professionals aid in providing the care-giver with the necessary information emanating from these bodies. However, the advancement of technology has provided a secondary means of access to information, and these media avenues should be utilised in providing the correct information to the public.

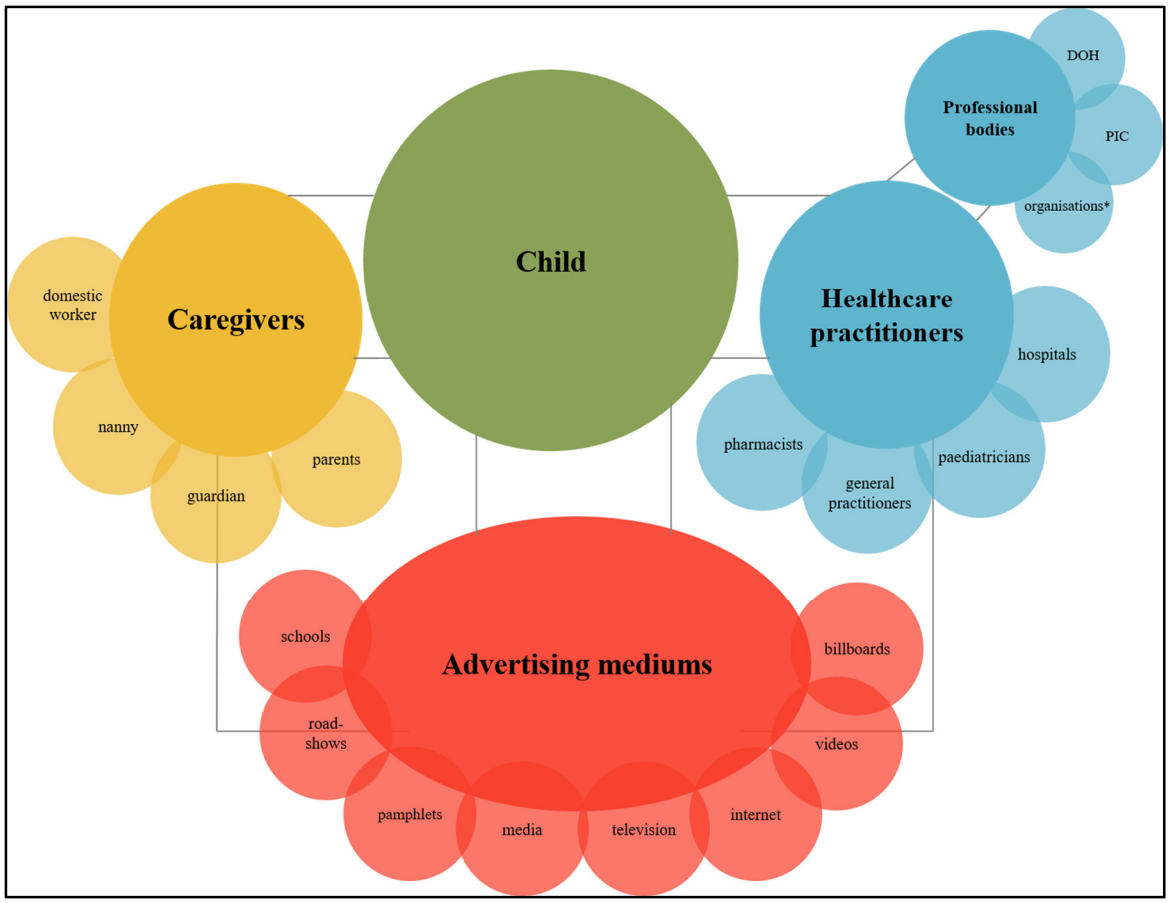

Figure 5.8 Multidisciplinary approaches towards creating public awareness in the interest of the child

Department of Health (DOH)
Poison Information Centres (PIC)

*Examples of organisations: Child Accident Prevention Foundation in South Africa (CAPFSA), Health Professions Council of South Africa (HPCSA), amongst others.

5.4 Limitations

During this study, various challenges arose, which could not be avoided or addressed in the study. These challenges were seen as limitations and will be discussed further below.

5.4.1 Location of sample

This study was conducted in one urban suburb of Gauteng therefore the findings from this study cannot be extrapolated to be representative of South Africa on a whole, neither can it be representative of all urban areas in South Africa, as the social constructs differ amongst suburbs. Nevertheless, all children across the country are at risk of accidental and non-accidental poisoning, in their household or external environment and as a result, some of the recommendations from this study will be relevant to parents and guardians across the country.

5.4.2 Instrument for quantitative data collection

The usage of a self-administered questionnaire to participants whom one does not come in contact with, presents with biases regarding recall, medium-to low response rates and no control over the completion of the questionnaire (Bowling, 2005). However, the primary information gathered from this questionnaire can be used as a guide in designing future research involving parents.

5.4.3 Number of participants in the semi-structured interview

The views of healthcare practitioners are representative of what they see in practice and may not necessarily be representative of healthcare practitioners across the country. Nevertheless, healthcare practitioners should be trained and educated to

respond to a poisoning emergency and as a result, would benefit from the recommendations set forth.

5.4.4 Triangulation of quantitative data with respondents

Parents / guardians were not qualitatively interviewed through the medium of semi-structured interviews or focus groups. Interviewing parents / guardians of children who experienced a poisoning incident could provide further information regarding the situational analysis of accidental household poisoning. Furthermore, it could unpack the knowledge gaps if any exist and provide useful information of future research initiatives.

Notwithstanding of the limitations presented, the study provided valuable information that has not been previously investigated in South Africa regarding the occurrence of accidental household poisonings and provides areas of further research opportunities.

Chapter 6 CONCLUSION

The aim of this study as reflected in Section 2.7 page 28 was to establish the occurrence of accidental household poisonings amongst children in an urban suburb and the management thereof by parents and healthcare practitioners. Objectives were set out to meet this aim and the main findings are detailed below.

6.1 Overview

Objective 1: The types of poisonous substances stored and the accessibility of these substances to children

Households in Lenasia stored a variety of hazardous substances with drug-chemicals (medicinals) constituting the majority of substances. The five most common substances stored were: Paracetamol, cough mixture, perfume and aftershave, furniture polish and detergents. The three least common stored items were antidepressants, pool acid and alcoholic beverages. Overall these hazardous substances were predominantly stored in accessible reach to children.

Objective 2: The number of poisoning cases encountered and the classification.

A total of 256 poisoning cases were reported, with 249 occurring in the household and seven occurring in an external environment. The substances most commonly reported in poisoning cases were general non-drug chemicals, followed by drug-chemicals.

Objective 3: Response management followed in relation to a poisoning case.

First aid was the most common response in attending to a poison case, followed by seeking help from a doctor. Most parents identified with seeking help from a doctor, then a hospital and only 9% mentioned contacting a PIC, indicating that PIC were unfamiliar amongst the respondents. These findings were further supported by findings from the comments section, strongly suggesting that parents are ill-informed of the availability of such services.

The local practice of healthcare practitioners were explored, and the amount of poisoning cases presenting at health practitioners were infrequent. There is no established protocol to follow in practice and symptomatic management is routinely practised. Healthcare practitioners consult PIC's if necessary however cite various operational problems with the service that require remediation.

In conclusion, both parents and healthcare practitioners strongly advocate for increased awareness regarding poisonings amongst children and call for increased initiatives through schools, and the media in addressing the topic, highlighting resources and services available for the effective management.

6.2 Recommendations for future research

Studies conducted in South Africa, are quantitative and report on poisoning statistics from rural hospitals, and PIC's, while very limited studies have included house inspections as part of larger injury related studies. Further community surveys should be expanded upon to understand the social factors underpinning poisoning. Parents/guardians are a valuable resource tool and can play an important role in diversifying the data collected, by

providing a third dimension of the on hand experience to the problem, thereby bridging the knowledge gaps if any exist and provide useful information of future research initiatives

As the rate of poisoning has declined in South Africa, attention to the ongoing surveillance of poisonings and continued awareness seems to have diminished as attention is focused on other injuries amongst children. The reality is that with increasing chemicals available on the market, children are exposed to more hazardous substances. As poisonings remain amongst the top five unintentional injuries amongst children, awareness of hazardous substances and the correct management of poisonings is of paramount importance and should be made available to all as an ongoing initiative.

To address the concerns of a lack of statistic for poisonings in South Africa, as highlighted by previous studies and this study, and to understand if there are stark contrasts between children of rural areas and children of urban areas, cross-sectional studies monitoring poisoning trends within a specified period across both urban and rural areas should be conducted to understand this phenomenon.

6.3 Insights

This study has emphasized the unsafe practise of storing hazardous substances within the urban household. Previous studies in South Africa have reported poor storage practices in low socio-economic areas, whereas this study highlights similar practises amongst parents of urban children. This is also the first study in the geographical area that informed parents of the existence of PIC as a service towards the management of poisoning.

6.4 Way forward

Videos and promotional items highlighting the effects of hazardous substances on children's bodies should be presented in the media, through roadshows, or educational material to children, parents, guardians and other members of the household in an effort of educating them.

Relevant data emanating from PIC's should not be constrained to journals and online resources, but should be communicated with the public at large, thereby emphasizing their ongoing services and empowering parents and guardians

Healthcare practitioners should engage more with families and parents of younger children to provide information and support, in addition to treating the ill.

6.5 Concluding remarks

Children are a vulnerable population and the obligation of protecting them lays on the responsibility of the parent/guardian. Accidental household poisoning is an injury that can be avoided through correct household preventative practices institutionalised by empowered and informed parents/guardians.

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APPENDICES

Appendix A University of the Witwatersrand Human Research Ethics Committee - Clearance certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Ayesha Ahmed

CLEARANCE CERTIFICATE	M110723
PROJECT	The Need for Poisons Information Centre in Gauteng
INVESTIGATORS	Dr Ayesha Ahmed.
DEPARTMENT	Department of Pharmacy & Pharmacology
DATE CONSIDERED	29/07/2011
M1107230DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 28/10/2011 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Ms Shirra Moch

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

Appendix B Faculty of Health Sciences, Approval of title letter

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

11 January 2017
Person No: 0300807H
TAA

Ms AY Ahmed
Po Box 1122
Lenasia
1820
South Africa

Dear Ms Ahmed

Master of Science in Medicine: Change of title of research

I am pleased to inform you that the following change in the title of your Dissertation for the degree of **Master of Science in Medicine** has been approved:

From:

To: **The occurence and management of accidental childhood poisonings in a South African urban surburb: a mixed - methods study**

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

Appendix C Gauteng Department of Education research approval letter

education
Department: Education
GAUTENG PROVINCE

For administrative use:
Reference no. D2012/195

GDE RESEARCH APPROVAL LETTER

Date:	**8 December 2011**
Validity of research Approval:	**6 February 2012 to 30 September 2012**
Name of Researcher:	**Ahmed A.Y.**
Address of Researcher:	**P.O. Box 1122**
	Lenasia
	1820
Telephone Number:	**011 854 3935 / 072 290 8966**
Fax Number:	**011 854 6068**
Email address:	**Ayesha.A102@gmail.com**
Research Topic:	**The need for a Poisons Information Centre in Gauteng**
Number and type of schools:	**FIVE Primary Schools**
District/s/HO	**Johannesburg South**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

1. *The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*

1

Making education a societal priority

Office of the Director: Knowledge Management and Research
9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za
Website: www.education.gpg.gov.za

3. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.*
4. *A letter / document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.*
5. *The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.*
6. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
7. *Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year.*
8. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
9. *It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.*
10. *The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.*
11. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.*
12. *On completion of the study the researcher must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
13. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.*
14. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

Dr David Makhado

Director: Knowledge Management and Research

2011/12/08

Making education a societal priority

Office of the Director: Knowledge Management and Research

9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za
Website: www.education.gpg.gov.za

Appendix D List of randomised numbers and list of schools

869 247 848 311 656 888 660 611 493 846 788 226 912 119 233 158 382 709 728 141
169 350 805 440 006 307 934 055 425 581 378 987 895 906 874 970 681 546 685 269
784 504 814 884 938 777 258 816 408 102 019 799 194 008 831 098 297 966 959 713
450 974 404 645 920 564 899 628 707 205 976 927 809 162 104 542 963 436 549 474
699 760 044 457 485 667 856 756 322 624 984372 741 632 429 038 211 222 190 286
998 863 002 585 835 820 130 201 254 094 574 867 724 418 070 115 510 059 147 414
613 016 275 030 767 290 720 696 237 880 215 944 023 521 027 243 126 478 421 859
279 752 600 525 749 076 361 773 536 717 173 072 639 675 301688 792 948 745 354
528 538 506 602 048 179 318 902 151 137 446 517 570 410 891 183 040 735 386 432
827 376 464 731 664 333 592 081 083 607 771 012 553 931 532 995 339 837 344 560
442 795 472 910 596 803 916 842 066 393 677 824 852 034 489 389 955 991 617739
109 265 062 671 579 589 557 653 365 496 635 952 468 453 763 568 621 461 942 500
091 051 703 482 878 692 514 781 980 649 643 397 400 923 087 329 666 108 407 642
029 937 965 236 730 175 702 670 766 343 065 300 610 734 204 093 762 770 200 503
001 606 901 232 346 271 495 841 282 463 168 794 798 997 371 813 826 563 033 218
873 969 435 471 324 335 303 399 845 698 933 314 367 207 531 228 172 260 527 877
403 328 136 634 140 356 239 591 268 706 638 186 535 905 061 467 375 292 431 264
250 559 738 296 499 674 578 439 196 732 785 625 106 398 255 949 601 646 042 590
678 945 144 548 807 561 298 821 251 227 768 411 747 475 554 052 558 775 657 009
390 811 283 131 056 281 608 892 305 067 249 704 604 170 206 832 219 323 479 277

Specs: This table of 400 random numbers was produced according to the following specifications: Numbers were randomly selected from within the range of 0 to 999. Duplicate numbers were not allowed. This table was generated on 2/28/2012.

Numbers were chosen by vertical movement through the above list of random numbers

Table D1 List of primary schools in Lenasia

01	Al Aqsa
02	Alpha Primary
03	Apex Primary
04	Flamingo Primary
05	Greyville Primary
06	Harmony Primary
07	Impala Crescent Primary
08	Lenasia Model Primary
09	Lenasia Muslim School
10	Libra Primary
11	Nurul Islam Primary
12	Park Primary
13	Pentarosa Primary
14	Progress Primary
15	SBSM Private School
16	Sharicrest Primary
17	Zodiac Primary

Table D2 List of pre-school/creches in Lenasia

01	Bright Beginnings
02	Busibodies Nursery and Pre-school
03	Kindergarten Kids
04	Little Angels
05	Little Bambinos
06	Little Folks
07	Little Pumpkins
08	Little Shephards Educare
09	Little Wizards
10	Moms n Tots
11	Muslimahs and tots
12	Nawwar playground and pre-school
13	Nurul Islam
14	Rainbow Kids
15	Rainbow Nursery
16	Whiz Kids montesori and pre-primary
17	Young Einsteins

Appendix E School participation information letter

02 March 2012

Dear Sir/Madam

Invitation for your school to participate in a Poisons research study

Good day

My name is Ayesha Ahmed, and I am a masters student in the Department of Pharmacology at the University of the Witwatersrand.

My research focuses on accidental poisoning among children (between the age of 0 – 12 yrs) in Gauteng. This includes identifying the most commonly stored household poisonous substance, storage levels of these substances, rates of poisoning and poisoning management (how do you react and who do you contact in the case of a poisoning).

The benefits of this study include:

a. providing insight into the occurrence of poisonings and management procedures in Gauteng

b. establishing the need for a Poisons Information Centre in Gauteng.

Poisons Information Centres play a vital role within a region, as they are easily accessible in case of emergencies, and providing drug or chemical information. In addition, they are able to monitor poisoning trends and identify poisonous substances in a region, thereby alerting authorities and establishing intervention programmes to educate the nation.
By contacting a Poisons Information Centre, they will be able to advise you as to whether you need to visit the emergency room at a hospital or not, based on the substance ingested. This will reduce, the inconvenience of getting to a hospital, congestion at emergency wards and medical bills.

I hereby invite your school to please participate in this study. The process will involve handing out questionnaires to the students in your school, for their parents/guardians to answer. The questionnaire should take about ten minutes to complete. The questionnaire is anonymous and only members of the research team will have access to the responses, which will remain confidential.

It will be greatly appreciated if you could reply to this invitation by the 06 March 2012.

Your school is under no obligation to participate in this study. Kindly note, participation in this study confers neither advantage nor disadvantage. If you require further assistance or information about the study, please contact the researcher, using the details below.

Thanking you for your co-operation.

Miss Ayesha Ahmed
Department of Pharmacology, University of the Witwatersrand
Email: ayesha.a102@gmail.com
Mobile: 072 290 8966

Appendix F School participation consent form

Schools participation
Informed Consent form

I, _____ , _____ of
(state name and surname) *(state position, eg: principal)*

_____ , hereby (*consent / decline*) for our school
(school name)

to participate in the study regarding Poisonings in Lenasia and management thereof.

I understand that our schools decision to participate is voluntary, and I agree that participation in this study confers neither advantage nor disadvantage to the above mentioned school.

_____ _____
Name and Surname Name of school

_____ _____
Signature Date

Appendix G Participant Information Sheet

12 March 2012

Dear Parent / Guardian

My name is Ayesha Ahmed, and I am studying for a masters degree at the Department of Pharmacology at the University of the Witwatersrand.

My research focuses on poisoning among children (between the age of 0 – 12 years) in Lenasia, Gauteng. Recent studies conducted in America have shown that child poisoning is getting worse, and this calls for further educational efforts in safe storage of possible toxins.

The benefits of this study include:

a. providing insight into the storage of poisonous substances, occurrence of poisonings and management procedures in Gauteng
b. establishing the need for a Poisons Information Centre in Gauteng.

Poisons Information Centres play a vital role within a region, as they are easily accessible in case of emergencies, and providing drug or chemical information. In addition, they are able to monitor poisoning trends and identify poisonous substances in a region, thereby alerting authorities and establishing intervention programmes to educate the nation.
By contacting a Poisons Information Centre, they will be able to advise you as to whether you need to visit the emergency room at a hospital or not, based on the substance ingested. This will reduce, the inconvenience of getting to a hospital, congestion at emergency wards and medical bills.

The school from which you have received this questionnaire has given permission for this study to be conducted among the parents of the children attending the school.

I hereby invite you to please participate in this study. The questionnaire you have should not take you more than ten minutes to complete. As you will see your name does not appear on the questionnaire, and no one will know who has filled out the form. Therefore, please be truthful when answering the questionnaire. Only members of the research team will have access to the questionnaire, which will remain confidential and private.

Please try to answer all the questions. If there are questions you prefer not to answer, please state 'prefer not to answer' on the form. You are under no obligation to answer this questionnaire. If you complete the questionnaire, it will be regarded as consent to participate in the research. Kindly note, participation in this study confers neither advantage nor disadvantage. If you require further assistance or information about the questionnaire or the outcome of the research, please contact the researcher, using the details below.

It will be appreciated if you could please complete the questionnaire and seal it in the envelope provided and return it to your child's school by the 16th March 2012.

Thanking you for your co-operation.

Miss Ayesha Ahmed
Department of Pharmacology, University of the Witwatersrand
Email: ayesha.a102@gmail.com
Mobile: 072 290 8966

Appendix H Sample questionnaire

Parent/Guardian Questionnaire – Poisonous substances and poisons management

If you have received more than one copy of this questionnaire, please fill out only one copy.

Please insert a ✓ or ✖ at the most appropriate option.

Section A

School from which this questionnaire was received: _____

Participant details

Date of birth: _____ Gender: Male ☐ Female ☐

Marital status: Married ☐ Single☐ Divorced ☐ Widowed ☐

Relation to child: Mother ☐ Father ☐ Guardian ☐ (please specify relationship) _____

Occupation of mother: _____ Occupation of father: _____

Ethnicity: Indian ☐ African ☐ Coloured ☐ White ☐

Household member's details:

Children:	*Additional household members (please specify relation to child, eg: father, grandmother, uncle, aunt, cousin, etc…)*
1. Age:_____ Gender:_____	1. Age:_____ Gender:_____ relationship to child: _____
2. Age:_____ Gender:_____	2. Age:_____ Gender:_____ relationship to child: _____
3. Age:_____ Gender:_____	3. Age:_____ Gender:_____ relationship to child: _____
4. Age:_____ Gender:_____	4. Age:_____ Gender:_____ relationship to child: _____

Section B - Storage of household substances

SUBSTANCE	Which of these do you have at home (✓ or ✗)	How easily can your child reach these products		
		Very easy (no effort)	Easy (requires some effort, eg: a chair)	Difficult (Stored in a locked cupboard)
Antifreeze				
Windshield washer solutions				
Drain cleaners				
Toilet bowl cleaners				
Insecticides (Baygon®)				
Artificial nail removers				
Topical anesthetics (i.e. Products that may be used for sunburn pain)				
Detergents				
Automatic dishwasher detergents				
Furniture polish				
Perfume & aftershave				
Mouthwash				
Petrol, paraffin, and lamp oil				
Paint and paint thinners				
Mothballs				
Rat poison				
Medicines				
Paracetamol (panado)				
Antibiotics (eg: penicillin)				
Aspirin (dispirin)				
Cough mixture				
Prescription painkillers				
Oral contraceptives (birth control)				
Iron tablets				
Fluoride				
Antidepressants and anti-anxiety medication				
Traditional medicines				
Alcoholic beverages				
Beer				
Whiskey and Champagne				
Lithium batteries				
Cigarettes, tobacco products				
Pool acid				

SUBSTANCE	Which of these has your child ever taken? (✓ or ✱)	How did you react? a) Did nothing b) Did something, eg: first aid at home, force vomiting c) Phone someone for advice (family, friend, ambulance) d) Go to the doctor / hospital e) Hospital with admission f) Other (please specify)
Antifreeze		
Windshield washer solutions		
Drain cleaners		
Toilet bowl cleaners		
Insecticides (Baygon°)		
Artificial nail removers		
Topical anesthetics (i.e. Products that may be used for sunburn pain)		
Detergents		
Automatic dishwasher detergents		
Furniture polish		
Perfume & aftershave		
Mouthwash		
Petrol, paraffin and lamp oil		
Paint and paint thinners		
Mothballs		
Rat poison		
Medicines		
Paracetamol (panado)		
Antibiotics (eg: penicillin)		
Aspirin (dispirin)		
Cough mixture		
Prescription painkillers		
Oral contraceptives (birth control)		
Iron tablets		
Fluoride		
Antidepressants and anti-anxiety medication		
Traditional medicines		
Alcoholic beverages		
Beer		
Whiskey and Champagne		
Lithium batteries		
Cigarettes, tobacco products		
Pool acid		

1. Has your child ever been poisoned at any other place besides the home? (eg: school, shopping mall, friend's home, etc…) Yes ☐ No ☐

If yes, where did this occur? what was the poisonous substance and what was the outcome of the incident?

_____

Section C - Poisons Management - What do you do?

In the case of your child swallowing a possibly poisonous substance, what do you do?

a) Who do you phone? _____

b) Do you phone a Poisons Information Centre? Yes ☐ No ☐

If yes, which Poisons Information Centre do you phone and where do you get the number from?

_____

If no, why not?
Don't know about them ☐ Don't have a telephone ☐ Not a toll-free number ☐
Other (please specify) ☐ _____

c) Have you heard of any of the following Poisons Information Centers?

1) Tygerberg Poison Information Centre	Yes ☐	No ☐
2) Redcross children's memorial hospital	Yes ☐	No ☐
3) Bloemfontein Poisons Information Centre	Yes ☐	No ☐

d) Do you have the telephone numbers of the following Poisons Information Centers?

1) Tygerberg Poison Information Centre	Yes ☐	No ☐
2) Redcross children's memorial hospital	Yes ☐	No ☐
3) Bloemfontein Poisons Information Centre	Yes ☐	No ☐

e) Do you search the internet for poisons management information? Yes ☐ No ☐
If yes, which sites provide the most beneficial poisons management information?

Please feel free to add any comments

Comments: _____

Thank you for participating in this research.

Appendix I Coding Sheet for capture of data into Excel

Coding Sheet for data capture into Microsoft Excel.

SECTION A – Participant Details

Gender **(GEN)**	Marital Status **(MAR STA)**	Relation to child **(REL TO CHILD)**	Occupation of Mother **(OCC M)**	Occupation of father **(OCC F)**	Ethnicity **(ETHN)**
1 = Male	1 = Married	1 = Father	0=unemployed	0=unemployed	1 = Indian
2 = Female	2 = Single	2 = Mother	1=employed	1=employed	2 = African
	3 = Divorced	3 = Guardian	2=home exec	2=n/a	3 = Coloured
	4 = Widowed		3=n/a		4 = White

Household members details

Child 1 age **(C1age)**
Child 1 gender **(C1g)**
1 = Male
2 = Female

Sequential coding was applied to additional children residing in the household 2/3/4/5

Additional household members details

Age **(ADD1age)**
Gender **(ADD1g)**
1 = Male
2 = Female

Sequential coding was applied to the additional household members 2/3/4/5

Relation **(ADD1rel)**

1 = Father	4 = Grandmother	7 = Cousin
2 = Mother	5 = Uncle	8 = Great grandparent
3 = Grandfather	6 = Aunt	9 = Nanny/ childminder

SECTION B – Storage of household substances

Which of these substances do you have at home?
(Antifreeze used for illustrative purpose, coded **ANTIF**)

Is the item stored in the house? 0 = not stored in household 1 = stored in household	If Yes, at what level is the substance stored, 1 = Very easy 2 = Easy 3 = Difficult	Poisoning occurrence from this substance 0 = No 1 = Yes	Management of the poisoning from this substance 1 = did nothing 2 = did something (first aid) 3 = phone someone for advice 4 = go to the doctor / hospital 5 = hospital with admission 6 = other
ANTIF	**ANTIF-L**	**ANTIF-P**	**ANTIF-M**

This coding method was applied to all substances on the list.

A list of codes of the substances follows herewith.

Substance	CODE	
Antifreeze	ANTIF	
Windshield washer solutions	WWS	
Drain cleaners	DRAINC	
Toilet bowl cleaners	TBC	
Insecticides	INSECT	
Artificial nail removers	NAIL R	
Topical anaesthetics	TOP AN	
Detergents	DETERG	
Automatic dishwasher detergents	DISHW	
Furniture polish	POLISH	
Perfume and aftershave	P&A	
Mouthwash	MOUTHW	
Petrol, paraffin and lamp oil	PARAF	
Paint and paint thinners	PAINT	
Mothballs	MOTHB	
Rat poison	RATP	
Medicines -		
Paracetamol (panado)	PARAC	
Antibiotics (penicillin)	ANTIB	
Aspirin	ASPIRIN	
Cough mixture	CMIX	
Prescription pain killers	PPK	
Oral contraceptives	ORALC	
Iron tablets	IRONT	
Fluoride	FLUOR	
Antidepressants	ANTID	
Traditional medication	TRADM	
Alcoholic beverages		
Beer	BEER	
Whiskey and champagne	W&C	
Lithium batteries	LIT B	
Cigarettes, tobacco products	CIG	
Pool acid	POOLA	

Poisoning occurred at any other place **(EXT P)** 0 = No 1 = Yes If yes, at which location did the poisoning occur 1 = School 2 = Household 3 = Work	What was the substance **(EXT P)** Insert Code 1 = unknown 2 = drug-chemical/medicinal 3 = pesticide 4 = non-drug chemical 5 = animal bite	What was the outcome **(EXT P.O)** 1 = First Aid 2 = Went to the Doctor 3 = Hospital with admission 4 = called emergency medical services, dealt with incident on phone

SECTION C – Poisons Management

Who do you contact (CONTACT)	**Do you call a PIC? (CALL PIC)**
1 = Healthcare professional (Doctor, Pharmacist, Nurse) 2 = Rush to Hospital 3 = Poison Information Centre 4 = Ambulance 5 = Emergency Services (Police, Netcare) 6 = Other 7 = not sure	0 = No ⟶ Why not? 1 = Don't know about them 2 = Don't have a telephone 3 = Not a toll-free number 4 = Other 1 = Yes ⟶ Which PIC do you contact? 1 = Tygerberg PIC 2 =RCWMCH PIC 3 = Number listed in directory 4 = UNITAS 5 = Has number on an emergency list/ magnet 6 = JHB Poison Centre 7 = Not sure 8 = Number on Product 9 = St Johns Poison Centre 10 = Rietfontein PIC 11 = Amayeza

Have you heard of any of the following PIC? Tygerberg PIC = **(TPIC)** Redcross = **(RCWMCH)** Bloemfontein PIC **(BPIC)** 0 = No 1 = Yes	Do you have the telephone numbers of the following centres? Tygerberg PIC = **(TPIC-N)** Redcross = **(RCWMCH-N)** Bloemfontein PIC **(BPIC-N)** 0 = No 1 = Yes

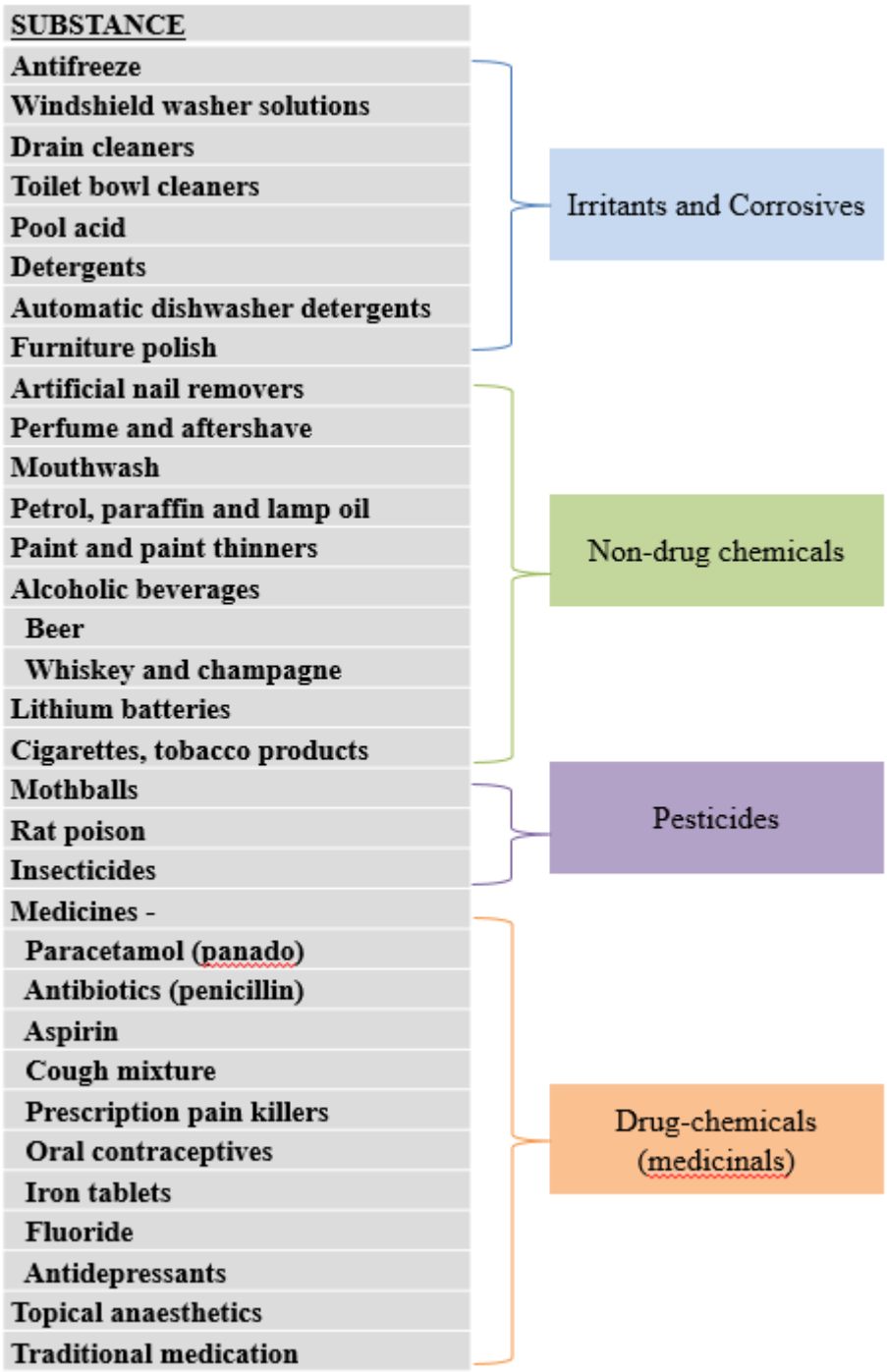
Do you search the internet for poisons management information? (INTERNET)
0 = No 1 = Yes

Sites providing beneficial information
(SITE) - captured as provided

Comments
(COMMENTS) – captured as provided

All sections were quantitatively analysed, accept for the Comments section, which was qualitatively analysed.

Appendix J Grouping of household substances into categories



Appendix K List of pre-determined open-ended questions for semi-structured interviews

Archive No.		Start time	
Site		End time	
Date			

1. **Can you tell me how often you encounter a poisoning case in children under the age of 12?**
   - By which parent/guardian do you receive the most queries (time of day, season, mother, father?)
   - From whom other than the parents/guardians do you receive childhood poison queries?

2. **What is the most common age range of children presenting with poisoning queries**
   - Boy or girls?
   - what do you think the reason is why this age group of children are commonly poisoned

3. **Which are the most common substances that are queried?**
   -why do you think these substances are accidently ingested

4. **What protocol do you follow in treating a poisoned child?**

5. **In the event of an unfamiliar substance ingested, do you have any resources available in practise to consult?**
   - Which sources of information do you consult? (Books, internet, PIC)
   - Can you please elaborate on which sources you access, which are the common ones
   - Do you access any professional sites?
   - How useful do you think these sites / PIC are?

   → **If no mention of PIC**
   - Do you know of any local/national PIC's that provide useful info?
   - In your opinion, what are the reasons why health practitioners do not make use of PIC?
   - What do you think could be implemented to improve the use of PIC among health practitioners

6. **How do you feel the role of technology has influenced how parents / health practitioners source medical information?**

7. **In relation to what you see in practice, what safety measurements do you think could be employed by parents/guardians in preventing accidental household poisonings**

   --> Is there anything else that you would like to add

Appendix L Healthcare practitioners informed consent and Information participation Sheet

Informed Consent Form for Healthcare professionals

Name of Principle Investigator:	**Ayesha Y. Ahmed**
Name of Organization:	**University of the Witwatersrand**
Name of Project:	***The occurrence and management of accidental childhood poisonings***

This Informed Consent Form has two parts:

- **Information Sheet (to share information about the study with you)**
- **Certificate of Consent (for signatures if you choose to participate)**

You will be given a copy of the full Informed Consent Form (ICF)

Part I: Information Sheet

Introduction

I am Ayesha Ahmed, a masters students in the Pharmacology Division at the University of the Witwatersrand. My research is focused on accidental childhood poisoning, and understanding factors contributing to poisoning and the management thereof. I warmly invite you to participate in this research by sharing your medical experience on childhood poisoning. You do not need to decide today whether you would like to participate, and should you require further information, please feel free to contact me or my supervisor at the details provided at the end of this form.

Purpose of the research

Accidental poisoning is among the top 5 injuries world-wide. Constructive effort and sound management are necessary steps in preventing poisoning, from a household safety level to obtaining professional medical assistance. We would like to understand how medical practitioners manage poisoning cases, what the common health practices are and how we as a community can provide awareness regarding poisoning.

Research Intervention

Participant Selection

As a healthcare professional of this community, you are invited to participate in this research as your experience in this medical field can contribute extensively to our understanding and knowledge of accidental childhood poisoning.

Procedures

If you accept to participate in this study, you will be required to participate in an audio-taped interview with me, which will last for approximately 20 minutes. The interview will be audio-recorded and notes will be taken during the length of the interview. Whilst you are encouraged to answer all questions in the interview script, if there are any questions you do not wish to answer you may say so and I will move on to the next question.

Voluntary Participation

Your agreement to participate in this research is completely voluntary. Choosing to not participate will not have any negative implication. If you have agreed to participate, and the interview has already started, and you later wish to withdraw, any recordings obtained will be destroyed.

Confidentiality
All information recorded will be kept confidential. A code will be allocated to your name and as such your name will not be mentioned on the audio-recording or in the research report. Only the research team will have access to the audio-recordings and notes generated from this interview. Your personal details and information gathered from this interview will not be divulged to the community or other healthcare practitioners participating in this research. The tape will be securely stored in a locked-up cupboard, with access only to the researchers. The tapes will be stored for a minimum of 2 years after publication or 6 years in the absence of a publication, as per the regulations of the Health Professional Council of South Africa, and will thereafter be destroyed.

Risks and Benefits
Your participation in this research provides no foreseeable risks. Whilst your participation provides no direct benefit to you, your insight into this matter will help us understand the issue better and will benefit the community and nation at large.

Reimbursements
You will not be provided any incentive for participating in this study.

Sharing the Results
All results collected from the interviews will not be attributed by name to any individual participating in this research. Upon completion, research findings gathered will be shared broadly either at conferences or through publications.

Right to Refuse or Withdraw
Your participation in this research is completely voluntary. Should you not wish to participate, it will not have any negative effect on you. You may stop participating at any point of the interview without any negative effect. Once the interview is completed, you will be afforded the opportunity to review your comments and my notes and clarify any discrepancies that may arise if you so choose.

If you have any questions please contact:

Ayesha Ahmed (researcher)
ayesha.ahmed@wits.ac.za or 072 290 8966

Shirra Moch (supervisor)
shirra.moch@wits.ac.za or 011 717.2472

This proposal has been reviewed and approved by the
Human Ethics Research Committee of the University of the Witwatersrand

If you agree to take part in the study, please sign the consent form overleaf.

Part II: Certificate of Consent (i)

I have been invited to participate in research about childhood poisoning and local health practices.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

_____ _____

Print Name of Participant **Signature of Participant**

Date_____

Day/month/year

Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands the interview procedure.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the nest of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this ICF has been provided to the participant.

_____ _____

Print Name of Researcher **Signature of Researcher**

Date_____

Day/month/year

Part II: Certificate of Consent (ii) – Consent to be audio-recorded

I have been invited to participate in research about childhood poisoning and local health practices.

I have consented to voluntarily participating in the aforementioned research. As a requirement of the research process, I understand that the interview will be audio-recorded.

I hereby consent to be audio-recorded for the purposes of the stated research.

Date_____
Day/month/year

_____ _____
Print Name of Participant **Signature of Participant**

Professional qualification: _____

No. of years in practice: _____

Extra courses undertaken: _____

Appendix M Extract of the General Ethical Guidelines for Health Researchers – (HPCSA)

13. DATA AND SPECIMEN STORAGE

13.1 Data and specimens obtained as a result of research activity should be securely stored.

13.2 Data, including tape recordings should be stored for a minimum of 2 years after publication or 6 years in the absence of publication.

13.3 There must be justifiable reasons which should be provided to Research Ethics Committees for data and specimens to leave the country. This should only be done after a Material Transfer Agreement has been signed and submitted to the local Research Ethics Committee.

Appendix N Chi-squared tables of the non-significant relation between variables (Age of child, ethnicity and marital status) and occurrence of poisoning

Table O.1 Chi-squared table of Age of child and occurrence of poisoning

Age of child	Occurrence of poisoning No	Occurrence of poisoning Yes	Total
Attending pre-school/crèche	181 (87.02%)	27 (12.98%)	208 (100%)
Attending primary school	1 359 (90.30%)	146 (9.70%)	1 505 (100%)
Total	1 540 (89.90%)	173 (10.10%)	1 713 (100%)

Pearson $Chi^2 = 2.1651$, $Pr = 0.141$

Table O.2 Chi-squared table of Ethnicity and occurrence of poisoning

Ethnicity	Occurrence of poisoning No	Occurrence of poisoning Yes	Total
Indian	855 (90.19%)	93 (9.81%)	948 (100%)
African	638 (88.73%)	81 (11.27%)	719 (100%)
Coloured	43 (89.58%)	5 (10.42%)	48 (100%)
White	2 (100%)	0 (0)	2 (100%)
Total	1 538 (89.57%)	179 (10.43%)	1 717 (100%)

Pearson $Chi^2 = 1.1607$, $Pr = 0.762$

Fisher's exact = 0.688 (Observations per cell <5, therefore the Fishers exact value was used)

Table O.3 Chi-squared table of Marital Status and occurrence of poisoning

Marital Status	Occurrence of poisoning No	Occurrence of poisoning Yes	Total
Married	1 164 (%)	141 (%)	1 305 (100%)
Single	287 (%)	26 (%)	313 (100%)
Divorced	69 (%)	6 (%)	75 (100%)
Widowed	24 (%)	5 (%)	29 (100%)
Total	1 544 (%)	178 (%)	1 722 (100%)

Pearson Chi^2 = 3.6335 , Pr = 0.304

Appendix O Chi-squared test results of level of storage of each substance and the occurrence of poisoning

Table P.1 Results of Chi-squared tests and Fishers exact test for significant and non-significant relations between each substances level of storage and occurrence of poisoning

Categorical variable	Chi-squared statistic	Pr	Fishers exact
Pool Acid ǂ	-	-	-
Windshield washer solutions	1.1702	0.425	0.545
Antifreeze	2.7391	0.254	0.452
Automatic dishwasher detergents	3.1312	0.209	0.339
Drain cleaners	2.3050	0.316	0.279
Toilet bowl cleaners	2.9025	0.234	0.219
Detergents	1.5569	0.459	0.462
Furniture polish	1.3486	0.510	0.565
Whiskey and champagne	0.8117	0.666	0.537
Beer	4.3341	0.115	0.152
Lithium batteries	5.2667	0.072	0.061
Cigarettes, tobacco products	5.0329	0.081	0.075
Artificial nail removers	0.8474	0.655	1.000
Petrol, paraffin and lamp oil	7.2390	0.027	0.037*
Paint and paint thinners	8.4618	0.015	0.006*
Mouthwash	1.8302	0.400	0.359
Perfume and aftershave	0.9876	0.610	0.638
Mothballs	0.5120	0.774	1.000
Rat poison	1.2682	0.530	0.325
Insecticides	2.4906	0.288	0.506
Antidepressants ǂ	-	-	-
Traditional medication	2.8012	0.246	0.227
Oral contraceptives	0.3345	0.846	0.872
Fluoride	4.1899	0.123	0.137
Iron tablets	1.7545	0.416	0.629
Topical anaesthetics	1.3723	0.504	0.704
Antibiotics	1.0253	0.599	0.852
Prescription pain killers	3.5842	0.167	0.268
Aspirin	4.0506	0.132	0.129
Cough mixture	1.1470	0.702	0.481
Paracetamol	0.0571	0.972	1.000

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Figure 1.2 Sustainable development goals targeting unintentional poisonings

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Table 1.1 Routes of exposure to poisonous substances

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How poisons get into the body:
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2. inhalation
3. absorption

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Figure 1.3 Representation of points of local and systemic effects experiences through poisoning

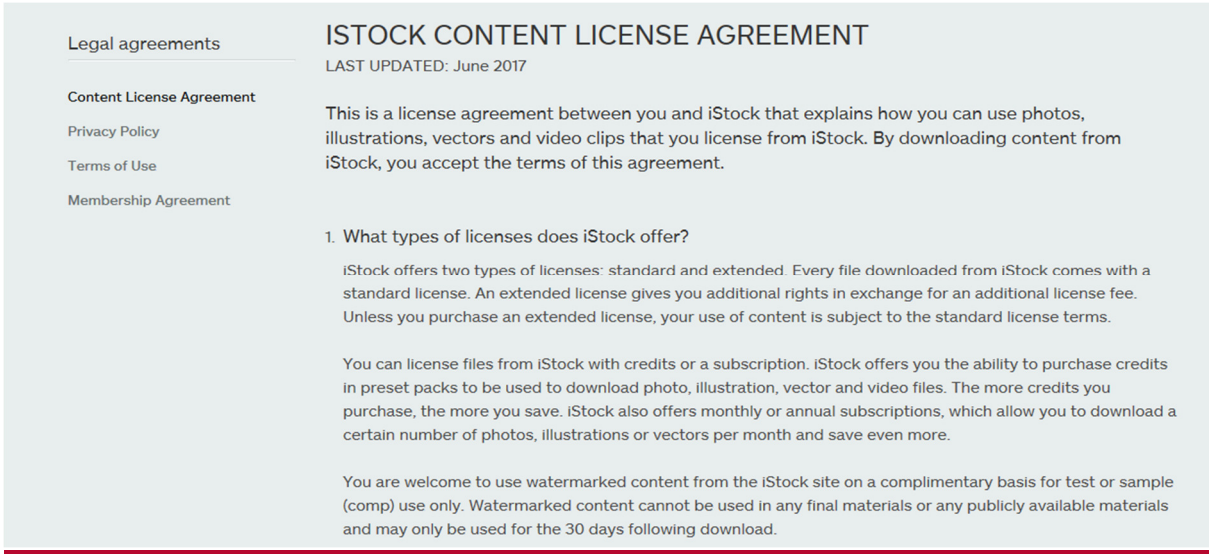

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Table 2.1 Haddon Matrix applied to the risk factors for childhood poisoning (WHO, 2008)

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Figure 3.1 Designing and conducting mixed methods research based on Creswell 2014.

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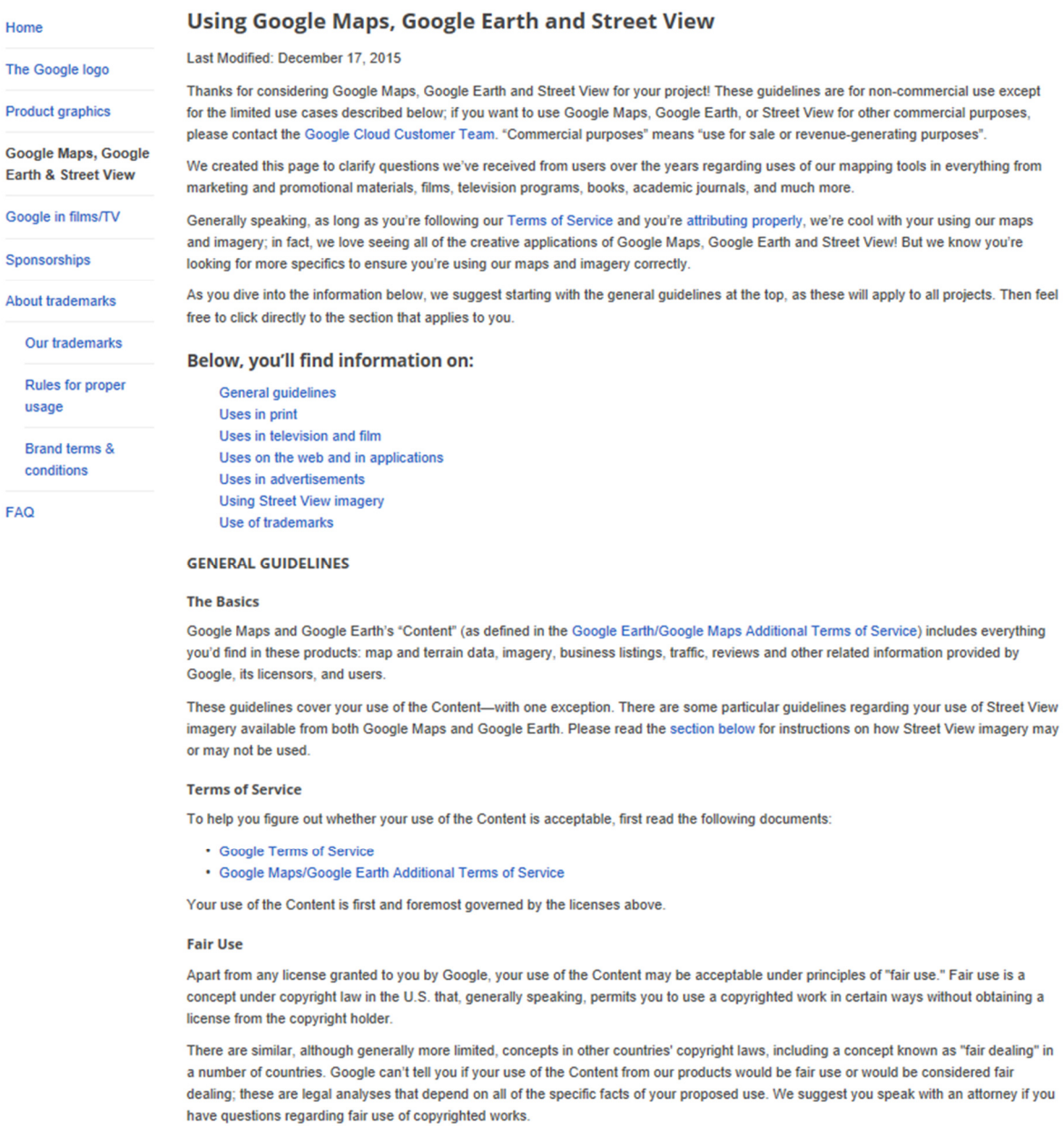
Figure 1.5 Map of Lenasia and surrounding informal settlements



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