ASRAT WOLDEYES HEALTH SCIENCE CAMPUS

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF PAEDIATRICS & CHILD HEALTH NURSING

DETERMINANTS OF CHILDHOOD MORTALITY DUE TO POISONING AT EMERGENCY DEPARTMENT OF PUBLIC HOSPITAL, NORTH SHOA ZONE, AMHARA REGION, ETHIOPIA, 2023:UNMATCHED CASE CONTROL STUDY

By

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A RESEARCH THESIS SUBMITTED TO THE DEPARTMENT OF PAEDIATRICS & CHILD HEALTH NURSING, SCHOOL OF NURSING AND MIDWIFERY, ASRAT WOLDEYES HEALTH SCIENCE CAMPUS, DEBRE BERHAN UNIVERSITY FOR PARTIAL FULFILMENT OF THE DEGREE OF MASTER OF SCIENCE IN PAEDIATRICS & CHILD HEALTH NURSING

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Acronyms/Abbrevitions

ALP	Aluminum Phosphide
CDC	Center for Disease Control
DALY	Disability Adjusted Life-Years
ED	Emergency Department
FMOH	Federal Ministry of Health
NPDS	Nation Poison Data System
OPC	Organophosphate Compound
OTC	Over The Counter
PIC	Poison Information Centre
SPSS	Statistical Package of Social Science
TASH	TikurAnbesa Specialized Hospital
USA	United States Of America
UN	United Nation
WHO	World Health Organization

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Abstarct

Background:poisoning is a common reason for visiting the emergency department worldwide. However, little is known about this issue in the selected Hospital, North Shoa, Amhara Region, Ethiopia.

Objectives: To identify the determinants of childhood mortality due to poisoning in emergency department of public hospital in North Shoa zone, Amhara region, Ethiopia**,** 2023.

Methods: Institution based unmatched case control study design was conducted from Jauary 1^{sr} to June 26th 2023. A total of 428 participants was included in the study, 86 cases and 342 controls. Systematic random sampling was used to select study subjects. The data was checked for completeness and then entered into Epi-data version 4.6 and exported to SPSS version 25. The results were presented in frequencies and percentages for categorical variables. Binary logistic regression model was used to estimate the effect of an independent variable on the outcome variable and then variables with p-value < 0.25 in bi-variable analysis was enterd to multivariable analysis. Multiple logistic regression analysis was employed to evaluate independent effect of covariates. A P-value ≤ 0.05 was used to declare statistical significance.

Results: The study showed that the odds of urban residence is (AOR:2.95 ,95% CI (1.57, 5.55). route of poisoning inhalation AOR: 5.01, 95% CI [1.67, 15.08]), mode of posioning exposued accidentaly (AOR: 2.94, 95% CI [(1.17, 7.40)]) were the determinant factors significantly associated with childhood mortality due to poisoning at emergency department.

Conclusion: The results of the study showed that poisoning was one of the factors in the study area that contributed to childhood death. The study identified a number of potential risk factors, including urban residence, accidental poisoning, and poisoning ingestion and inhalation. The focus of therapy can be changed by using this finding to lower the number of children who die from poisoning.

Keywords:childhood mortality, poisoning, North Shoa and public hospital, Ethiopia

1. Introduction

1.1. Background

Poisoning is a major public health problem and a significant cause of mortality and morbidity in children, accounting for approximately 3.0% of all patients admitted to emergency departments (EDs)(1). Every year, approximately 45,000 children die from poisoning(2). Children under-fifteen years old have the highest mortality rates related to unintentional poisoning in the Eastern Mediterranean Region(3).

Poisoning is still a serious public health issue for children. Every year, injuries claim the lives of up to one million children around the world(4). Poisoning is the fourth most common cause of death for these people, behind drowning, burns, and auto accidents. About 15% of deaths from accidental poisoning are caused by children under the age of five (5). In reality, there is a significant underreporting of poisoning incidents. Poisons develop when harmful substances are ingested, inhaled, injected, or absorbed via the skin in large enough quantities. Poisoning is one of the leading global causes of infant morbidity and mortality. Children are particularly susceptible to poisoning due to their enthusiasm to put items in their mouths and the fact that their immune systems are still maturing (6).

Poisoning is the onset of unfavorable symptoms as a result of exposure to a toxic substance, such as chemicals, drugs, biological agents, environmental toxins, occupational toxins, or as a result of drug abuse (7). A worldwide pediatric emergency, poisoning is a frequent but significant preventable cause of illness and mortality in children. Accidental poisoning is responsible for about 2% of all injury-related deaths among children from developing countries. The second most common harm and third most common reason for pediatric emergency department visits(8). Globally, Magnitude of poisoning varies based on the types of poisons used, the degree of public awareness on poisoning, and the accessibility and availability of medical facilities(9).

Poisoning has a significant detrimental influence on a society's economic and health-related welfare.

The World Health Organization (WHO) estimates that accidental poisoning claimed the lives of 263,540 persons in 2022(5). Among them, low- and middle-income countries accounted for 84% of deaths. According to the WHO, intentional poisoning from pesticides results in 370,000 fatalities annually, placing it among the world's top 50 causes of death(12). According to a study done in Botswana, South Africa, and Uganda, three African countries, poisoning has been found as a substantial source of morbidity and mortality, with hospital-based poisoning prevalence rates ranging from 1.2% to 17% (2, 13, 14).

According to estimates from the WHO, accidental poisoning in Ethiopia resulted in 3.5 deaths per 100,000 people in 2019(4). In a district of Ethiopia, poisoning was shown to be the second most frequent means of suicide attempt. Strong detergents and rodenticides were the most regularly utilized poisons, according to the study, who also noted that women used poisoning more frequently than males (15).

There are no well organized poison control centers, regular screenings, or confirmatory tests in Ethiopia. Epidemiological information on poisoning has some limitations as well, notably in terms of the results of clinical therapy in hospital emergency rooms(16).

1.2. Statement of the problem

Poisoning is the fourth most common cause of death for these people, behind drowning, burns, and auto accidents. About 15% of deaths from accidental poisoning are caused by children under the age of five (5). Over 45,000 children under the age of 15 pass away from poisoning every year, with the global poisoning death rate for those under the age of 15 approximately 1.8 per 100,000(2). According to studies, the cultural and geographic factors of various populations can affect the mortality rate from poisoning. The mortality rate is approximately 0.5 per 100,000 people in developed countries, but it is significantly higher in low-income countries, where it is 2.0 per 100,000 people (almost 4 times higher than the rate in high income countries) (1).

Approximately 80% of poisoning cases occur between the ages of 1 and 5 years, and the most common cause of poisoning in children younger than 1 year old is medication administered to parents(20). The main causes of poisoning in children include the drugs abuse, exposure to hydrocarbons, bleaching agents, detergents and disinfectants, plant pesticides, insecticides, and the use of cosmetics, alcohol, and narcotics; however, more than 75% of poisoning cases occur as a result of consuming poisonous substances (20).

Additionally, it is well known that changes in people's lifestyles, social behaviors, and economic conditions, combined with increased access to and use of chemicals for a variety of uses in industry, agriculture, and medicine, have increased the rate of poisoning and poison-related mortality globally. While determining the scope of the problem, it is important to take into account the enormous psychological and emotional that cases of poisoning place on families in addition to the significant harm they bring to the health and economic well-being of communities(16). Any society's poisoning prevention initiatives must first identify the risk factors for poisoning. By altering these risk variables at the community level, the frequency of poisoning and the resulting mortality can be decreased (21, 22,23).

Studies on the determinats of poisoning and associated mortality rate have generally been quite few in Ethiopia. There is little evidence, and research done on the topic ignored assessing the magnitude of childhood mortality of poisioning among emergency patients, determining the mortality rates among poisoned patients, identifying the factors that lead to child poisoning, and determining the rate of child poisoning deaths.

Consequently, identifying risk factors is essential to lowering the incidence of childhood mortality and ensuring that the necessary actions, such as prevention programs, are taken to improve patient outcomes. So, the purpose of this study is to investigate the determinants of childhood mortality among children exposed to poisoning in the emergency room of public hospital in the North Showa zone of the Amhara region of Ethiopia,2023.

1.3. Significance of the study

The rational for selecting this problem area is due to the fact that poisoning is a significant and preventable cause of mortality among children internationally(13) through simple, immediate, and effective risk-reduction measures. Despite the appearance that global statistics on the prevalence of poisoning are well established, recent data from poorer countries have gotten less attention (25). There aren't many epidemiological research on poisoning in Ethiopia. Nonetheless, these few lines of data that have already been published indicate that poisoning is a significant public health issue in Ethiopia.

The finding of the study will help in identifying gaps and potential intervention areas with respect to poisioning of children for hospital managers as well as concerned stakeholders. It can be used for pediatrcs and child health professions to develop interventions to reduce childhood poisoning by addressing factors that contribute to childhood poisoning. Besides, it will serve as a baseline for further study in the area. The ultimate aim of this study was asdressing the factors that contribute to childhood mortality due to poisoning.

2. Literature Review

2.1. Children's Mortality of Poisioning

The World Health Organization estimates that more than 350,000 unintentional poisoning mortality worldwide in 2020 cost the world 7.4 million years of healthy life (life years adjusted for handicap) (DALYs)(24).

Mortality rates of 20% are not unusual, and the World Health Organization has reported that more than 200,000 people each year died by pesticide poisoning (5).
The sixth most common cause of mortality, non-alcohol poisoning, has shown an increase over the past 30 years (26). Most drug overdose deaths take place outside of a medical setting. Finland reported 16.6 poisoning-related deaths per 100 000 residents in 2002 (27). In Finland, the frequency of non-alcohol poisoning deaths per 100,000 people per year in 2005 was 6.8 for men and 3.2 for women(27).

Magnitudes of poisoning-related deaths are reported to be 15.6/100,000 people annually in the United States, and there has been an increase in cases over time, particularly as a result of opioid toxicity (28). According to the WHO, Africa accounted for 8% and Zambiya for 3.13% of all poisoning-related deaths in 2015(29).

The study conducted in Iran revealed that 28 cases (0.3%) of the 8158 children who were treated for poisoning died, with 19 (67.9%) boys and 9 (32.1% girls) (17). The mortality rate for the 1,020 hospitalized children in Nigeria was 5.9%, with a median age of 1.0 year (interquartile range, 0.6-4.0)(30).

Males were more likely than females to become poisoned by illicit drugs, but females were more likely to become poisoned by all other toxic substances. Females (48.4%) were more likely than males (31.3%) to intentionally poison themselves. The majority of patients stayed in the hospital for fewer than two days, however more female patients (70.1%) than male patients (29.9%) stayed longer. 2.4% of cases were fatal overall(17).

The mortality rate of study participants was 1.3%, with 64 deaths, according to a retrospective and descriptive study conducted on the pattern of acute poisoning in Shenyang, China, between

2012 and 2016. A retrospective investigation on the patterns and outcomes of acute poisoning episodes was done at a hospital with 15.4% overall mortality rate was discovered (31).

Poisoning magnitude and forms vary widely across the globe and are influenced by socioeconomic level, cultural norms, as well as regional industrial and agricultural operations (32, 33).

Many retrospective hospital-based investigations on the prevalence of poisoning in the world revealed that there was variation. As an illustration, a retrospective investigation of poisoning in Iran's capital city of Tehran revealed an magnitude was 5.4% (34); in contrast, it was 0.07% in Kenya (35).

According to a retrospective examination of poisoning done at the hospital in Gondar, 0.67% of patients hospitalized with a diagnosis of poisoning had that diagnosis when they arrived at the emergency department of the facility (6, 36).

Pesticide poisoning is linked to significant illness and mortality, particularly in developingcountries. There is no accurate information on the number of persons in these countries who experience pesticide-related health impacts each year. Many causes have been proposed for this, including a lack of uniform case definition (37). Only 10 of 58 developing countries (17.2%) have poisons information centers, despite the fact that the burden of poisoning exposures in Africa is a substantial public health concern (PICs)(47).

Since poisoning incidents in this area are typically inadequately recorded, the true epidemiology and precise numbers of poisonings are unknown. The underlying causes of poisoning include a lack of tools and expertise to diagnose cases, the fact that only specific instances must be reported to the regional or national department of health, and low fatality rates. According to WHO estimates, unintentional poisoning causes 27,949,000 DALYs and 39,800 mortality in Africa (27).

Retrospective analysis was done on the medical records of 424 patients who were hospitalized to eight hospitals in South Africa between January 2005 and June 2005, 17.6 years old on average, and 57.8% of the population was female(43).

The death rate per case was 1.5%(39).While taking result into account, death occurred in 0.9% of instances and 6.6% of cases that were sent home (24). According to a study conducted in the Ambo town area on patients admitted with poisoning between January 1, 2018, and March 17, 2019, the prevalence was 1.7%. There were 1:1.06 more women than men (42).

The most frequent explanations for 54 patients' poisonings were family or marital conflict (74.9%), a psychiatric issue (14.8%), and substance abuse (9.3%). The case fatality rate was found to range from 1.5% to 8.6%, according to the scant hospital-based investigations that have been conducted(40). For instance, a study by Belayneh (2021) using Tikur Anbessa Specialized Hospital found that the fatality rate was 13.7% and the overall discharge rate was 86.3%, with rodenticides being the leading cause of deaths.

2.2. Determinants of childhood mortality with poisioning

2.2.1. Sociodemographic factors

In developing countries child health is determined by different factors. Childhood mortality and morbidity from different causes are significantly related to socioeconomic status of the child's parent, which forms the immediate environment to the child. Support the importance of healthy environments on child health, even if these environments seem distant to the child health is crucial (41).

The research done in western Ethiopia showed the mortality rate was higher in boys, infants under 2 years old, and people with infectious illnesses. infections were the main cause of death in the 60 dead children 53 (88.3%), with sepsis 22 (36.7%), gastroenteritis 10 (16.7%), and meningitis 6 (10.0%) accounting for the highest mortality rates (42).

A study conducted in South Africa showed that 57.8% of the population was female(43).Males were more likely than females to become poisoned by illicit drugs, but females were more likely to become poisoned by all other toxic substances. Females (48.4%) were more likely than

males (31.3%) to intentionally poison themselves(29). A one-year record-based retrospective analysis on 103 patients' poisoning at Indea revealed that 52.4% of the patients were female and 47.6% were male(44).

Moreover, Abebe&Yaschilal (2020) observed that out of the 120 poisoning cases, 55% of the victims were female and the remaining 45% were male utilizing data from Dessie Referral Hospital. The research conducted in China showed that 80% of all poisoning cases occur between the ages of 1 year and 5 years, and the most common cause of poisoning in children younger than 1 year old is medication administered by parents to children(4). According to the study conducted in Iran being < 1 year old were the significant variables but mother's occupation was not significant factors(41). Research conducted in bagdad showed that mother age was found to be significant for those whose mothers were older than 35 years(45). Risk of mortality was significantly increased between the ages of 13 and 15 years 4.59 (95% CI, 1.80 to 11.20) compared with age 2 years and presence of infectious diseases 4.65 (95% CI, 1.80 to 12.10).(5).

2.2.2. Contributing factors of childhood poisoning

The study conducted in rural community of Egypt showed that inadequate supervision of child,parental; concern of lack of family support were significant factors(49). According to the study done in Iran factors like mother's smoking status, hyperactivity, accessibility of poisonous substances, a previous history of poisoning, and the presence of physical diseases or psychological disorders in family members did not have a significant relationship with mortality in poisoned children(41).

According to the study done in egypt unsafe storage of household chemicals were significant factors(49).In terms of arrival time, only 8.7% of patients (82.4%) arrived to the hospital within 30 minutes, while 52.4% arrived between 30 and 1 hour after exposure.The majority of patients stayed in the hospital for fewer than two days, however more female patients (70.1%) than male patients (29.9%) stayed longer. 2.4% of cases were fatal overall(17).

The remaining 38% arrived in between an hour and 24 hours. The death rate per case was 5.8%. Upon discharge, psychiatric referral and targeted education were provided in 8.7% and 40.8%

of the cases, respectively. An important association was intentional poisoning. Fifty-nine percent of the poisonings were accidental(48).The study studied in Navi Mumbai tertiary care hospital showed tha the most frequent presenting symptoms were, in order, nausea and vomiting, altered consciousness, and epigastric pain (49.5%, 16.5%, and 13.6%)(50, 51). The study conducted in Austerlia showed that alteration in mental status (62.3%) and tachypnea (64.2%) were the most frequent presentations(3).

2.2.3. Poisoning characterstics

The research conducted in Sirlanka showed that alcohol was the most common poisoning substance (50%) according to a study conducted at the Morrocco, and intentional poisoning accounted for 59.4% of all poisonings(46).

In descending order, the toxic agents that were responsible for the poisonings were: household chemicals (45.7%), modern medicines (17.5%), animal/insect bites (15.8%), agrochemical chemicals (9.7%)(47), food poisoning (5.4%), drugs of abuse (3.3%), traditional medicines (2.4%), and plants (0.2%). The most frequent causes were household cleaners, organophosphates, and pharmaceuticals (41.7%, 27.2%, and 12.6%, respectively)(9, 12).

2.3. Conceptual framework

Based on the literatures reviewed th.e following conceptual frameworks is develop(52,53,54.55,56,57).

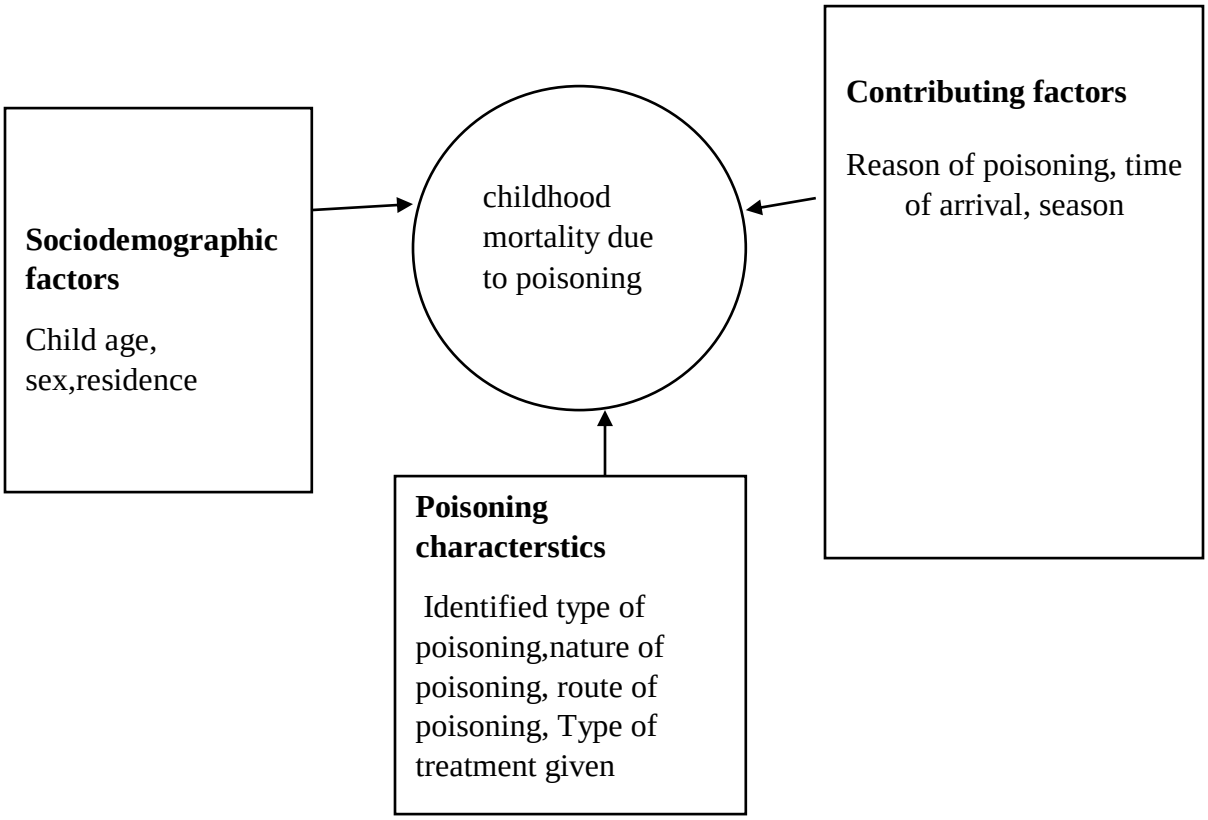

Figure 1:Conceptual framework for the predictors of mortality with childhood poisoning in Emergency department of Public Hospital in North Shoa Zone, Amhara region, Ethiopia.

3. Objectives

3.1. General objective

To asses the determinants of childhood mortality due to poisoning in emergency department of Public Hospital in North Shoa Zone, Amhara region, Ethiopia.

3.2. Specific objective

To identify the determinants of childhood mortality due to poisoning in emergency department of Public Hospital in North Shoa Zone, Amhara region, Ethiopia.

4. Materials and Methods

4.1. Study Area

North Shoa is one of the Zones in Amhara regional states. In North Shoa there are 11 hospitals from which the two hospitals are private hospitals and one comphrensive specialized hospitals. The capital city of North shoa Zone, Debre Berhan town, which is located 130 km from the capital city of Addis Abeba. According to North Shoa Zonal Health Department data the total population of the zone is 2,095,593. Total population of 0-15 years old is 812 383 out of these 411,514 are male and 400,867 are female(58). This study was done in 4 selected hospital, Debre Berhan Comphernsice specialized Hospital, Enat Primary Hospital, Shoarobit Hospital, and Deneba Primary hospitals Emergency Department in North Shoa Zone.

4.2. Study design and study period

Institutional based unmatched case control study design was conducted from May1st to May30th,2023 to assess the determinants of childhood mortality due to poisoning in Emergency department of governmental Hospital in North Shoa Zone, Amhara Region, Ethiopia.

4.3. Population

4.3.1. Source population

All children aged 0 to 15 years who visited public hospital Emergency Department from March 2019 to March 2023 in North Shoa Zone, Amhara Region, Ethiopia.

4.3.2. Study populations

All selected children aged 0 to 15 years who visited the selected public hospital Emergency Department from March 2019 to March 2023 in North Shoa Zone, Amhara Regional State, Ethiopia.

4.4. Selection of Cases

Children who died from poisoning in emergency department between March 2019 and March 2023 were the case. The emergency department's registration book served as the selection frame for cases. . Then, sample size for cases were proportionally allocated for selected public hospital. Finally, during the data collection period, data collector gathered information from the cases in each public health Hospital until the proportionally allocated 86 sample size achieved In this study, cases were considered to be only death which is confirmed by physician.

4.5. Selection of controls

Children who improved from poisoning in emergency rooms between March 2019 and March 2023 were the controls. The emergency department's registration book served as the selection frame for the controls. Then, sample size for controls were proportionally allocated for selected public hospital. Finally, during the data collection period, data collector gathered information from the controls in each public health Hospital until the proportionally allocated 342 sample size achieved. In this study, control were considered to be only diagnosed as poisoning and improved which is confirmed by physician.

4.6. Inclusion and Exclussion criteria

4.6.1. Inclussion Criteria

- Inclusion criteria for cases:Children mortality secondary to poisioning who was recorded in emergency department in selected hospital from March 2019 to March 2023 with complete medical records.
- Inclusion criteria for controls: The control group was children admitted to the emergency for reasons of poisoning and improved with complet records in the chart.

4.4.1. Exclusion criteria

- Exclusion criteria for cases: Absent of cards and missed basic sociodemographic and clinical information on patient card was excluded.

- Exclusion criteria for controls: children with not known there final outcome and children with absent of cards was excluded.

4.5. Sample size determination

The sample size was determined using Epi Info Version 7 statistical software by considering the following assumptions: 95% significance level, 80% power, P1= proportion of child mortality from poisioning with less than one years old, P2 = proportion of children survival from acute poisoning with less than one years old as main predictors of the outcome (child mortality) from studies conducted in the Imam Reza Ghaem, Mashhad, Iran which was 16 % for cases and 3.7 % for controls (12). The proportion of case and control was assumed to be 1:4, Therefore, P1=0.16 Zα / 2=1.96 (95% CI) and P2=0.037, power of 80%. The sample size was 285 in which 57 cases and 228 controls.When adding design effect 1.5, the final sample size was 428 in which 86 cases and 342 control from selected Hospitals in North Shoa Zone, Amhara Region, Ethiopia.

Table1:Sample size determination using EPI INFO, 2023

Variables		Mortality with Childhood		COR	Pow R	Sam Size	Refere nce(41)
		Yes	No				
Age	<1 year	39(16%)	18(3.7%)	8.09	80%	285	
	1-4 years	108(44.4%)	183(37.4%)	2.20			
	4-8 years	58(23.9%)	146(29.9%)	1.48			
	>8 years	38(15.6%)	142(29	1			
Access to poisonous	Yes	106(65.8)	46(9.4)	7.45	80%	38	
	No	137(34.2)	443(90.6%)	1			
History of poisoning	Yes	91(71)	24(4.9)	11.59	80%	27	
	No	152(62)	465(95.1%)	1			

Using Epi info version 7 double population proportion formula for three factors

4.6. Sampling technique

From 11 hospitals in North Shoa zone, 4 hospitals was selected randomely by lottery method. Cases and controls was proportionally allocating to each selected hospitals by using emergency registration

book from March 2019 to March 2023. A systematic random sampling techniqes was applied to select a study untis from medical registration logbooks by evey other case.

The first control was included in the sample chosen randomly by lottery method and the number 1 was selected and then every other case select controls from Public Hospital until 342 controls was selected.

For cases by simple random sampling select 86 cases by lottery method proportionally from each hospital.

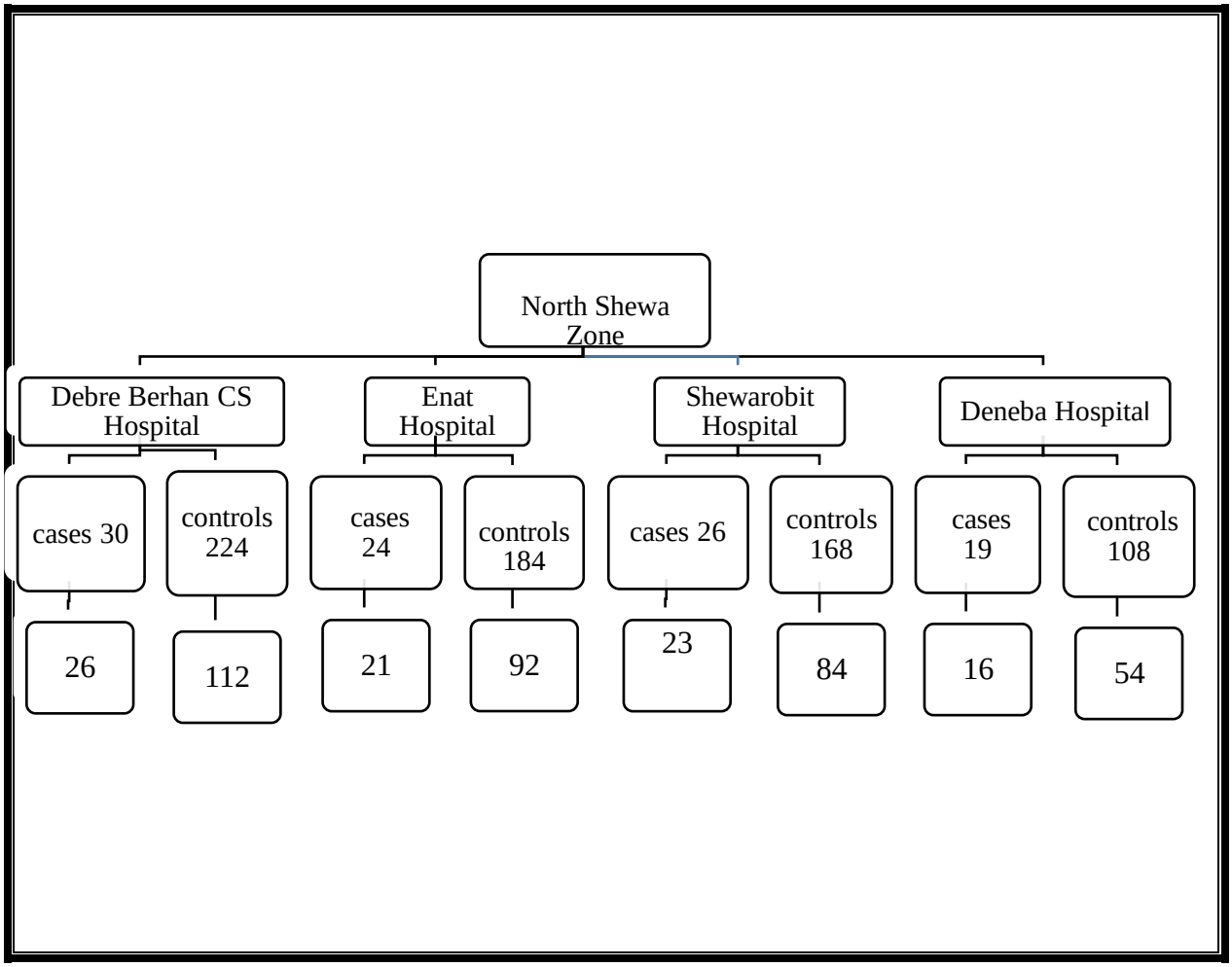

Figure 2: Sampling procedures for the predictors of mortality with childhood poisoning in emergency department of Public Hospital in North Shoa Zone, Amhara region, Ethiopia

4.7. Dependent and independent variables

4.7.1. Dependent Variables

Mortality of childhood by poisioning

4.7.2. Independent variables

Socio demographic factors: child age , gender , residency

Poisoning characterstics: Identified type of poisoning, poisioning substance and type of treatment given

Contributing factors: Time of arrival and season of poisioning

4.8. Operational definitions

Emergency department: This is where all casualties brought to the hospital are received(27).

Mortality rate: is a measure of the number of deaths (in general, or due to a specific cause) in a particular population, scaled to the size of that population, per unit of time(12).

Intentional poisoning:occurs when someone consumes or administers a substance with the intent to harm(38).

Unintentional poisoning: is if a person taking or giving a substance did not mean to cause harm(38).

4.9. Data collection tools and methods

The data collecting checklist was adopted and modified from different literatures (15,17,21,25,27,42). A structured standardized checklist and questionnaire was used to collect relevant information from patient charts. Data was extracted from patient medical charts. The data collection tool contains patient sociodemography, poisioning substance, identified type of poisioning occurred, season and reason of poisioning, type of treatment given, time of arrival,and time since exposure to poison.

Pretest was done and the finding of pretest was discussed among data collectors, supervisors and researchers in order to ensure better understanding of tools and procedures so that it was modified. After pretest factors such as smoking history of mothers and father, relgion, pervious history of poisoining, occupational status and educational level of parents were modified. Data was collected by two diploma nurses.

4.10. Data quality management

The data collecting checklist was developed by the principal investigator after reviewing different literatures(15,17,21,25,27,42). a data collecting checklist was prepared in English. Objective based, logically sequenced, free of scientific terms and non- leading data collecting checklist was prepared. Pre-test was undertaken in Ataye Primary Hospital other than selected hospitals on data collecting checklist before the actual data collection startes.

The data collectors and supervisor was provided training for two days on the objective of the study, contents of the data collecting checklist and how to maintain confidentiality and privacy of the study subjects. The principal investigator was made a day to day site supervision during the whole period of data collection and was checked the collected data for completeness, clarity and consistency on a daily basis.

The collected information was rechecked for its completeness and consistency before entering the data into a computer. At the end of data entry data cleaning was made. Frequencies, cross tabulations, sorting and filters was used to check missed values and variables. Errors identified was corrected after revising the original data collecting checklist.

4.11. Data Processing and Analysis

The data was entered into Epi-data version 4.6 and exported to SPSS 25 for analysis. The first step before analysis was data exploration to visualize the general feature of the data to be analyze. After exploration, bivariate analysis and multivariable analysis was performed step by step. Bivariate analysis using cross tabulation and bivariate logistic regression was done. Both bivariate and multivariate logistic regression analysis was done to see the association of each categories of each variable with the outcome variable. Significance was checked at 95 % CI in

binary logistic regression. Variables with p<0.05 in binary logistic regression analysis was entered in multivariate logistic regression analysis to control for potential confounding variables. Finally, statistical significance was disclosed at P<0.05 at 95% CI to identify determinant factors of childhood mortality by poisoning at emergency department.

4.12. Ethical Considereation

The ethical clearance was obtained from the ethical clearance committee of Debre Berhan University; Asrat Woldeys Health Science Campus. Permission was obtained from selected Hospitals. Patient consent will not be necessary because the information was gathered from the patient's chart.

4.13. Dissemination of results

High priority will be given to the timely dissemination of the study findings to the relevant organizations and stakeholders. The plan of diffusion of the result includes presentation at Debre Berhan University. The report paper will be disseminated to the Hospital. Eventually, effort will be made on publication in scientific journals.

5. Results

5.1. Socio-demographic Characteristics of Respondents'

From a total of 428 study participants, 395 patient charts were included in the study providing a response rate of 92%. The mean age of respondents of both cases and controls was 11.2 (±S. D 3.6) years, about 12(15.2%) cases and 15 (4.7 %) controls were at age range of less than 4 years .

Among 395 children, 33 (41.8%) cases and 139 (44%) controls were males(Table 2).

Table2: Distribution of study participants by socio-demographic characteristics, in selected Public Hospital Emergency Department, North Shoa Zone, Amhara region, Ethiopia, 2023(n=395).

Characteristic	Category	Participants	
		Cases (%)	Controls (%)
Age (year)	< 4years	12 (15.2)	15 (4.7)
	4-8 years	9 (11.4)	50(15.8)
	9-12 years	23 (29.1)	111 (35.1)
	>12 years	35(44.3)	140(44.3)
Residence	Rural	69(87.3)	240(75.9)
	Urban	10 (12.7)	76(24.1)
Sex	Male	33 (41.8)	139 (44)
	Female	46 (58.2)	177(56)

5.2. Contributing factors associated for poisoning among poisoned children

According to 395 participants, 55 (69.6%) of cases and 229(72.5%) of controls have been ingested poisoning intentionaly(figure 4). From 395 respondents, 46(58.2%) of cases and 231 (96.6%) of controls had poisend at home. Out of 395 partcipants, 33(41.8%) of cases and 206(65.2%) of controls had 1-4 hours duration to reach health facility.

Forty three of cases(54.4%) and 215 (68.0%) of controls route of poisoioning was through ingestion. Among 395 participants, 44(55.7%) of cases and 192(60.8%) of controls were poisoned at Autumn season (Table 3).

Table3: Childhood mortality secondary to poisoning in selected Public Hospital Emergency Department, North Shoa Zone, Amhara region, Ethiopia, 2023.

Characteristic	Category	Participants	
		Cases (%) (n=79)	Controls (%) (n=316)
Route of poisoning	Ingestion	43(54.4)	4(1.9)
	Inhalation	25(31.6)	202(98.1)
	Bite	11(13.9)	150(72.8)
Location of the poisoning event	At home	46(58.2)	231(73.1)
	Not at home	33(41.8)	85(26.9)
Season of poisoning	Spring	5(6.3)	37(11.7%)
	Summer	25(31.6)	67(21.2%)
	Autumn	44(55.7)	192(60.8%)
	Winter	5(6.3)	20(6.3%)

n: refers to total number of children for a variable about which data has been collected.

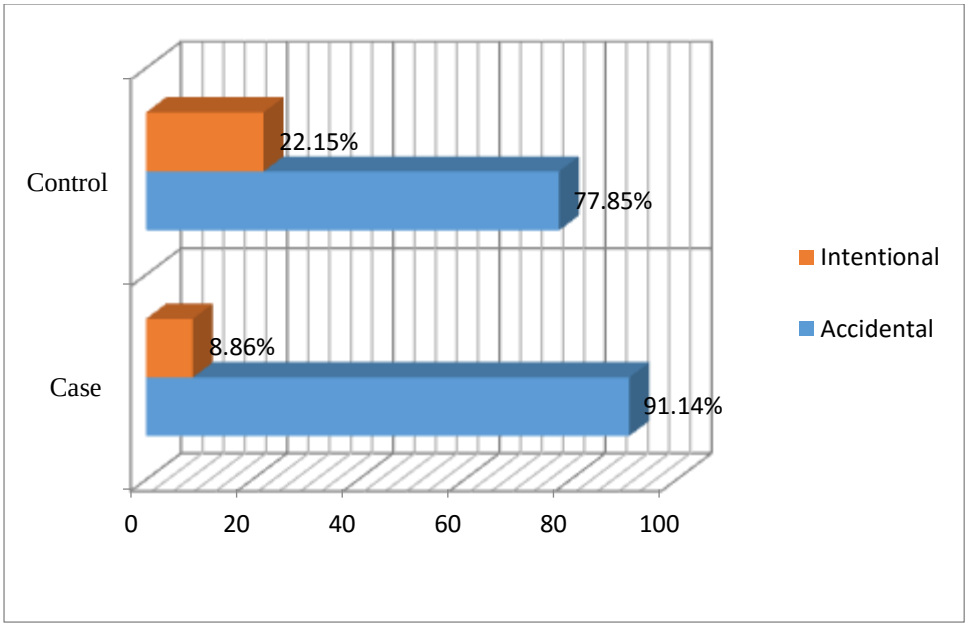

Figure 3: Mode of poisoning in cases and controls in selected Public Hospital Emergency Department, North Shoa Zone, Amhara region, Ethiopia, 2023.

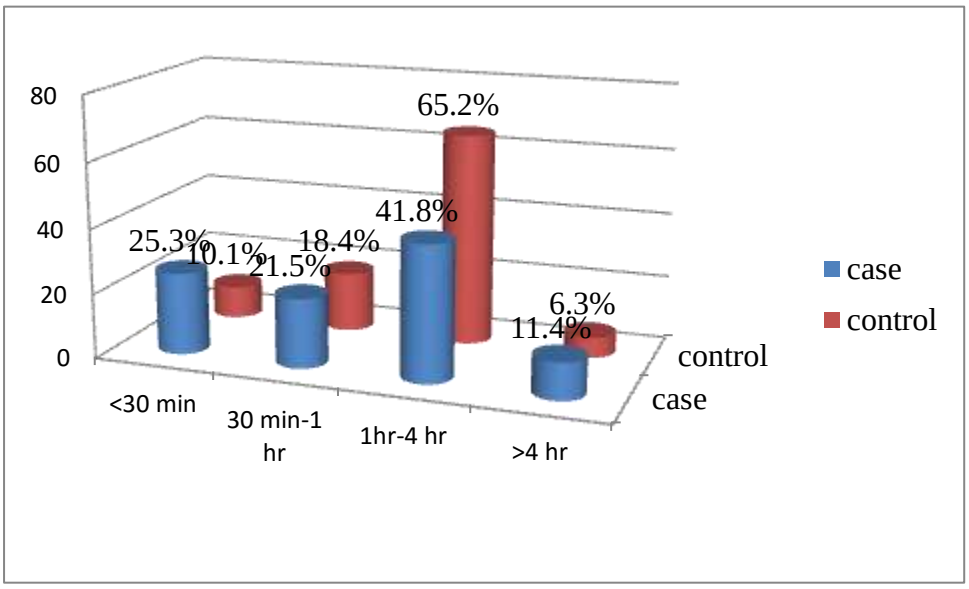

Figure4: Duration of exposure of respondents among cases and controls of in selected Public Hospital Emergency Department, North Shoa Zone, Amhara region, Ethiopia, 2023.

5.2. Poisoning charactersitcis

Herbicides were identified as the cause of poisoning in 20 (25.31%) cases and 86 (27.21%) controls. Fluid resuscitation was administered to 105 (33.22%) controls and 21 (26.58%) cases at emergency department.

Table4: Poisoning characterstics in cases and controls of in selected Public Hospital Emergency Department, North Shoa Zone, Amhara region, Ethiopia, 2023.

Variables		Case(n=79)	Control(n=316)
Poisoning substance identified	Organophosphate Materials,	3(3.80%)	12(3.79%)
	Bleaching Agents	7(8.86)	28(8.89)
	Pharmaceuticals drugs:	6(7.6%)	34(10.75%)
	Herbicides	20(25.31%)	86(27.21%)
	Rat Poisoning Chemicals	15(18.99%)	60(18.99%)
	Carbon Monoxide.	8(10.13%)	42(13.29%)
	Snake bite	11(13.92%)	34(10.76%)
	Others	9(11.39%)	20(6.32%)
Type of treatment given	Fluid Resuscitation	34(43.03%)	105(33.22%)
	Chelating with Activated Charcoal	24(30.38%)	55(17.41%)
	Antidote Management	9(11.39%)	20(6.33%)
	Whole Bowel irrigation	6(7.59%)	11(3.48%)
	Gastric Lavage	17(21.51%)	74(23.42%)
	Hemodialysis	4(5.06%)	12(3.80%)
	Emesis	8(10.13%)	26(8.23%)
	Medications other than Antidote	6(7.59%)	23(7.28%)

Others	8(10.13%)	10(3.12%)

5.3. Determinants of childhood mortality of poisoning

The bi-variable logistic regression analysis showed that age,residence,nature of poisoning location of poisoning , route of poisoning, season of poisoning exposed, and duration of exposure showed association at p-value <0.25 with childhood mortality due to poisoning.

After controlling the confounding effects of independent variables residence, route of poisoning and nature of posioning were statistically significant in multivariable analysis at p value <0.05.

The odds of occurance of childhood mortality due to poisoning was 2.95 times higher among children who live in urban, compared with children who live in rural(AOR:2.95 ,95% CI (1.57, 5.55).

Accordingly the odds of occurance of childhood mortality due to poisoning was 5.01 times higher among children who entered through inhalation than children who entered through bite (AOR: 5.01, 95% CI [1.67, 15.08]).

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Table5: Factors associated with occurrence of childhood mortality secondary to poisoning in selected Public Hospital Emergency Department, North Shoa Zone, Amhara region, Ethiopia, 2023.

Variables	Frequency		COR (95% CI)	p-value	AOR (95% CI)
	Case (n=79)	Control (n=316)			
Place of residence*					
Urban	24	175	2.84(1.68,4.82)	0.00*	2.95(1.57, 5.55)
Rural	55	141	1.00		1.00

route of poisoning					
oral	43	215	3.24(1.42, 7.39)	0.01*	3.49(1.31,9.26)
Inhalation	25	84	2.17(0.90, 5.24)	0.00*	5.01(1.67, 15.08)
Bite	11	17	1.00		1.00
Source of poisoning	46	205	1.32(0.80, 2.20)	0.37	1.00(0.49, 2.01)
home	33	111	1.00		1.00
Not at home					
Duration of exposure					
<30 minutes	20	32	1.00		1.00
30 min – 1 hr	17	58	0.72(0.27, 1.89)	0.32	0.58(0.20, 1.70)
1hr-4 hr	33	206	1.53(0.59, 3.99)	0.90	1.06(0.37, 3.09)
>4 hrs	9	20	2.8(1.18, 6.69)	0.07	2.40(0.92, 6.08)
Season of poisoning occur			2.25(0.80, 6.37)	0.16	1.91(0.63, 5.84)
Spring	5	57			
Summer	13	40	0.61(0.26, 1.35)	0.10	0.52(0.21, 1.26)
Autumn	42	123	0.58(0.32, 1.06)	0.37	0.65(0.34, 1.28)
Winter	19	96	1.00		1.00
Age in years					
< 4 years	12	15	4.44(1.57, 12.56)	0.34	0.62(0.23, 1.69)
4-8 years	9	50	3.86(1.60, 9.33)	0.20	1.81(0.73,4.46)
9-12 years	23	111	3.20(1.38, 7.45)	0.63	1.17(0.61, 2.26)
>12 years	35	140	1.00		1.00

Mode of poisoning					
Intentional	7	70	1.00		1.00
Accidental	72	246	2.93(1.29, 6.45)	0.02*	2.94(1.17, 7.40)

* Significant at p<0.05, n: refers to total number of children for a variable about which data has been collected.

5.4. Discussion

Poisoning is one of the most important preventable factors contributing to the hospitalization and death of children in ED. This Hospital based unmatch case control study aimed to identify the determinants of childhood mortality among children exposed to poisoning in the emergency departments of public hospital in North Shoa Zone of Amhara region of Ethiopia. Childhood mortality secondary to poisoning have been hypothesized by different studies to be associated with socio-demographic, contributing factors and poisoning characterstics. This study aims to identify determinant factors of childhood mortality secondary to poisoning among children aged less than 15 years at emergency department.

These studies states that the odds of occurance of childhood mortality secondary to poisoning was 2.94 times higher among children who had exposued accidentaly compared with the children who had expoused intensionaly(AOR: 2.94, 95% CI [(1.17, 7.40)]). This finding is similar with studies conducted at Iran AOR:4.54, 95% CI (1.10, 18.68) (11).

The reasons probably could be because of children are particularly vulnerable to acute poisoning because they are more likely to explore their environment by putting things in their mouths. Therefore, it is important to take steps to prevent accidental poisonings in children. One of the most effective preventive measures is to keep all toxic substances out of reach of children. This includes medications, cleaning products, pesticides, and any other potentially harmful products. It is also important to use child-resistant packaging whenever possible, as these designs make it difficult for children to open the container. It is important to educate children on the dangers of ingesting unknown substances and to teach them to ask an adult before consuming anything.

The odds of occurance of childhood mortality secondary to poisoning was 2.95 times higher among children who live in urban, compared with children who live in rural India(AOR:2.95

,95% CI (1.57, 5.55). This finding is similar with studies conducted at india (10). However, urban residence was not significant in other studies (7, 26). Possible explanation for difference might be explained by urban children easily exposed for different chemicals and had the highest rate of unintesional death from suffocation.

These studies states that the odds of occurance of childhood mortality secondary to poisoning was 5.01 times higher among children who entered through inhalation than chidren who entered to their body through bite (AOR: 5.01, 95% CI [1.18, 12.09]). The odds of occurance of childhood mortality secondary to poisoning was 3.49 times higher among children who entered to their body through ingation than chidren who entered to their body through bite (AOR: 3.49, 95% CI [1.31, 9.26]). This finding is similar with study conducted in Iran AOR:6.72, 95% CI (1.40, 32.07)(11).

The reasons probably could be because of poisoning eneterd to children to their lungs through inhalation had high mortality rate. Inhalational poisoning have no given time to reach emergency department of hospital and not get help from health professionals, Perhaps due to the co-occurrence of other risk factors and access to inhalational poisonous substances increased the mortality risk of poisoned children, which should be taken into account.

Generally, the findings of the study have paramount implications for control of childhood mortality secondary to poisoning. It would provide helpful insights for policy makers and pediatricians and emergency department staff in to the potential risk factors of childhood mortality to take priority prevention interventions to poisoning.

6. Strengths and limitations of the study

One of the strengths of this study design being case control , and cases and controls confirmation was done by a physician.The limitations the results might have been biased because of Health workers on duty Emergency department not recorded full information on the patient chart.

7. Conclusion

This study concluded that childhood mortality due to poisoning is a significant cuases for childhood mortality in the study area. The study identified potential factors that are associated with childhood mortality of poisoning namely urban residence, accidental nature of poisoning, inhalation and ingation route of poisoning and these factors can be used to target interventions to reduce childhood mortality of poisoning.

8. Recommendations

The following recommendations are forwarded based on the findings of the study.

The Hospital Adminstirators and the health extension workers are highly required to provide the intensive and regular health education on the cause and prervention method of accidental childhood poisoning.

Pediatricians and emergency department staff should be familiar with the management of acute poisoning and be aware of the different agents of intoxication according to age and gender.

Hospital staffs highly required to providing health education to the commuity to adopting better safety measures such as use of child resistant containers for medications, keeping the hazardous substance out of reach for children, not leaving the children unattended, administration of medications under supervision.

Conducting further research to identify additional factors that are associated with childhood mortality of poisoning

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Annex I:Data abstraction format from patient medical charts

ASRAT WOLDEYES HEALTH SCIENCE CAMPUS

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF PAEDIATRICS & CHILD HEALTH NURSING

Determinants of mortality with childhood poisoning in emergency department of Public Hospital in North Shoa Zone, Amhara region, Ethiopia

General Information

01. code number:_____

02. MRN:_____

03. Data of data collection: ……/…../….

04. Hospital: ……

05. Date of admission: …./……/…….

Part 1 Socio demographic Determinants

101	Age in Month	____Month
102	Sex	1. Male 2. Female
103	Place of residence	1. Urban 2. Rural
104	Birth of the the child	----------
105	Location of the poisoning event	1. Home 2. Not at home

Part 2. Poisoning characterstics

201	Nature of poisoning:	1. Intentional 2. Accidental 3. Unspecified
202	Poisoning Substances Identified	1. Organophosphate Materials, 2. Bleaching Agents 3. Pharmaceuticals drugs: 4. Herbicides 5. Rat Poisoning Chemicals 6. Alcohol Intoxication 7. Carbon Monoxide. 8. Traditional Medicines 9. Dog bite 10. Snake bite 11. Food Poisioning 12. unknown
203	Type of treatment given	1. Fluid Resuscitation 2. Chelating with Activated Charcoal 3. Antidote Management 4. Whole Bowel irrigation 5. Gastric Lavage 6. Hem dialysis 7. Emesis 8 Medications other than Antidote 9. Others (Specify) ----------
204	route of poisoning	1. Inhalation 2. Ingation 3.Bite

Part 3. Contributing factors

301	Reason of Poisoning:	1. Unemployment 2. Mental Illness 3. Income Problems 4. Failure in Exam 5. Quarrel with Family 6. Unspecified Reason 7. Marital and Love Disharmonies 8. unkown 9. Others (Specify) ----------
302	First aid measures taken by the care takers	1. Milk to induce emesis 2. Water to induce emesis 3. General/trade name of the poison 4. Soap water to induce emesis 5. Unknown
303	Symptoms before presenting to hospital	1. Cough 2. Shortness of breath 3. Hiccups 4. Giddiness 5. Abdominal pain 6. Unconsciousness 7. Sore throat 8. Palpitations 9. Drowsiness 10. Vomiting 11. Loose stools 12. Dizziness 13. Specify if any other;
304	Duration of exposure	1. First 30 minute---- 2. 30minute -1hr….. 3. 1-4hr… 4. >4hr…..
305	Time for onset of symptoms following poisoning:	…….min.
306	Time for presentation to pediatric emergency unit:	…….min.

307	What are the possible reasons for delayed presentation?	1. Lack of transport in emergencies 2. Lack of financial resources 3. Lack of knowledge regarding possible complications 4. Lack of concern regarding the urgency of the situation / need for intervention 5. Delayed attention by the emergency medical team 6. Any other reason 7. Unkonown
308	Psychological intervention/ Psychiatric referral	
309	Complication of poisoning	1. Yes 2.No
310	If Yes what is the complication	----------
311	Outcome of Poisoning: -	Improved---------- Death……

Declaration

I, the undersigned, Paediatrics & Child Health Nursing student declare that this reasrech thesis is my original work in partial fulfillment of the requirement for the degree of Paediatrics & Child Health Nursing

Name: Gurshaye Negash (BSC)

Signature: _____

Place of submission: Debre Berhan University, Asrat Woldeys Health Scince Campus

Date of Submission: _____

This reasrech thesis has been submitted for examination with our approval as university advisor(s).

Advisors name	**Signature**	**Date**
1. Mr. Sisay S.(MSc, Assin't prof.)	_____	_____
2. Ms. Kalkidan M. (Bsc, MSc)	_____	_____

Name of interal examiner	signature	Date
_____.	_____.	_____.

Name external examiner	signature	Date
_____.	_____.	_____.