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The Pattern and Outcome of Acute Poisoning at Toxicology Center in St. Peter Specialized Hospital

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Abstract

Background: Patients with acute poisoning are common in emergency departments and hospitals. Patients usually ingest oral medications of different types that differ from country to country. Most countries including Ethiopia lack national based prevalent studies.

Objective: The objectives of this study are to assess the pattern of the different causes (toxic substances) of acute poisoning and outcome of treatment and to identify factors associated with acute poisoning in patients treated at the toxicology center of SPSH during the study period.

Methods: A cross sectional retrospective study was used. A total of 300 patients with acute poisoning treated over one year and two months at the toxicology center were included in the study. Data collection involves record review of the relevant variables included in the questionnaire. Data was checked for consistency and clarity and was entered in to Epi info version 6 database and exported to SPSS version 20. After data clearance, results were analyzed. Frequency tables were used to display distributions of findings among the different independent variables. Chi-square test was used to analyze associations and multinomial logistic regression was used to control for confounding variables. Results are claimed to be statistically significant when the P-value is greater than or equal to 0.05.

Result: A total of 300 patients with acute poisoning were included in the study. The mean age of the study participants was 26.3 years (Range: 2 - 80 years and SD = 11.7 years). One hundred and fifty-six (52%) were females and the rest males with three patients having no record. With respect to marital status, the majority of patients, 177 (59%) were single followed by married patients accounting for 105 (35%) of the total.

Conclusion: The study is useful to create awareness of the pattern of acute poisoning among health care workers at the toxicology center of St. Peter Specialized Hospital that is crucial for the quality management of patients in the future. It will also help the hospital logistic management in the future planning.

Keywords: Acute, Poisoning, Pattern, Toxicology Center, St. Peter

Abbreviations
DALY- Disability Adjusted Life Years
OPP - Organophosphate poisoning
SPSH - Saint Peter Specialized Hospital
SPSS - Statistical Package for Social Sciences
WHO - World Health Organization

Introduction

Acute poisoning is considered as an injury in which the toxic effects occur almost immediately, usually within hours from the time of exposure. It can be classified as accidental or intentional. Accidental poisonings might involve exposures in the work place, home, and/or recreational settings [1] Patients with acute poisonings are common in emergency departments and hospitals. Patients usually ingest oral medications of different types, most commonly psychotropic drugs that lead to intoxication. The outcome is usually good and hospital stays are usually short even for those patients requiring intensive care [2].

The morbidity and mortality associated with acute poisoning is becoming a major public health issue in many countries. Estimates indicate that some forms of poisons are directly or indirectly responsible for more than 1 million illnesses worldwide annually[3]. The World Health Organization estimates that the total number of acute unintentional poisonings throughout the world ranges from 2 -3 million cases annually, of which 1 million are severe poisonings that result in 20000 deaths annually [4].

Based on the WHO report of Regional distribution of the global poisoning injury burden (DALYs lost), the total number of DALYs lost was 8, 235, 000 and Europe (28%) and South East Asia (28%) together account for one half of the total number of DALYs lost worldwide to poisoning, while the rest were America (5%), Africa (15%), West Pacific (17%), and Middle East region (21%) [5].

Typical Agents used in poisonings include pesticides, rodenticide, herbicides, pharmaceutical products, household chemicals, foods, alcohols, plants, traditional medicines, and illegal street drugs. Over the last few decades, agricultural pesticides have become the main source of poisoning in the developing world. Pesticides, particularly organophosphorus compounds are widely used in agriculture, vector control and domestic purposes. Because of their easy availability, organophosphorus poisoning has assumed major global health challenge. Pesticides account for about one third of the world's suicide and deliberate self-poisoning involving these chemicals have been reported in many countries including Ethiopia [3, 4, 6].

Various hospital-based studies have shown variations in age and sex distribution of acute poisoning cases. In Europe, especially in low- and middle-income countries, males account for the highest number of poisonings in the world. Different Retrospective Hospital based studies conducted in Southern part of India (69.6%), Iran, Tehran (51%), Saudi Arabia (73.6%), and Kenya have also shown higher incidence of acute poisoning cases in males [7-10].

Concerning acute poisoning in Ethiopia, WHO reported that acute poisoning accounts for 0.5% of distribution causes of intentional and unintentional injuries in 2012 the weighted pool percentage of seven studies in Ethiopia showed that organophosphates (47.2%) were the leading cause reported. The other reported causes of poisoning were sodium hypochlorite (bleaching agent) (12.9%), Drugs (10%), Herbicide (6.2%), Hydrocarbons (2.9%), Alcohol (2.9%), carbon monoxide (1.4%), and in 14.8% the cause was not identified [11].

Statement of the Problem

Most countries including Ethiopia have no national prevalent data concerning acute poisoning while acute poisoning is becoming one of the major public health problems. However, WHO estimates the prevalence of acute poisoning for countries which was 0.5% for Ethiopia in 2012. Hospital based studies in Ethiopia have indicated that different poisons are implicated as causes of acute poison-

ing that includes organophosphates, drugs, herbicides, pesticides, insecticides, rat poisons, house hold detergents, carbon monoxide, and food poisonings. It is estimated that around 2-3 million cases of unintentional acute poisoning cases occur worldwide of which one million are severe cases that account for 20, 000 deaths annually.

Significance of the Study

This study helps increase awareness of health care workers about the pattern of acute poisoning at the toxicology center of St. Peter Specialized Hospital which is crucial for quality management of patients. It helps to know which poisons are most commonly implicated as causes, what are the associated socio-demographic factors that might give clues for further analytic studies, what are the outcomes after the management of patients. It also helps the hospital in the planning and scaling up of the toxicology center based on the gaps identified.

Literature Review

Epidemiologic data from WHO estimates indicate that there are about 2 - 3 million cases of acute unintentional poisonings throughout the world of which 1 million are severe poisonings that result in 20000 deaths annually [5].

A prospective study done in a tertiary care hospital of Western Rajasthan, India, on epidemiologic study of acute poisoning in children aged 1 - 17 years in 2013/14 indicated that the prevalence of acute poisoning was 1.12% (173 pediatric cases of acute poisoning out of the total of 15, 736 admitted patients). The study demonstrated that males were more commonly affected than females (68.4% Vs 31.6%). Most of the cases were from rural areas (65.5%). With regard to age group, children aged 1 - 5 years of age accounted for about 80% of the cases. The main causes of acute poisoning in the first year of life, in the age group 3 - 5 years, and at school age including adolescence were medications given by parents, medications kept in the cupboards or left open, and medications used for suicide respectively. The mortality rate from poisoning was 3.5% [12].

Ansam F. Sawalha & et.al did a study on the pattern of acute poisoning among admitted patients in a government hospital in Pakistan in 2010. The results indicated that 674 cases of acute poisoning were admitted accounting for 1.5% of the total admissions. About 58% of poisoning cases occurred at home with male to female ratio of 1.5:1. Occurrence occurred more in the summer than winter season and the age group most affected was above 18 years of age. Ninety two percent of the cases encountered unintentional poisoning which was significantly associated with male sex (61.3%, p <0.01) while intentional poisoning was significant in females (64.8%, p < 0.001). The causative agents were mainly biological agents (77.4%), pharmaceuticals (11.6%) and other chemicals (10.9%). The most common route of exposure was through stings (72.3%) followed by oral ingestion (23.5%) and inhalation (3.4%). The majority of cases (91.1%) didn't undergo any decontamination methods. Of those who undergo decontamination procedures, gastric lavage was most common [13].

Another study was done in China by F. Chen and et. al. in an Emergency center in Fujihan Provincial Hospital in 2010. The study, which included 2867 patients who were treated for acute poisoning from January 2004 to December 2010, indicated that the prevalence of acute poisoning was 11.33% in January each year. The common causes of acute poisoning in descending order were alcohol intoxication (54.55%), medication poisoning (25.95%), pesticide poisoning (5.65%), and drug poisoning (4.88%). Most (56.44%) of the patients with drug poisoning were under 25 years and their mean age was significantly lower than that of patients with medication poisoning or alcohol poisoning (P<0.01). In the medication poisoning group females accounted for 80.65% while in patients with alcohol poisoning the majority (65.54%) were males. About 65.54% of the patients were followed up after emergency treatment, 30.39% of the patients were hospitalized and four patients died [14].

A retrospective study on causes of acute poisoning in adults in a hospital found in Istanbul revealed that out of 675 cases of acute poisoning, drugs were the commonest causes (74.2%), which was followed by carbon-monoxide (8.7%) and alcohol (8.4%). The study also showed that poisoning was intentional in 73.5% of the cases and accidental in 25.6%. Treatment in ICU was required in 6.6% of patients [15].

A study done by M. O. Okumu & et.al in Western Kenya demonstrated that out of 385 cases of acute poisoning cases, 23.6% presented 1 - 4 hours after exposure with a peak time of exposure at 6:00 -00:00. About 62.9% of the cases were due to accidental poisoning with Snake bites and organophosphate poisonings (OPPs) accounting for 33% and 22.1% of all the cases respectively. Sixty-three percent of the exposures were oral, and 63.9% of all cases occurred in the rainy season. Family disputes as a reason accounted for 49.2% (60/122) of intentional poisoning cases, use of tourniquets and herbal medicine was used as pre-hospital first aid management in 16.1% (10/62) of the cases. About 28.6% of all cases were subjected to laboratory evaluation and 83.9% were hospitalized for 1-5 days. Eighty percent (308/385) of the cases responded well to therapy, 7.3% (28/385) died of whom 68% (19/28) were males and 39.3% (11/28) deaths were related to OPPs [16].

A literature review by D. Tegwireyi and et. al. in 2016 on the pattern and epidemiology of acute poisoning in the East African region discussed that published studies are lacking in most of the countries except Ethiopia. According to the review there were only WHO estimates of deaths due to unintentional poisoning in 2004: for Burundi (7.3 deaths per 100,000 populations), Comoros (1.7 deaths per 100, 000 populations), Djibouti (3.9 deaths per 100,000 populations), and Eritrea (3.7 deaths per 100,000 populations). For Ethiopia, WHO estimated that there were 3.5 deaths per 100,000 populations due to unintentional poisoning in 2004. A number of papers have been published concerning poisoning in Ethiopia. Assefa and Colleagues reported on an outbreak of food poisoning resulting in Salmonella Newport that occurred during the period from December 31, 1991 to January 4, 1992 among students at a Medical College. Out of 344 students, 79 (23%) had clinical symptoms of food poisoning from the bacteria. The main symptoms of the food poisoning outbreak were malaise, diarrhea, and abdominal cramps. There were no fatalities [17].
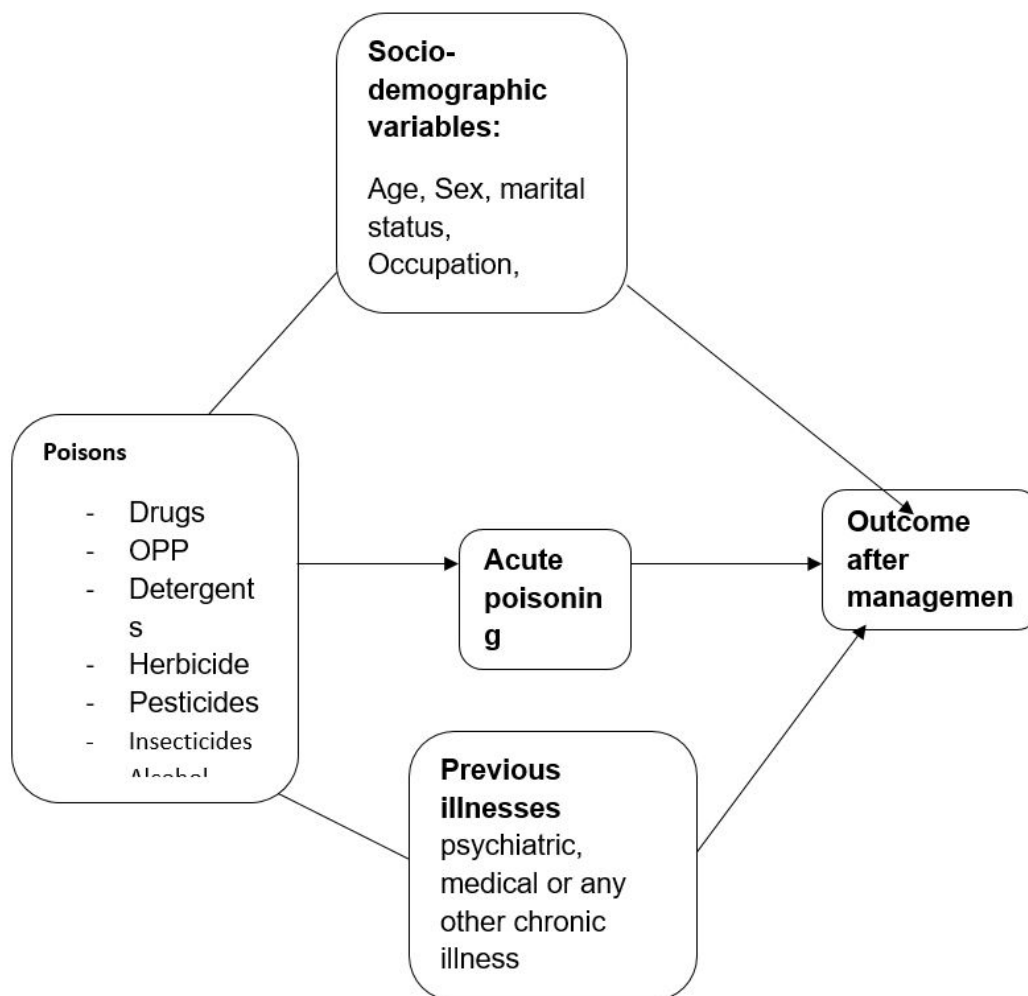

Figure 1: Conceptual Framework

Objectives

General objective

• To assess the pattern and outcome of acute poisoning in St. Peter Specialized Hospital, Addis Ababa, Ethiopia, 2019 G.C.

Specific objectives

• To determine the most common causes of acute poisoning in patients coming to the Toxicology center of St. Peter Specialized Hospital from 09-May-2017 to 08-Jan-2019
• To assess factors associated with acute poisoning in patients coming to St. Peter Specialized Hospital from 09-May-2017 to 08-Jan-2019
• To assess the pattern of the outcome of treatment for acute poisoning in SPSH during the study period.

Methods

Study Design

A Cross Sectional Retrospective Study

Study Area

The study will take place in St. Peter Specialized Hospital Toxicology center. St. Peter Specialized Hospital is established in 1963 as a TB sanatorium and gradually expanded itself to include many other disciplines in the recent years. It provides services that include Internal medicine, Surgery, Pediatric, Gynecology and Obstetrics, Maternal and Child Health, Psychiatry, Dentistry, Radiology, Voluntary Counseling and Testing, Antiretroviral treatment, and Dermato venereology, it has a well-established Research Department serving for investigators coming from the hospital staff and other institutions. The Training Center is currently functional and a lot of trainings are being conducted. The hospital has a bed capacity of around 268 and serves patients coming from all over the country. The Toxicology Center was established recently with incorporating research in its main activity.

Study Period

The study will be conducted from May - July 2019 G.C.

Source Population

All patients who attend the toxicology center during the study period

Target Population

Patients who were treated for acute poisoning at the toxicology center of St. Peter Specialized Hospital during the study period

Inclusion Criteria

All patients who attended the toxicology center during the study period will be included in the study.

Exclusion Criteria

All patients with chronic poisoning and referred patients for other reasons (e.g., there were patients who were referred for dialysis due to other causes other than poisoning).

Sample Size

Since the number of patients with acute poisoning who attended the hospital during the study period was limited, all these (a total of 300) patients will be included in the study. Similar studies also took the total number of patients seen during the study period.

Data Collection Procedure and Analysis

Patients' data is available in the toxicology center with the Excel spread sheet. The data has been captured after the permission of the hospital. The principal investigator will organize the data for each patient and uses a questionnaire to collect data in a consistent manner. Data will be cleared and exported in to SPSS version 20 for analysis. Tabular presentations will be used for socio-demographic variables and findings. Chi-square test is the statistical test that will be used to analyze associations or differences of outcome variables with the different independent variables. Multivariate logistic regression will be used to control for confounding. Results are claimed to be significant if the p-value is less than or equal to 0.05.

Results

A total of 300 patients with acute poisoning were included in the study. The mean age of the study participants was 26.3 years (Range: 2 - 80 years and SD = 11.7 years). One hundred and fifty-six (52%) were females and the rest males with three patients having no record. With respect to marital status, the majority of patients, 177 (59%) were single followed by married patients accounting for 105 (35%) of the total. The socio-demographic distributions are shown in the following table.

Variables	Frequency	Percent
Age category (years)		
0-14	16	5.3
15-29	196	65.3
30-44	61	20.3
45-59	20	6.7
>=60	7	2.3
Total	300	100
Sex		
Female	156	52.5
Male	141	47.5
Total	297	100
Missing	3	
Marital status		
Single	177	61.6
Married	105	36.4
Divorced or widowed	6	2
Total	288	100
Missing	12	

Variables	Frequency	Percent
Educational status		
Illiterate and KG	61	23.6
Grade 1-6	43	16.6
Grade 7-12	100	38.6
College/University/Graduates	55	21.2
Total	259	100
Missing	41	
Occupational status		
Student	89	32.0
House wife	32	11.5
Government worker	2	0.7
Unemployed	25	9.0
Private or self employed	38	13.7
Daily laborer	16	5.8
Farmer	27	9.7
Others	49	17.6
Total	278	100
Missing	22	

Table 1: Socio-demographic distributions of patients with acute poisoning

	Frequency	Percent
Past Medical History		
Epilepsy	4	1.4
Psychiatric illness	4	1.4
Diabetes or hypertension	2	0.7
Others	9	3.0
No past history of illness	275	93.5
Total	294	100
Missing	6	
Current pregnancy for women		
Yes	11	7.6
No	133	92.4
Total	144	100.0
Prior suicidal attempt		
Yes	15	5.1
No	280	94.9
Total	295	100
Missing	5	
Intention of previous suicidal attempt		
Intentional/suicidal	8	53.3
Unknown	7	46.7
Total	15	100.0

Table 2: The distribution of cases with regard to past/current medical conditions

There were only four patients (1.2%) with the history of past and/or current psychiatric illness. With regard to past medical illnesses, there were 4 (1.3%) cases of epilepsy, 2 (0.7%) cases of diabetes or hypertension and 9 (3.0%) with other types of chronic illnesses. For females in the reproductive age group; there were 11 (3.7%) cases with current pregnancy. Fifteen cases (5.0%) had history of previous suicidal attempts out of which 8 (53.3%) were intentional. There was no record of the type of the attempt (i.e., whether intentional or accidental) for the seven cases. The distribution of cases is shown in Table 2 below.

Two hundred and fifteen (71.7%) of the cases came to St. Peter Hospital with referral paper from other health institutions, 81 (27.0%) cases self-referred and the other 4 cases (1.3%) transferred. With respect to mode of transport: 192 (64.0%) came by ambulance, 33 (11.0%) walking or supported, 48 (16.0%) by taxi and 25 (8.3%) by private car or other mode of transport. There was no record for 2 (0.7%) cases.

	Frequency	percent
Type of visit		
Referred	215	71.7
Self-visit	81	27.0
Transferred	4	1.3
Total	300	100.0
Mode of transport		
Ambulance	192	64.4
Walking/supported	33	11.1
Taxi	48	16.1
Private car or other mode	25	8.4
Total	298	100
Missing	2	
Home care given		
Drinking milk	35	11.8
Drinking milk and water	14	4.7
Water only and other methods	5	1.7
None	243	81.8
Total	297	100.0
Missing	3	
Location of incident		
Home	258	87.5
Out of home	11	3.7
Work place	12	4.1
Others	14	4.7
Total	295	100
Missing	5	
Reason for exposure		
Suicidal/intentional	238	81.8
Accidental	53	18.2
Total	291	100
Missing	9	

Table 3: Distribution of cases of acute poisoning with respect to type of visit, mode of transport, home care given, location of incident and reason for exposure

Some of the study participants were given different types of home care before coming to the hospital out of which 35 (11.7%) were given milk, 14 (4.7%) cases combined milk and water, and 5 (1.7%) were given water only and/or other methods. Most of the cases, 243 (81.0%), were given nothing before arrival to the hospital. Most poisonings, 258 (86.0%) occurred at home followed by work place, 12 (4.0%). See table 3 for distributions.

The common agents of poisoning in decreasing order were: Drugs, organophosphates/ pesticides/ insecticide, house hold bleach and rat poison accounting for 112 (37.3%), 62 (20.7%), 29 (9.7%), and 18 (6.0%) respectively (See the distribution in table 4 below).

Agents	Frequency	Percent
Drug poisoning	90	31.3
Organophosphate/pesticide/insecticides/ herbicide	61	21.2
House hold bleach	32	11.1
Rat poison/rodenticide	22	7.6
Carbon monoxide/other gas	24	8.3
Alcohol intoxication	11	3.8
Snake venom	7	2.4
Aluminum phosphate poisoning	18	6.3
Others	23	8.0
Total	288	100
Missing	12	

Table 4: Distribution of agents accounting for acute poisoning in SPSH

Among the total patients only 43% of the patients were linked to psychiatric clinic.

		Frequency	Percent
Consultation	linked to Psychiatric unit	129	43.0
	Not linked to Psychiatric Unit	138	46.0
	link to other departments	5	1.7
	Missed	28	9.3
	Total	300	100.0

Table 5: Linkage of patients to Psychiatric clinic

Most of the patients came within four and eight hours of their exposure to the poisoning agents. Fifteen percent of the patients came after 24 hours of their exposure.

		Frequency	Percent
Route of exposure	Inhalation	43	14.4
	Ingestion	239	80.2
	Cutaneous contact	1	0.3
	Bite	7	2.4
	Injection	3	1
	Others	5	1.7
	Total	298	100
	Missing	2	
Time elapsed	<1hour	28	9.5%
	1 to 4 hours	80	27.2%
	4 to 8 hours	70	23.8%
	8 - 12 hours	24	8.2%
	12 - 24 hours	46	15.6%
	>24 hours	46	15.6%
	Total	294	100
	Missing	6	

Table 6: Route of Exposure and time elapsed between exposure and presentation to the hospital

With regard to outcome, 268 (89.3%) of the patients improved after proper management, 14 (4.7%) patients were either transferred or referred, 11 (3.7%) died and 5 (1.7%) of the patients left against medical advice (Table 5). All (100%) of the patients who died were referred from other institutions. Most patients, 10/11 (90.9%), who died were due to ingestion of the toxic agent. There was no statistically significant difference in outcome when patients with psychiatric illness are compared with those without psychiatric illness, X^2, 1 d.f. =1.817, P>0.1.

Outcome	Frequency	Percent
Improved	268	89.9
Transferred/Referred	14	4.7
Died	11	3.7
Left against medical advice	5	1.7
Total	298	100
Missing	2	

Table 7: Outcome of patients after proper management

There is no statistically significant difference in outcome after proper management between males and females (X^2 = 1.774, p-value = 0.621); among the different age groups (X^2 = 12.65, p-value = 0.395); and the different occupational groups ((p>0.05). There is a difference with regard to marital status: Most deaths occurred among married people (55.5%) (X^2 =30.9, p-value =0.000).

Variables	Category	Poisoning outcome		COR
		Death	Improved	
Age	0 - 14	0	14	
	15 - 24	4	138	**1.46(0.31 - 6.86)**
	25 - 35	4	76	**2.65(0.57 -12.36)**
	≻ 35	3	39	**1**
Sex	Male	6	127	**1**
	Female	5	139	**0.76(0.22 - 2.56)**
Previous Psychiatric illness	Yes	2	19	**1**
	No	9	246	**2.88 (0.58 - 14.28)**
Education Level	Grade 1 - 8	3	79	**1**
	Grade 9-10	0	53	
	Grade 11 - 12	0	10	
	Diploma and above	1	48	**1.82(0.18 - 18.01)**
	Unknown	1	31	**1.18(0.12 - 11.75)**
	Illiterate	6	43	**0.27(0.07 -1.14)**
Marital status	Single	5	165	**1**
	Marred	6	94	**0.47(0.14 - 1.59)**
	Divorced	0	3	

Table 8: Strength of association in outcome among different independent variables

Discussion

In a hospital-based study done in **Kampala Uganda** there was a significant association between gender and poisoning. The average length of stay was around (26.6 ±12.2) which is almost similar to the finding in our study, (26 ± 11). There was a statistically significance regarding to gender which females were more victims of poisoning. Though statistically insignificant, females are more exposed to poisoning than their counter parts. In another study done in Adama hospital medical college on poisoning admitted cases there is no significance relation between gender status and poisoning. [6]

In another hospital-based study done Nepal Kathmandu Ninety-seven percent of cases were intentional poisoning for suicidal attempt which is almost similar to our case, 79%. It's also similar to a study done in university hospital in Tabriz, Iran which is 9.8% of cases were accidental and in 90.2% intentional poisonings.

Most of the cases (61.6%) had arrived hospital within 3 hours after exposure to the poison where as in our case it's within four hours of exposure. [18]

In a study at Adama hospital medical college on poisoning admitted cases majority of the patients (83.6%) were below 30 years of age, which is different with the data found in this study which is below 24 ages. And the highest number of pts was farmers which is student in this study and followed by farmers. Organophosphates were the most commonly used toxic agents (52.1%), followed by household cleaning products (12.7%) which is similar in this study but followed by drug overdose unlike the above result. Drugs were the most common cause of poisonings (60.8%) in a study done in Iran, on university hospital in Tabriz. [19]

Majority (82%) of the patients who came to the unit took poison intentionally. Only 18 percent were accidental exposure. Similarly, Studies have shown that intentional poisoning incidents led to the deaths of the victims in many countries including Ethiopia. This is because of the ingestion of large quantities of the toxic agents. [3-5]

The case fatality rate in this study is 3.6% which is consistent with many findings. A systematic review on global epidemiology of acute poisoning with an emphasis to Ethiopia: the case fatality rate was founded to be with range of 2.4% - 8.6%. The case fatality rate of developing countries is significantly higher than developed than developed countries.[5]

In our case this might be due to the fact that there is strong preventive measures and effective management of acutely poisoned victims in developed countries. And also, its hospital-based study the finding will be low if its community based.

Most of the poisons taken in our study are medicinal drugs which are single medications or a combination of more than a drug. This is consistent with the findings in many literatures. This might be due to the ignorant access of OTC drugs from pharmacy and poor handling of drugs by family member due to negligence and poor counseling from pharmacy stores.

Though most of the poisoning cases were intentional only 43% of were linked to psychiatric clinic. This is should be very critical point to be addressed by the unit. According to WHO report of September 2019 for every suicide there are many more people who attempt suicide every year. A prior suicide attempt is the single most important risk factor for suicide in the general population.

Conclusion

Majority of the patients commit suicide intentionally. This might give big insight for the hospital to focus on the patients since most of suicidal attempt are the result of suicidal ideation and which intern is one of the psychiatry emergencies. So, all patients who commit suicide intentionally should have to be linked to psychiatry clinic of the hospital.

Majority of the patients were not linked to psychiatry clinic so this might give them another chance to commit another suicide again. So, the issue should be given due attention by the unit.

There are six snakebites among all patients and they should be given due attention on those patients for further study on the case.

Recommendation

• The data handled by the toxicology unit is very good relative to the data handled by other departments in the hospital. And the staff should be given many thanks for that in the name of the hospital.

• Some of the variables are missed data more than the expected range. which makes the data analysis impossible for the variable and persuaded to omit

• Left against medical advice patients should be given stress if they are gone with themselves.

• Most of the patients attending the unit were linked to other departments for further medical management this is totally different from one of the main principles of the establishment of the unit which was to give all the medical services in the department.

• There is a need for assigning a psychiatric HCW at the toxicology center.

• There should be refreshing trainings for HCWs working at the toxicology center with regard to psychiatric emergencies and development of tools to assess suicidal attempts and how to handle data for further studies.

• There is a need for awareness creation programs in the community and schools as to how to handle and store pharmaceutical drugs and other poisons.

• There is a need for establishment of toxicology centers in other institutions.

Acknowledgment

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