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Title: Identification of the patients admitted to the NHSL in the year 2013 with common household agents and pharmaceutical poisoning

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General Objective:

To identify the common household and pharmaceutical agents, socio- demographic factors and treatment cost per for antidote use in the management of pharmaceutical poisoning.

Specific Objective:

1. To study the common substances responsible for morbidity due to household and pharmaceutical poisoning and its frequency.
2. To identify the related cultural social and demographic factors.
3. To assess the treatment cost per case of poisoning for antidote use in the management of pharmaceutical poisoning.

Introduction and Justification:

Self- poisoning is a major public health problem in Sri Lanka, the majority of the cases being due to ingestion of yellow oleander, pharmaceuticals, paraquats and organophosphorus compounds. There is an estimated prevalence of 315 to 364 per 100,000 populations per attempting self-poisoning each year [(1)]. In 1990s the pesticide poisoning was listed as the 6th common cause of hospital deaths in Sri Lanka [(2)].

However, since 1995 the suicide rate in Sri Lanka has declined to 23 per 100,000 populations and it has been attributed to a fall in case fatality rate following reduction in toxicity of accessible pesticides [(3, 4).] Despite the fall in rate of suicide, the rate of self- poisoning continues to be high and it associated with high morbidity and high economic cost to country [(4)]. The study carried out in year 2000 at National Hospital of Sri Lanka (NHSL), Colombo was indicated that pesticide (17.59%) was the most common agent type used in poisoning and pharmaceuticals (13.96%) ranked the second highest [(5)].

Fernando R. in 2007 indicated that within the last few years the pattern of poisoning has changed in hospitals mainly in cities and pharmaceuticals poisoning is an emerging problem and Paracetamol leads with highest admission rate in the NHSL [(6, 7, 18)]. Over the past 40 years, several studies have investigated the incidence and factors associated with self- poisoning in Sri Lanka ,

and it was revealed there appears to be an emerging pattern of increasing medicinal overdoses, paralleled by gender shift towards males to females[7].

However, according to the National data published in 2013, there was a risk of alarming rise of household poisoning in Sri Lanka. The toxic effects of non- medicinal household substances were rated as 31,363 admission in state hospitals and it was higher than the number of patients admitted due to toxic effects of medicinal agents (28,975) and organophosphates and carbamate insecticides (21,133) [8]. The reported case fatality rate for non- medicinal household poisoning was 0.55% and it was greater than pharmaceutical poisoning (0.26%) [8].

In recent past a new laundry detergents consisting of sachets of oxalic acid and potassium permanganate has become a popular household agent among the youth for self- poisoning[9] These attempts of deliberate self- harm create economic impact on health care system and cause distress to individual and families [10].

Justification:

The study aims to identify the common household agents responsible for poisoning, newly marketed products, the vulnerable groups, cultural social grounds and demographic factors responsible for drug and household poisoning and management cost for antidote use in drug poisoning, which would help in better understanding of how to broad base plans on awareness, prevention and cost implications and its reduction in the management of poisoning in future.

Methodology:

Hospital based retrospective cross sectional study carried out over the period of three consecutive months at NHSL, a leading tertiary care hospital in Colombo, catering to above 12 year old persons. All the Bed Head Tickets (BHTs) in year 2013 which coded and entered in IMMR registry as poisoning according to the ICD- 10 were referred from the Medical Record Division at the National Hospital, Colombo. Out of all BHTs relevant to poisoning, the BHTs relevant to the toxic effects of substances chiefly non medicinal (IMMR Code 238) and Drug medicaments and biological substances (IMMR Code 234) were selected. All relevant data on BHTs were collected using a prepared data extraction sheet and data collection was done.

Inclusion Criteria:

All medical records of the year 2013, which were coded according to the IMMR cording system as of household poisoning (IMMR Code – 238) or Pharmaceutical poisoning (IMMR Code- 234) were included in to the study.

Exclusion Criteria:

Out of the BHTs which were selected relevant to the IMMR Code 238 and 234, the BHTs identified as the toxic effects of plants and other edible plant substances, pesticide poisoning, industrial poisoning due to toxic effects of metals and inorganic substances, food toxicity due to sea foods, mushrooms, berries, snake bites and other animal bites were excluded.

Potential benefit to participants:

Current pattern of poisoning and cost for anti- dote usage which would emerge from the study leading to better understanding of how to broad base plans on awareness. This would help in reducing morbidity, mortality and unnecessary cost to the health care leading to benefit of the patients in future.

Data extraction instrument:

Pre tested data extraction form was used for data collection and it was consisted of the following sections:

a) Details of patients admitted with poisoning- District, Name of hospital, BHT No., Date and Time of admission, Mode of admission (Transfer or Direct admission) and Ward.
b) Related demographic factors- Age, Sex, Address, District of residence and sector (urban / rural)
c) Risk behaviour- Risk behaviour: Previous attempts of suicide, underline causes or chronic illness of the patient, History of alcohol dependence, pre- determination, triggering factors and suicidal intent.
d) Nature of poisoning – type of poison, ingested amount, route and circumstances of exposure
e) Summary of treatment given

Data Collectors:

Co- researches of two Medical Officers and one Research Officer attached to the National Poisons Information Centre were collected data.

Analysis and Statistical consideration:

Descriptive statistics as mean, standard deviation and percentage values was calculated to describe the distribution in each variable. Demographic factors and risk behaviours associated with poisoning was analysed using Chi-square test 95% confidence intervals. The means of each group was compared using T- test whenever necessary. Treatment cost was analysed using pre estimated cost per (unit prize) each antidote usage in treatment. Analysis was done using SPSS version 16.0

Administrative requirement:

Before starting the study consent and the approval of the Director, National Hospital of Colombo was obtained.

Ethical clearance:

Ethical clearance was obtained from the ethical review committee, National Hospital, Colombo.

RESULTS:

The total numbers of 403 data were collected. Majority (87%, n=350) of patients were predominantly residing in Colombo Districts.

Table 1- Mode of admission vs Time of admission

	Time of admission				
Mode of Admission	**8-12hrs.**	**12-16hrs.**	**16-20hrs**	**20-08hrs.**	**Total**
Direct	86	95	114	89	384
Transfer	3	76	6	3	19
Total	**89**	**102**	**120**	**92**	**403**

Table 1 shows, 95 %(n=384) of victims directly admitted to the hospital and nearly 5 %(n= 19) were transferred from other regional hospitals situated in the Colombo District. Highest number of patients (30%, n=120) were admitted during the periods of 16 to 20 hours of the day, however it was not statistically significant with mode of admission (x^2= 1.860, df= 3, p>0.05)

Table 2 – List of transfer Hospital

Hospital Name	No of transfer
B.H. Horana	1
B.H. Mulleriyawa	3
D.H.Balangoda	1
D.H. Biyagama	1
D.H.Minuwangoda	1
Private Nursing Home	1
D.H. Maligawatta	1
P.U. Thalangama	5
B.H. Dompe	1
G.H. Kalutara	1
IDH	1
Military Hospital	1
Prison Hospital	1
Total	**19**

Table 3 - Age vs Gender distribution of victims

Age/ Gender	Male	Female	Total	Percentage
12-14yrs.(Child)	7	5	12	3%
15-19yrs.(Adolescents)	44	73	117	29%
20-40yrs.(Adults)	98	137	235	58.3%
40-60yrs.(Middle age)	18	16	34	8.4%
>60yrs.(Elderly)	4	1	5	1.2%
Total	**171**	**232**	**403**	**100**

Table 3 and figure 1 shows, female constituted 58 % and it was significantly higher than males. However majority 58.3% of patients admitted were adults for both sexes and the adolescent (15-19 yrs) was rated as second highest for both sexes. Considering the age group less than 19 years nearly 43% (n= 55, out of 129) were children of schooling.

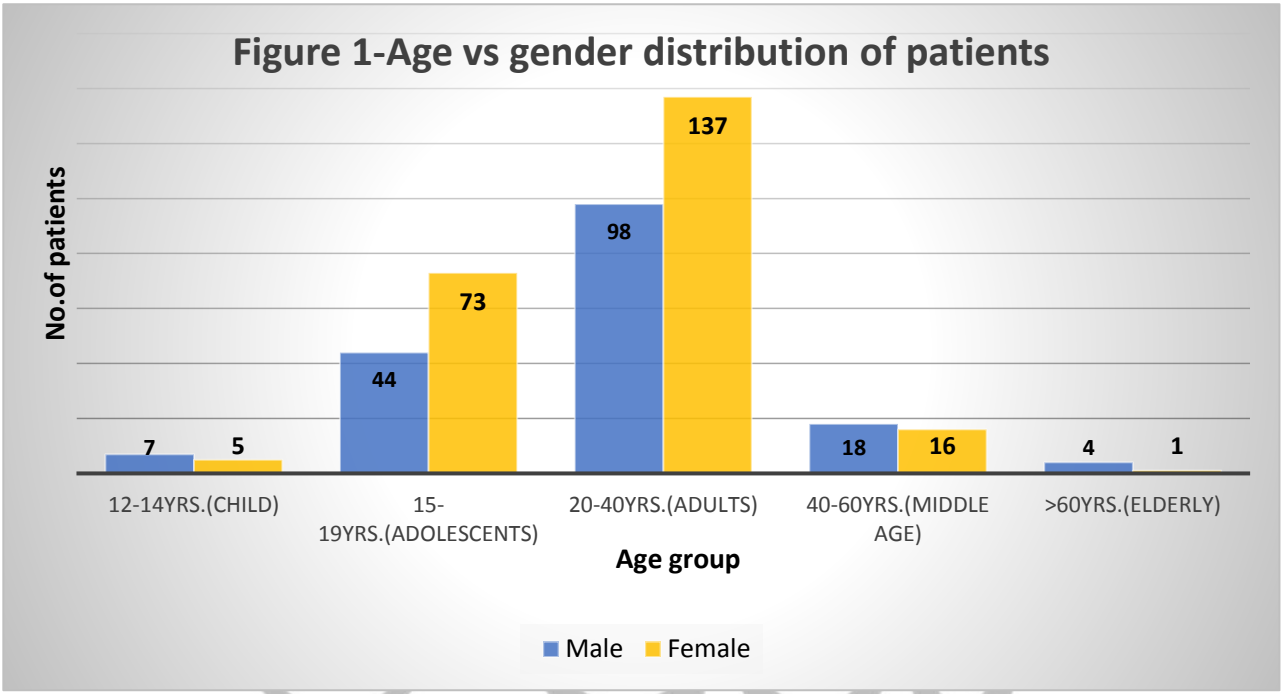


Table 4- Distribution of gender vs marital status

Gender	Marital status			Total
	Unmarried	Married	Not recorded	
Male	82	33	54	169
Female	117	68	45	230
Not recorded	4	0	0	04
Total	**203**	**101**	**99**	**403**

Table 4 shows, out of the total number of females majority 58% were (117 out of the 230) unmarried and it was statistically significant ($x^2 = 14.089$, df= 4, $p<0.05$)

Table 5 – Distribution of gender vs employment

Gender	Employed	Unemployed	Not recorded	Total
Male	51	39	79	169
Female	37	79	114	230
Not recorded	1	3	0	4
Total	**89**	**121**	**193**	**403**

Table 5 depicts the distribution of gender vs employment. The type of employment was not recorded in majority 48%, of patients and among them 29 % were students in level of secondary education in schools. Considering the employed group of patients majority 57% were males and unemployed group 65% were housewives (79 out of 121). It was statistically significant (x^2= 14.089, df=4, $p<0.05$) with the gender.

Most of the reported employees were labourers, factory workers, Bridal dressers, Masons, Police Constables, Army soldiers, House keepers, salesman, servants, store keepers and Home keepers.

Table5 : Type of poisons recorded among students:

Name of poison	No. of patients	Percentage
Alfacalcidol	2	3.6%
Carbamezepine	1	1.8%
Calythromycin	2	3.6%
Erythromycin	1	1.8%
Glibenclamide	1	1.8%
Lithium carbonate	1	1.8%
PCM	27	49.1%
Salbutamol	1	1.8%
Combination of drugs	6	11%
Toilet cleaners	2	3.6%
Kerosene oil	6	11%
Rodenticide (Run rat)	1	1.8%
Insecticide (Zazafly)	2	3.6%
Unknown products	2	3.6%
Total	**55**	**100**

Paracetamol was the commonest poisoning agent among school children (49.1%, 27 out of the 55) the petroleum product Kerosene oil and ingestion of combination of drugs (more than one medicinal agent) were rated as second commonest types of agents used for poisoning.

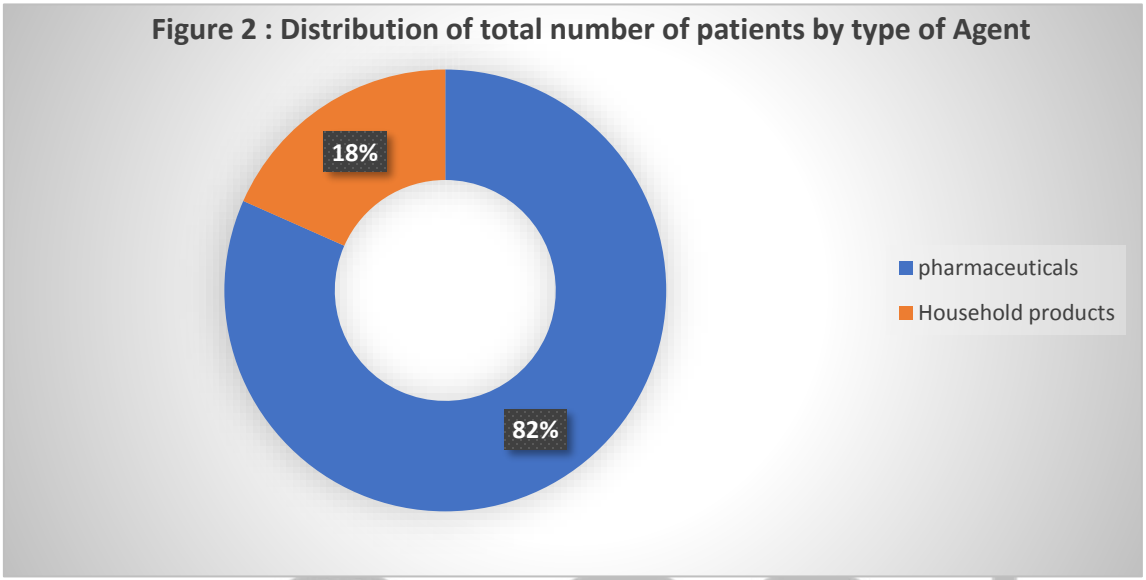


Figure 2 shows, pharmaceuticals (82%) were the most common agent type used in poisoning than household products (18%).

Table 6. List of pharmaceutical Agents

Medicinal agent	No. of Patients	Percentage
Vitamins	8	2.4%
Antibiotics	4	1.2%
Anti- helminthic	1	0.3%
Antihypertensive	4	1.2%
Antipsychotic	6	1.8%
Cholesterol lowering drug	1	0.3%
Antiseptic	2	0.6%
Benzodiazepine	**9**	**2.7%**
Combination of drugs	**28**	**8.5%**
Cardiac drugs	2	0.6%
Anti- diabetics	9	2.7%

Antimalarial drugs	2	0.6%
NSAID	1	0.3%
Anti- inflammatory drugs	1	0.3%
Bronchodilators	5	1.5%
Antacids	2	0.6%
Analgesics + Antipyretics	**224**	**68.1%**
Antihistamine	5	1.5%
Antiasthmatic	1	0.3%
Bronchodilators	5	1.5%
Unknown Drugs	**9**	**2.7%**
Total	**329**	**100**

According to the Table 6, Analgesics and Antipyretics was the most common (68.1%) medicinal agents used for the poisoning. Among these Paracetamol was the commonest drug of choice for poisoning and it was accounted as 83 %(n=186 out of 224). The use of combination of drugs for deliberate self- harm was rated as second highest (8.5%). Benzodiazepines and Unknown drugs were rated as third (2.7%).

Table 4: List of Household products used for poisoning

Household product	No. of Patients	Percentage
Bleaching agents	**3**	4.1%
Cooking oils	**1**	1.4%
Detergents	**6**	8.1%
Automobile fluids	**2**	2.7%
Drainage cleaners	**1**	1.4%
Engine oils	**2**	2.7%
Toilet cleaners	**9**	12.2%
Mosquito coils	**9**	12.2%
Vehicle cleaners	**1**	1.4%
Kerosene oils	**15**	20.3%
Rodenticides	**17**	23.0%

Thinner	**1**	1.4%
Washing powders	**1**	1.4%
Unknown products	**6**	8.1%
Total	**74**	**100**

Rodenticides was the commonest (23%, n=17) household product used for poisoning. Followed by Kerosene oil (20.3%), Mosquito coils (12.2%), Cleaning agents used in toiletries (12.2%) and detergents were also used for poisoning.

Table 5- Distribution of age group vs agent

Age group	Pharmaceuticals	Household products	Unknown	Total
12-14yrs.	10	2	0	12
15-19yrs.	98	19	0	117
20-40yrs.	195	40	0	235
40-60yrs.	21	12	1	34
>60yrs.	04	01	0	05
Total	**328**	**74**	**1**	**403**

Table 5 shows, out of the total number of poisoning reported among students majority 83% were due to pharmaceutical drugs and it was statistically significant (x^2= 48.453, df= 20, p=0.000) However exposure type of agent was not significant with gender (x^2=8.496, df=10, p.0.05)

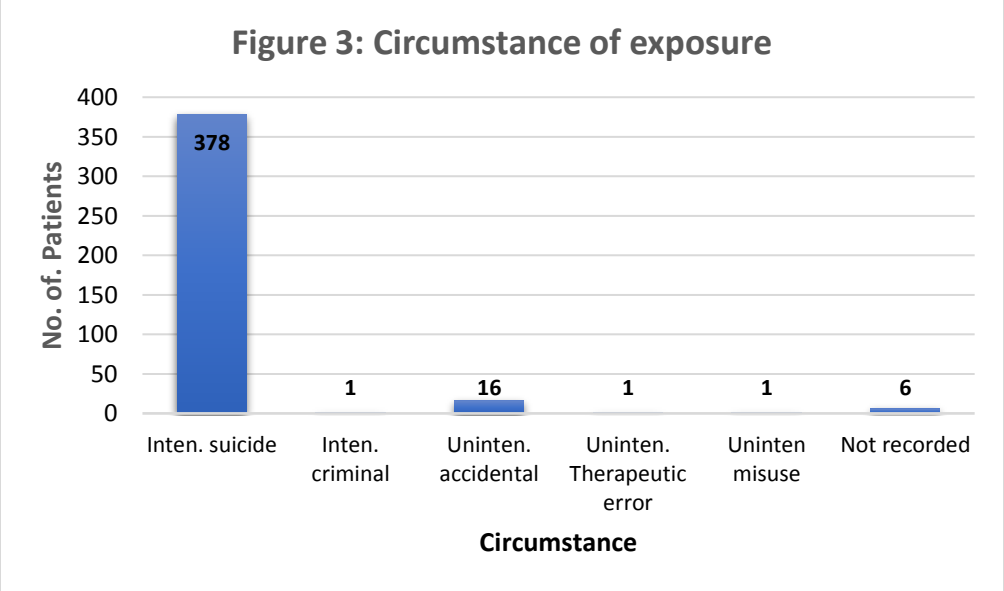
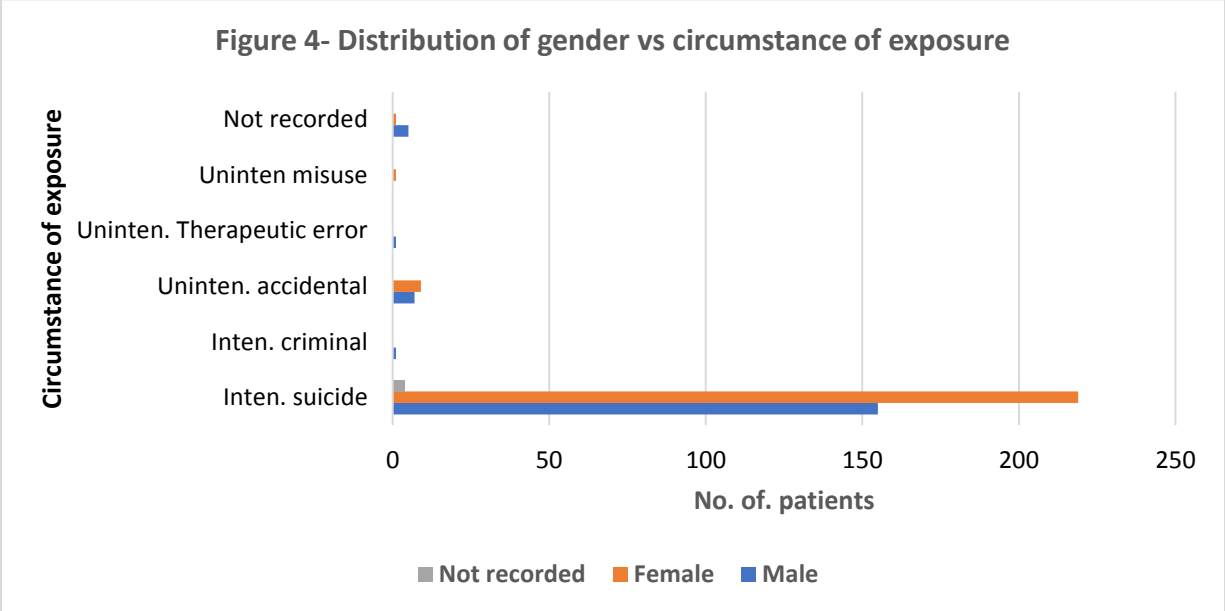


Figure 3 show, the use of poisons for deliberate self- harm was highest (94%) compared to unintentional accidental poisoning (4%). Other ways of unintentional exposure were not significant and negligible. Only one criminal case was reported as 40-60 yrs. of male was ingested unknown drink given by a known person at home.

Table 5 : Distribution of gender by circumstance of exposure

Sex	**Circumstance of Exposure**						
	Inten. suicide	**Inten. criminal**	**Uninten. accidental**	**Uninten. Therapeutic error**	**Uninten misuse**	**Not recorded**	**Total**
Male	155	1	7	1	0	5	169
Female	219	0	9	0	1	1	230
Not recorded	04	0	0	0	0	0	04
Total	**378**	**1**	**16**	**1**	**1**	**6**	**403**

Table 5 depicts, the highest number of female (58%) were taken poisons intentionally for suicide than males (41%). Furthermore, the female rate of suicide was 1.4 times the male rate.



All the poison exposure cases were acute and ingestion was the commonest (>99%, n= 402) route of exposure. The route of exposure as Inhalation was reported in only one case in which victim of 20-40 yrs. aged female sprayed insecticide " Mortein Spray" on her face deliberately.

Identification of Risk factors:

Table 6 : Previous attempts of poisoning current illness & Past Medical history

No. of Previous attempts	**No. of patients**	**Percentage**
1	4	44.4%
2	1	11.1%
Not recorded	4	44.4%
Current illness	**No. of patients**	**Percentage**
YES	15	3.7%
NO	388	96.3%
Past medical History	**No. of patients**	**Percentage**
YES	14	3.5%
No	389	96.5%

Table 6 shows risk factors for poisoning. Among the total number of recorded victims only 2.2 % (9 out of 403) patients had history of previous attempt of poisoning episode. However, the majority 98% of poison exposure victims did not have previous attempt of self-harm. Among the reported 9 victims, 4 of them had history of one previous attempt of deliberate self- harm before the current attempt and only 1 patient had 2 previous attempts before the current attempt.

Among the total number of patients, the number of victims with current illness and past medical history were minimum and nearly 4% for each respectively. The reported types of current illness were Cirrhosis, Diabetic mellitus, Psychiatrist illnesses, Epilepsy, Bronchial asthma etc. Also considering the past medical history the psychiatric illnesses as Depression and Schizophrenia were reported as the triggering factors for poisoning.

Table 7 – The reported reasons for present suicidal attempt

Reason for attempt of suicide	No. of patients	Percentage
Conflict with boy/ girl friend	11	25%
Argument with family members	24	54.6%
Stress reactions	3	6.8%
Chronic illnesses	4	9.1%
Financial problems	2	4.5%
Total	**44**	**100.0**

Based on the table 5, considering the victims who included in a group of intentional suicide, the reason for the present attempt of suicide was not documented in majority (n=359, 89.1%) of the patients and it was reported only for 44 victims. The family issues or argument with a family member was the most common reason (24, 54.6%). Issues of love affairs and presence of chronic illness were rated as the second (11, 25%) and third highest (9.1%) respectively. The various types of stress reactions and financial problems were also documented as the reasons for attempt of suicide.

Antidote usage:

N-Acetylcysteine was the most common antidote used for paracetamol poisoning (92.5%, n=172 out of 186) .The highest numbers of paracetamol poisoned patients were treated with 15000mg of NAC as an antidote. In addition to these 12000mq, 18000mg and 21000mg of NAC were used to treat the victims and were rated as second and third highest doses of used. The average value of NAC used per person was 14871.28mg/kg (n=172, SD=$^{+}$- 5049.32) .The reported minimum and maximum doses of NAC used was 300mg and 37500mg respectively. The cost the 2g (10ml) vial of NAC =Rs. 302.27/-*. According to the result the estimated average cost of IV NAC treatment per paracetamol poisoning patient was Rs. 22347.57/- and the estimated total cost was Rs. 386,582.04/- (n=172).

*Source: Price List, 2013, Medical Supply Division, Ministry of Health, Colombo

The 14 of paracetamol exposure patients had treated with antidote **Methionine**. The total dose of methionine used for treatment was 140mg (Mean 10mg, SD= ±3.16, n=14). The cost of the 500mg of the oral Methionine is Rs.26.88/-* . The estimated average cost for the treatment of oral Methionine per Paracetamol exposure patient was Rs. 0.54/- . The estimated total cost of the treatment of oral Methionine for Paracetamol exposure patients was Rs.7.56/-.

The 300qg and 400ug of **Flumazenil** were given for 2 victims who had ingested drugs of benzodiazepine. The average dose of IV flumazenil used for treatment was 350µg (n=2). According to the source the cost of the 500µg vial of Flumazenil is Rs. 2772.25/-* . The estimated average cost for Flumazenil usage was Rs. 1940.58/-. The total cost of IV flumazenil usage was Rs. 3881.16/-.

Vitamin K was given for 3 patients who had ingested products of rodenticide, containing Coumarine. The total dose of IV vitamin K used was 70mg. The average dose per person was 23.33mg (SD= ±4.83). The cost of the 10mg vial of IV K is Rs. 36.48/-*. The average treatment cost per patient for the Vitamin K was Rs. 85.11/-. The estimated total cost was Rs. 255.32/-.

Atropine was used to treat the 2 patients who had ingested Propranolol deliberately. The total dose of IV atropine used for treatment was 1.8mg. The average dose used was 0.9mg (SD= ±95) and the cost of the one vial of 0.6mg of IV Atropine is Rs. 7.62/-*. According to this the average treatment cost per patient for IV Atropine 0.6mg was Rs. 11.43/-. The total estimated cost was Rs. 22.86/-.

Outcome:

The almost 98% (n=395 out of 403) of poison exposure victims were recovered and discharged. Only four patients were left against the medical advice and three were missing from the wards. Only one case of death was reported as 20-40 yrs. of married woman ingested a massive dose of antihypertensive drug and presented after more than nine hours of ingestion.

The minimum days in hospital were one and the maximum days were 34.The average days in hospital was approximately 2 (Mean=1.95, SD= ± 2.030). Out of the total number of victims only four patients were admitted to the ICU for monitoring and further treatment and almost 99% were not admitted. Among the all reported 403 cases of poisoning more than one fourth of patients (27.5%) were referred to the both psychiatrist and councillor.

*Source: Price List, 2013, Medical Supply Division, Ministry of Health, Colombo

Discussion:

Since the study was based on the patients who came to NHSL most of the patients were from Colombo district. The direct admissions of poisoning were higher than the transfers to the NHSL. The reason for the transfer was lack of antidote and for specialized care and it was consistent with the early studies done in NHSL (Senarathna SMDKG 2008).

The frequency of getting poisoning admissions was highest at evening between 16-20 hours of the day. This result was different from the previous studies done at NHSL where the frequency of getting poisoning admission was highest at night after 20 hours to mid night. (Sheriff R, et al. 2000, Vithanage A. et al , 2010). This might be due to the fact that present study based on only the household and pharmaceutical poisoning except the all poisoning admissions to the NHSL.

Considering the gender distribution of poisoning admissions due to household products and pharmaceutical drug overdoses to the NHSL, the majority were females and male to female sex ratio is 1:1:4. This result of the present study appears to signify the trend that has been emerging in the last decade where increasing the ratio of non-fatal self- poisoning among females compared to males in urban areas (Rajapaksha T, Griffiths K.M. and Christensen H, 2013).

Most of the poisoned patients were adults in 20-40 years of group and poisoning was also common among adolescent for both sexes. The retrospective hospital-based study carried out in the selected hospitals in the Western Province in 1995 showed that the age group between 15-34 years was the commonest age group for attempt suicide (Fernando D, Fernando R 1995). Therefore, the adults in the prime of youth represented the mostly affected group and this trend had been continuing throughout the past 18 years. This trend has been associated with the common problems related to the age group such as lack of employment, broken of relationships, increasing of cost of living, social violence, growing psychological stress related to pattern of education and uncertainties like feeling of isolation and lack of emotional supports.

The poisoning among school children accounted for 3% of the study population and majority used pharmaceutical drugs for poisoning. Poisoning was not common in the older aged groups (>60yrs.). This may be due to growing experience with age.

Documentation of socioeconomic data in BHTs was poor. This may be due to lack of time due to increased patients load. The results of the present study showed majority were unmarried, unemployed. Among the unemployed group 65% were housewives.

Considering the risk factors patients with previous attempts of suicides were not a commonly encountered category in NHSL. Patients with chronic illness and psychiatric illness were very low accounted 4% each respectively. The majority of attempts were precipitated by family issues as argument with the family members and this result is consistence with the study done in NHSL in 2003. (De Silva D, De Alwis Seneviratne R, 2003).

With regard to common agent types of poisoning, pharmaceuticals were commoner than household poisoning. In this present study analgesics was the commonest group and paracetamol was the commonest pharmaceutical agent. This result was consistent with the early study done at NHSL which revealed that pattern of poisoning has changed and paracetamol poisoning was the common poisoning agent in hospitals mainly in cities (Fernando R. 2007). The probable reason for increased paracetamol poisoning was related with its availability as an over the counter medication and the low cost (Senarathna SMDKG et. Al. 2008). The previous study carried out of in NHSL was revealed that the substances used for poisoning is associated with availability of substances at homes. (De Silva D., De Silva Senevitatne R. 2003) Rodenticide was the commonest household product used for poisoning. Kerosene oil, Mosquito coils, cleaning agents used in toilets and detergents are commonly used household products for poisoning.

According to the results, ingestion was the most common route of poisoning. the availability of suicidal agents in liquid form in the market may have contributed to ingestion being the commonest route of poisoning.

Considering the management of paracetamol poisoning commonly used antidote was N-Acetylcysteine and it was consistent with the results of the previous study (Galappatthy P, 2006)10. According to the result of the present study the estimated average cost of IV NAC treatment per paracetamol poisoning patients was Rs. 22347.57/- . The cost of NAC usage is significantly increased. It was two times higher compared to the early studies where the cost of NAC is about Rs. 11,000/- for treat regime of paracetamol poisoning (Senarathna SMDKG et al. 2008.). Compared to the cost of N-acetylcysteine cost for other antidotes were negligible.

*Source: Price List, 2013, Medical Supply Division, Ministry of Health, Colombo

Conclusion:

The pharmaceutical drug over dose is commoner than the exposure to household products. Females are predominating than males and their rate of suicide was 1.4 times the male rate. The adult belongs to 20-40 age group is the most vulnerable group for both sexes. The deliberate self-harm is significantly higher and it was more than twenty four times higher than the accidental poisoning. Females were taken poisons intentionally for suicide and most of them were unmarried and unemployed. The poisoning among the school children in secondary educational level has to be considered. Paracetamol is the most common drug of choice among the pharmaceutical over doses and the rodenticides is the common household product used for poisoning. According to evident the availability and easy accessibility of over the counter drug should be limited and household products should have store securely to prevent unnecessary morbidity of poisoning.

The most common triggering factor is the interpersonal conflicts especially with family members and the issues of broken affairs also contributory factor for attempt of suicide. The awareness programs has to be conducted to general public and the school children regarding on how to prevent the interpersonal conflict and emotional stress.

The cost of management of these patients including the cost of the antidote and the socioeconomic costs of poisoning is a burden to the health care service and the country.

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Competing interest:

No competing interest

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