

## Original Research Article

# Prospective study of clinical profile and outcome of children presenting with poisoning

Ramamoorthy R., Madhubalan T.\*, Chidambaranathan S.,

Department of Pediatrics, Rajah Muthiah Medical College and Hospital, Annamalai University, Tamil Nadu, India

**Received:** 15 January 2020

**Accepted:** 20 January 2020

**\*Correspondence:**

Dr. Madhubalan T.,

E-mail: arvindr84@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Childhood poisoning covers the entire gamut from accidental ingestion in toddlers and preschool children to intentional overdosage in adolescents. To find the clinic- epidemiological profile of poisoning regarding age, sex, type of poison, manner of poisoning, common clinical features, duration between poisoning and presentation to hospital, duration of hospital stay, to find out the different agents involved duration of ICU stay, pre-referral treatment and treatment given.

**Methods:** All children below 12 years of age admitted during the one-year study period with a history of poisoning were included. Animal bites, snake and scorpion envenomation, chronic poisoning, drug allergy was excluded. All children were examined, investigated and treated according to hospital policy. The outcome of poisoning was recorded.

**Results:** There were 143 cases of children with poisoning admitted. Accidental poisoning constituted 88.1% cases (n126), 7.7% (n11) was suicidal and the remaining 4.2% (n6) was homicidal. In most cases, poisoning was due to hydrocarbons followed by pesticides. kerosene oil was the most common substance followed by OPC.

**Conclusions:** The highest incidence of poisoning was observed in children below 5 years of age and from the lower middle socio-economic group. Most of the poisons were household products and the most common nature of exposure was accidental in most of the cases, recovery was complete.

**Keywords:** Accidental, Childhood poisoning, Hydrocarbons, Outcome

### INTRODUCTION

Childhood poisoning is one of the emergencies commonly encountered in pediatric practice. Since the usage of chemicals has been increasing in houses acute poisoning cases also increased. Accidental poisoning is more common in childhood and most of the cases are preventable.<sup>1</sup> Among hospital admissions Poisoning is the 12<sup>th</sup> most common in children. It contributes to the majority of total cases and fatalities. In many poisoning cases in childhood is a result of oral consumption of poisonous agents.<sup>2</sup> The present-day household offers toxic substances at every corner including caustics, insecticides and medicines that provide easy settings for

childhood inquisitiveness to end in disaster. These agents are often mistaken by children for soft drinks or water.<sup>3</sup> The average incidence among various studies range from 0.3% to 7.6%. The poisoning type and incidence of poisoning also differ from hospital to hospital and have a special bearing on the emergency pediatrics care of the area.<sup>4</sup>

Accidental poisoning is common in the preschool or toddler age group (less than 5 years) because the children up to this age have an exploratory tendency for the substance by taking it into the mouth while the suicidal poisoning is due to arguments by parents or stress.<sup>5</sup> Male children predominate the poisoning accidents accounted

for by their greater degree of activity and the number of cases belongs to poor socioeconomic status because of less space.<sup>6</sup> The present-day households offer toxic substances at every corner including caustics, insecticides and medicines that provide all too easy settings for childhood inquisitiveness to end in disaster. So far, the studies on poisoning have not undertaken this hospital, hence there is a definite need for the study to know the definite and detailed epidemiological evidence of poisoning.<sup>7</sup>

**METHODS**

The study included children admitted with bronchiolitis in between during the period of September 2018 to January 2019 at Department of Pediatrics, Raja Muthiah Medical College and Hospital. All children less than 12 years of age admitted in our NICU, PICU, and pediatric ward with a history of poisoning or intoxication were included in the study.

**Inclusion criteria**

- All children less than 12 years of age who come with a history of poison. consumption/intoxication, irrespective of signs and symptoms, accompanied or unaccompanied by poison or container.
- Children with a doubtful history of ingestion of poison but with definite symptoms and signs of poisoning.

**Exclusion criteria**

- Chronic poisoning, Snakebite, scorpion sting and another poisonous bite, Idiosyncratic reactions to drug, food poisoning.<sup>4</sup>

**Method of collection of data**

Children admitted with a history of poisoning in NICU, PICU and pediatric ward during the study period will be studied regarding age, sex, social demographic data. Ethical committee clearance was obtained in our hospital to conduct our study. Informed consent obtained from parents and caregivers of the children before including them in the study details of the poison will be noted as, name, type of agent, route of exposure, time of arrival to hospital after poison exposure, manner of poisoning.

Clinical examination will be done by seeing vital signs, the systemic examination of CVS, RS, Abdomen, CNS. Necessary investigations will be done according to the type of poisoning by investigations like complete blood hemogram, renal function test and liver function test, chest-x-ray, electrocardiography, echo, urine routine, ultrasound abdomen, cholinesterase level, ABG analysis, serum calcium, serum electrolytes and treatment given according to standard protocol including psychiatry counseling and outcome noted.

**Statistical analysis**

The package EPI-INFO version 3.5.3 was used for the analysis of the data and Microsoft Excel was used for data entry as well as to generate graphs, tables, etc. Results were expressed as the mean±standard deviation for continuous variables and as number and proportion (%) for categorical data. Since all data are known to be normally distributed, the parametric tests were used for statistical analyses.

**RESULTS**

The mean age of the case was 3.80 years. In this study, the maximum number of cases 60.8 % was seen in the 1-3 years age group(n=87) followed 17.5% in the age group 3-6 years(n=25). Similarly, 17.5 % in the age group 6-12 years(n=25) and less commonly 4.2% in the less than one-year age group (Table 1).

**Table 1: Age distribution.**

Age	Frequency	Percent
<1 year	6	4.2
1-3 years	87	60.8
3-6 years	25	17.5
6-12 years	25	17.5
Total	143	100.0

Most of the parents belong to the middle school level (n=87) 60.8% followed by 21.7% (n=31) in high school level. Then 11.2% (n=16) in primary level. Then 2.8% (n=4) in the illiterate level, 1.4% (n=2) in both graduate and secondary level and 0.7% (n=1) in intermediate level (Table 2).

**Table 2: Educational status of parents.**

Educational status of parents	Frequency	Percent
Illiterate	4	2.8
Primary	16	11.2
Middle school	87	60.8
High school	31	21.7
Graduate	2	1.4
Secondary	2	1.4
Intermediate	1	0.7
Total	143	100.0

In this study maximum of 65.7% (n=94) belong to lower-middle socioeconomic status followed by 14.7% in the lower class and 12.6% in the upper-middle class. Least in the upper-lower (n=10)7% (Table 3). In this study 37.8% (n=54) belong to hydrocarbon group, 21.7% (n=31) in the insecticide group, 11.2% (n=16) in both household and plant group. 7% (n=10) belongs to drugs, 5.6% (n=8) belong to corrosive, 4.9% (n=7) belongs to pesticides and 0.7% (n=1) in unknown group. Chi-square for the type of poisoning according to the age group from 0-12 year- X<sup>2</sup> is 62.12-p<0.001-which is significant (Table 4).

**Table 3: Socioeconomic status.**

Socioeconomic status	Frequency	Percent
Lower	21	14.7
lower middle	94	65.7
Upper lower	10	7.0
Upper middle	18	12.6
Total	143	100.0

**Table 4: Type of poisoning.**

Type of poisoning	Frequency	Percent
Corrosive	8	5.6
Drugs	10	7.0
Household	16	11.2
Hydrocarbon	54	37.8
Insecticide	31	21.7
Pesticide	7	4.9
Plant	16	11.2
Unknown	1	0.7
Total	143	100.0

In this study kerosene (30.1%), organophosphorus (9.8%), mineral spirit (7.7%), pyrethrins (7%) and oleander seed (6.3%) poisoning being the common poisoning agents (Table 5).

In this study accidental poisoning being the most common 88.1% (n- 126). The least mode of poisoning is homicide (4.2%). Among the accidental poisoning 1-3 years (61%) being the commonest age group with male predominance (41%). The incidence of homicidal poisoning is equal in both male and female sex (2%). Suicidal poisoning is more common in 6-12 years and more common in the male sex. Chi-square of p-value in the mode of poison in relation to the age group is <0.001-significant (Table 6).

In this study oral ingestion is the most common route 98.6% (n141), the least common shared by parenteral and dermal absorption (0.7%) with chi-square of p-value 0.971 is not significant (Table 7). In this study 33.6% (n48) was given pre-referral treatment in the form of gastric lavage, atropine, oxygen and etc. 66.4% were not

given pre-referral treatment with a chi-square of p-value 0.032 is significant (Table 8).

The mean duration between poisoning and presentation was 4.31 hours. In this study most of the children 79.7% reached the hospital within 1-6 hours. 9.1% Reached the hospital within one hour and 8.4% reached the hospital within 7-24 hours. Only 2.8% reached the hospital more than 24 hours with Chi-square of p-value 0.086 is not significant (Table 9).

**Table 5: Agents of poisoning.**

Agent of poison	Frequency	Percent
1%GBHC	1	0.7
Aluminium phosphide	2	1.4
Amitriptyline	3	2.1
Ant killer	2	1.4
Bleaching powder solution	1	0.7
Camphor	3	2.1
Carbamates	5	3.5
Cowdung powder	10	7.0
Dhatura	1	0.7
Diesel	1	0.7
Kerosene	43	30.1
Mineral spirit	11	7.7
Mushroom	2	1.4
Napthalene ball	1	0.7
Oduvan leaf	4	2.8
Oleander seed	9	6.3
Organophosphorus	14	9.8
Organochloride	1	0.7
Paracetamol	2	1.4
Phenol	7	4.9
Phenytoin	2	1.4
Phorate powder	4	2.8
Progesterin	1	0.7
Pyrethrins	10	7.0
Ratkillerpaste/yellow phosphorus	2	1.4
Sodiumvalproate	1	0.7
Total	143	100.0

**Table 6: Mode of poisoning.**

Age	Mode of poison						Total	Chi-square	p
	Accidental		Homicide		Suicidal				
	N	%	N	%	N	%			
<1 Year	5	83	1	17			6	69.26	<0.001**
1-3 Years	87	100					87		
3-6 Years	23	92	2	8			25		
6-12 Years	11	44	3	12	11	44	25		
Total	126	88.1	6	4.2	11	7.7	143		

**Table 7: Route of poisoning.**

Age	Route of poison						Total	Chi-square	p
	Dermal absorption		Injection		Oral				
	N	%	N	%	N	%			
<1 year	-	-	-	-	6	100	6	1.31	0.971
1-3 years	1	1	1	1	85	98	87		
3-6 years	-	-	-	-	25	100	25		
6-12 years	-	-	--	--	25	100	25		
Total	1	0.7	0.7	1	141	98.6	143		

**Table 8: Prereferral treatment.**

Age	Pre referral treatment				Total	Chi-square	p
	No		Yes				
	N	%	N	%			
<1 year	4	67	2	33	6	8.78	0.032*
1-3 years	65	75	22	25	87		
3-6 years	15	60	10	40	25		
6-12 years	11	44	14	56	25		
Total	95	66.4	48	33.6	143		

**Table 9: Duration between poisoning and presentation.**

Age	The duration between poisoning and presentation								Total	Chi-square	p
	<1 hour		1-6 hours		7-24 hours		>24 hours				
	N	%	N	%	N	%	N	%			
<1 year	1	17	3	50	2	33			6	15.17	0.086
1-3 years	8	9	75	86	2	2	2	2	87		
3-6 years	3	12	17	68	4	16	1	4	25		
6-12 years	1	4	19	76	4	16	1	4	25		
Total	13	9.1	114	79.7	12	8.4	4	2.8	143		

**Table 10: Mode of presentation.**

Clinical feature/ Mode of presentation	Frequency	Percent
NO	10	7.0
Abdominal pain	13	9.1
Altered sensorium	12	8.4
Cough	20	14.0
Fasciculation	1	0.7
Giddiness	10	7.0
Nasal bleed	1	0.7
Seizure	5	3.5
Tachypnea	17	11.9
Vomiting	54	37.8
Total	143	100.0

In this study 37.8% (n54) presented with vomiting commonly followed by cough 14% (n20%), tachypnea 11.9% (n17), abdominal pain 9.1% (n13), altered sensorium 8.4% (n12). 7% in asymptomatic and children presenting with giddiness. Least being seizure, nasal bleed and fasciculation respectively (Table 10).

Table 11 show The mean duration of hospital stay was 4.5 days. In this study, 60.8% of the children were being discharged within 3-5 days and 25.9% in 6-10 days, 12.6% in less than 3 days only 0.7% in more than 10 days

In this study 59% (n=41) of children were admitted in ICU and 41%(n=41) were not admitted in ICU. Out of 143 cases,

only 20%(n=28) were received specific antidote and 80% were received supportive treatment (Table 12).

In this study 95.1%(n=136) were discharged whereas 4.9% (n=7) died. Fatality is more (n=4) in male children than female (n=3) (Table 13).

**Table 11: Duration of hospital stay.**

Age	Duration of hospital stay								Total	Chi-square	p
	<3 days		3-5 days		6-10 days		>10 days				
	N	%	N	%	N	%	N	%			
<1 year			6	100					6		
1-3 years	14	16	48	55	24	28	1	1	87		
3-6 years	4	16	16	64	5	20			25		
6-12 years			17	68	8	32			25	10.20	0.335
Total	18	12.6	87	60.8	37	26	1	0.7	143		

**Table 12: Duration of ICU stay and antidote used.**

	No		Yes		Total
	N	%	N	%	
ICU stay	85	59	58	41	143
Specific antidote used	115	80	28	20	143

**Table 13: Outcome of this study.**

Sex	Outcome				Total	Chi-square	P
	Dead		Discharged				
	N	%	N	%			
Male	4	5	84	95	88	0.060	0.806
Female	3	5	52	95	55		
Total	7	4.9	136	95.1	143		

**DISCUSSION**

In this study authors are trying to give the data in poisoning cases admitted to our hospital over a period of 12 months. In the present study, 143 children with poisoning were admitted during the study period. In this study, the highest number of cases occur in the 1-3 years of age group (60.8%) followed by 3-6 years of age group (17.5%). In this study 6 cases were admitted less than one year of age group. Youngest case is nineteen days old. In 3-6 years, age group female predominant is more than male. Incidence of the poisoning highest in the 1-3 years age group Diane P et al, study.<sup>8</sup>

Children with age group of less than 5 years have been affected more in concordance with many literature reports. The high incidence of fewer than 5 years because of inherent inquisitiveness and higher oral exploratory activity aide by their newly acquired mobility and hand skills. The highest incidence of poisoning occurred in male children (61.5%) than female children (38.5%) and male to female ratio 1.6:1. This is similar to many studies found a male preponderance. Most of the case parents

belong to the lower-middle-class group (65.7%) according to a modified kuppusamy scale. probably due to less educational status, more number of family members, fewer storage spaces and overcrowding in these families. A similar study pattern was observed in a study done by Dutta AK et al.<sup>9</sup>

Among the type of poisoning most common is hydrocarbons, kerosene oil (30.1%) is the commonest agent involved. Is shows kerosene being the commonest household fuels used in lower-middle-class group families since it is kept in bottles on the floor in the kitchen, children’s easily drink those bottles as water or playing due to curiosity.<sup>10</sup> The third commonest agent involved is mineral spirit or thinner, usually mixed with paints for painting the houses. It also comes under the hydrocarbons group. Children accidentally were drinking it like water. This type of poisoning found in the children’s families involved in the building construction work. The next commonest poisoning agent is cow dung powder (7%) shared with pyrethrins. Cowdung powder commonly used in rural areas for mopping the floor in festival seasons. pyrethrins are found in mosquitoes repellents and liquids.

Oleander seed and oduvan leaf poisoning though common in the adult group, a significant number of cases also occurred in the adolescent age group. Households poisoning (11.2%) commonly encountered are naphthalene, camphor and rat killer paste and etc.<sup>11</sup> Drug constitutes (7%) of cases. In this study, the most common mode is accidental followed by suicide. Accidental poisoning is more common in 1-3 years age group with male predominance because most of the male child is more active and poor care given to the children by parents since they are going to works.

Most of the caregivers are grandparents and difficult to manage the children at home. Suicidal is the next common-mode due to immaturity, Fear of parents scolding them for poor school performance and family

dispute. Agents used for suicidal poisoning are OPC, oduvan leaf, cow dung powder and aluminum phosphide.<sup>12</sup> Male Children affected more than females involved in suicidal poisoning in other studies suicidal poisoning by drug ingestion being most common. In our study, the majority of the child received, without pre-referral treatment and 33.6% of children received pre-referral treatment in the form of atropine, gastric decontamination and Oxygen etc, at surrounding referral hospitals.<sup>13</sup> The mean duration of poisoning and presentation was 4.31 hours. The duration was shorter in the urban population compare to the rural population. This could be explained by the longer distance that these rural patients traveled to reach our hospital and also received initial treatment at a nearby hospital. In this study, the most common mode of presentation is vomiting (37.8%) followed by cough (14%). 11.9% of children presented with respiratory distress.<sup>14</sup> Among the 143 children, only 20% (n=28) them were received specific antidotes like atropine, Physostigmine, NAC, Vit K. When indicated and this observation was similar to previously done study by M Riordan G et al.

The majority of the patient required only shorter duration ICU stay compare to insecticide and pesticide poisoning cases. In this study, 95.1% (n=136) of children with poisoning were survived and discharged. The death occurred in 4.9% (n=7) cases.

The mortality of this study was similar to that seen in previous studies. The maximum number (n=5) of death occurred with insecticide group especially OPC followed by cow dung powder and kerosene oil with male predominance.<sup>15</sup> Outcome was poor in children admitted to hospital more than 6 hours of poison ingestion. According to the chi-square, the p-value is 58.73-is significant. If the child presented with an altered sensorium, the outcome will be guarded. The p-value of chi-square is 80.35-<0.001-which is significant. The number of deaths occurs in children with an ICU stay. Which is also significant (p=0.001) according to chi-square.<sup>16</sup>

## CONCLUSION

The majority of the accidental poisonings are preventable by means of simple preventive measures and reduce the significant mortality among childhood poisoning. The main cause of pediatric poisonings due to negligence and ignorance and this could be prevented by giving more attention at home.

At present lack of community-based childhood poisoning prevention program, simple preventive measures like education to the parents, proper storage, child proof container, proper placement of drugs could be preventing mortality and morbidity in children with poisoning.

## ACKNOWLEDGEMENTS

The author would like to thank the whole team at the PICU and Paediatrics Department's Clinical and Experimental Research Centre of Department of Pediatrics, Raja Muthiah medical & College and Hospital for helping with data collection and laboratory analyses for research work.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Aqeel M, Khan AM. Pattern and frequency of acute poisoning in children. *Pak J Med Sci.* 2009;25(3):51-4.
2. Arnold TC, Arnold T, Willis BH, Xiao F, Conrad SA, Carden DL. Aspiration of activated charcoal elicits an increase in lung microvascular permeability. *Journal of Toxicology: Clin Toxicol.* 1999 Jan 1;37(1):9-16.
3. Barceloux D, McGuigan M, Hartigan-Go K. American Academy of Clinical Toxicology, European Association of Poisons Centres and Clinical Toxicologists. Position statement: Cathartics. *J Toxicol Clin Toxicol.* 1997;35:743-52.
4. Bond GR. The role of activated charcoal and gastric emptying in gastrointestinal decontamination: a state-of-the-art review. *Ann Emerg Med.* 2002 Mar 1;39(3):273-86.
5. Brata Ghosh V, Jhamb U, Singhal R, Krishnan R. Common childhood poisonings and their outcome in a tertiary care center in Delhi. *Ind J Pediatr.* 2013 Jun 1;80(6):516-8.
6. Buckley NA, Buckley N, Whyte IM, O'Connell DL, Dawson AH. Activated charcoal reduces the need for N-acetylcysteine treatment after acetaminophen (paracetamol) overdose. *J Toxicol: Clin Toxicol.* 1999 Jan 1;37(6):753-7.
7. Chyka PA, Seger D. Position statement: single-dose activated charcoal. American Academy of Clinical Toxicology; European Association of Poisons Centres and Clinical Toxicologists. *J Toxicol Clin Toxicol.* 1997;35:721-41.
8. Calello DP, Osterhoudt KC, Henretig FM. New and novel antidotes in pediatrics. *Pediatr Emerg Care.* 2006 Jul 1;22(7):523-30.
9. Dutta AK, Seth A, Goyal PK, Aggarwal V, Mittal SK, Sharma R, et al. Poisoning in children: Indian scenario. *Ind J Pediatr.* 1998 May 1;65(3):365-70.
10. Jayashree M, Singhi S. Changing trends and predictors of outcome in patients with acute poisoning admitted to the intensive care. *J Trop Pediatr.* 2011 Oct 1;57(5):340-6.
11. Tucker JR. Indications for, techniques of, complications of, and efficacy of gastric lavage in

- the treatment of the poisoned child. *Curr Opin Pediatr*. 2000 Apr 1;12(2):163-5.
12. Kohli U, Kuttiaat VS, Lodha R, Kabra SK. Profile of childhood poisoning at a tertiary care centre in North India. *Ind J Pediatr*. 2008 Aug 1;75(8):791.
  13. Krenzelok EP, Heller MB. Effectiveness of commercially available aqueous activated charcoal products. *Annal Emerg Med*. 1987 Dec 1;16(12):1340-3.
  14. Liisanantti J, Kaukoranta P, Martikainen M, Ala-Kokko T. Aspiration pneumonia following severe self-poisoning. *Resuscitation*. 2003 Jan 1;56(1):49-53.
  15. Riordan M, Rylance G, Berry K. Poisoning in children 3: common medicines. *Archiv Dis Childhood*. 2002 Nov 1;87(5):400-2.
  16. Manzar N, Saad SM, Manzar B, Fatima SS. The study of etiological and demographic characteristics of acute household accidental poisoning in children -A consecutive case series study from Pakistan. *BMC Pediatr*. 2010;10:28.

**Cite this article as:** Ramamoorthy R, Madhubalan T, Chidambaranathan S. Prospective study of clinical profile and outcome of children presenting with poisoning. *Int J Contemp Pediatr* 2020;7:466-72.