

Study of Spectrum of Poisoning In Children Admitted In Pediatric Ward of a Tertiary Care Hospital

Seth Soutrik¹, SadhukhanSoumita², Islam Kamirul³, Datta AK³

^{1,3}(Resident, Department of Pediatrics, Burdwan Medical College, India)

²(Resident, Department of Medicine, Command Hospital(EC), India)

⁴(HOD, Department of Pediatrics, Burdwan Medical College, India)

Corresponding author: Seth Soutrik

Abstract: Accidental or intentional ingestion of a toxic agent is common in the pediatric population.² Poisoning is classified as external causes of morbidity and mortality as they are entirely dependent on the presence of an extrinsic environmental factor. Although the provision of a completely risk-free environment is not possible, children and young people should be protected from external causes of serious harm.¹ Acute poisoning in children is an important worldwide pediatric emergency. The exact incidence of childhood poisoning is not known in India due to under reporting and poor record keeping however reported incidence of childhood poisoning in various studies varies from 0.3% to 7.6%.³ This study is planned to gather clinico-epidemiological data regarding poisoning in children in rural tertiary care hospital, so as to create awareness and help to reduce the occurrence of poisoning, morbidity and mortality associated with it. This hospital based observational study was conducted in children aged 1-12 year admitted in paediatric emergency ward presented with accidental poisoning from any source between January 2016 to December 2016. A total of 231 children admitted with accidental poisoning were included in the study..

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I. Introduction

Children need a safe, healthy, and nurturing environment to achieve their full potential. Poisoning is classified as external causes of morbidity and mortality as they are entirely dependent on the presence of an extrinsic environmental factor. Although the provision of a completely risk-free environment is not possible, children and young people should be protected from external causes of serious harm.¹ Poisoning may occur with differing modes of exposure. Exposures may occur via ingestion, ocular exposure, topical exposure, envenomation, inhalation, and transplacental exposure. Poisoning that occurs in children less than 5 years of age is generally accidental and accounts for ~85%-90% of pediatric poisoning.⁶ Ingestions have a bimodal population distribution, with the first peak in those aged 1 to 5 years, typically associated with exploratory behaviours and ingestion of a single agent. The second peak occurs during adolescence, is associated with intent to produce altered mental state or intent to harm/suicidal intent, and often involves more than one agent. There is a male predominance within the younger age group, which reverses in the older population.² Reported incidence of childhood poisoning in India in various studies varies from 0.3% to 7.6%.³ Management is essentially supportive.⁴ Prevention of unintentional ingestions is of utmost importance in the primary care setting. Anticipatory guidance should be provided to families regarding safe storage of medications, household cleaners, and access to poison control.² Our study was planned to gather clinico-epidemiological data regarding poisoning in children in rural tertiary care hospital, so as to create awareness and help to reduce the occurrence of poisoning, morbidity and mortality associated with it.

II. Material And Methods

This hospital based observational study was carried out on children aged 1-12 yr admitted in Paediatric emergency ward of Burdwan Medical College & Hospital, Burdwan, West Bengal who presented with accidental poisoning from any source between January 2016 to December 2016. A total of 231 children admitted with accidental poisoning were included in the study

Study Design: Hospital based Observational study

Study Location: This was a tertiary care hospital based study done in Department of Paediatrics, Burdwan Medical College & Hospital, Burdwan, West Bengal.

Study Duration: January 2016 to December 2016 (12 months)

Sample size: 231 children

Sampling method :Complete enumeration method.

Study technique :All patients admitted in pediatric emergency ward, BMCH (except those falling under exclusion criteria)are considered in the study .Proper history of the suspected poisoning was taken in details , proper and thorough examination was done with particular emphasis on system involved.Investigation (blood and radiological) as and when required was done. Finally the outcome of each patient was noted.

Inclusion criteria:

1. Children aged 1-12 years presenting in paediatric emergency ward with accidental poisoning from any source (chemical or biological)

Exclusion criteria:

1. Children below 1 year
2. Cases of food poisoning and dog bites
3. H/O Allergic reaction to any chemicals or idiosyncratic reaction of any drug/ medication intended for treatment presenting as poisoning
4. Patients with no signs of life on admission
5. Children with chronic illness
6. Party not willing to participate .

Procedure methodology

After written informed consent was obtained, a well-designed questionnaire was used to collect the data.For all patient, different parameters on sociodemographic basis including age, gender, SE status by modified Kuppaswamy scale, types of poison, nature of poison, route of exposure, clinical presentation and examination findings, investigation done, events of mortality and the reasons for mortality was taken. Relevant investigation findings like chest X-Ray to diagnose chemical pneumonitis in kerosene poisoning , blood tests and urine examination to rule out complication of various poisonings like insecticides or snake envenomation was recorded and compiled under clinical presentations. Analysis of results was done by standard statistical methods.

III. Result

Table no 1:During study period a total of 324 children with acute poisoning were admitted to hospital, total Pediatric admission during the study period was 14695, poisoning contributed for 2.2 % of total admission. 231 cases of accidental poisoning (1.57 %) were included in analysis after excluding cases with food poisoning, toxic or idiosyncratic reaction to prescribed drugs, dog bites , suicidal , homicidal poisoning and other exclusion criterias.

Table no 1

Total Admission	Total Poisoning Cases	Accidental Posinong	Percentage Of Accidental Posinong
14695	324	231	1.57

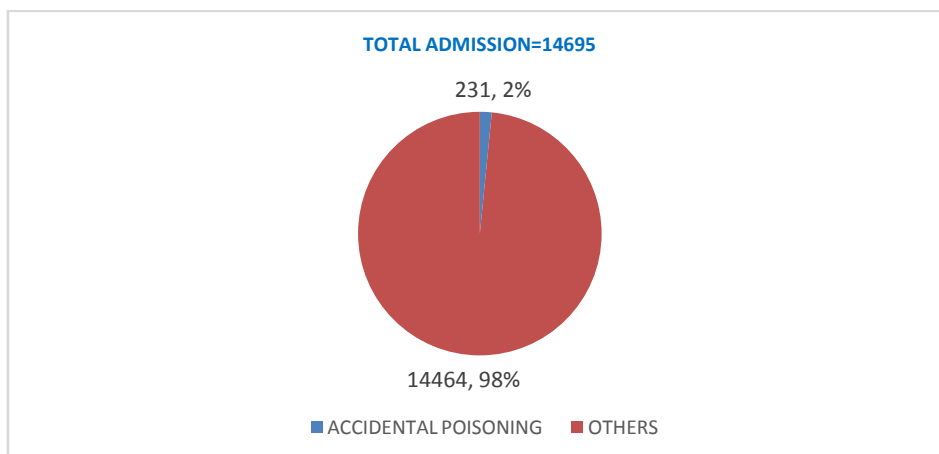


Table no 2:Out of 231 poisoning cases 135 were male (58.4%) , 96 were females , sex ratio in the study is 1.4 : 1 (Male: Female).

Table no2

Total	Male	Female
231	135	96

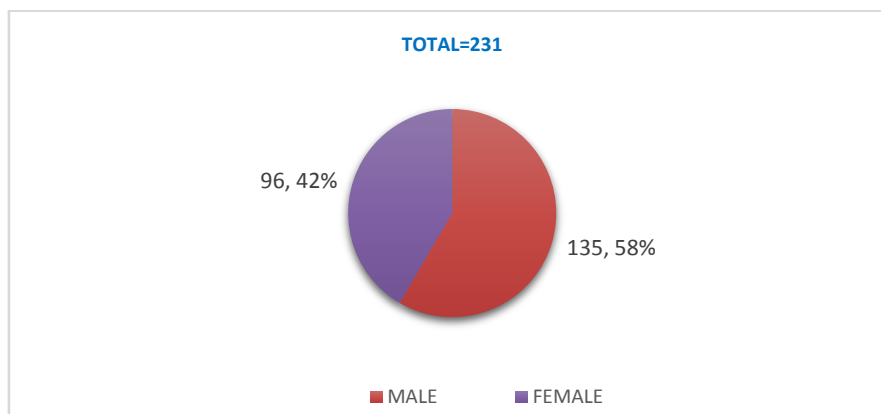


Table no3: Majority of the children with poisoning were from rural area (n= 153, 66.23 %) , urban residents were 78 in total i.e 33.76 %. Rural : Urban ratio – 1.9:1

Table no3

Total	Urban	Rural
231	78	153

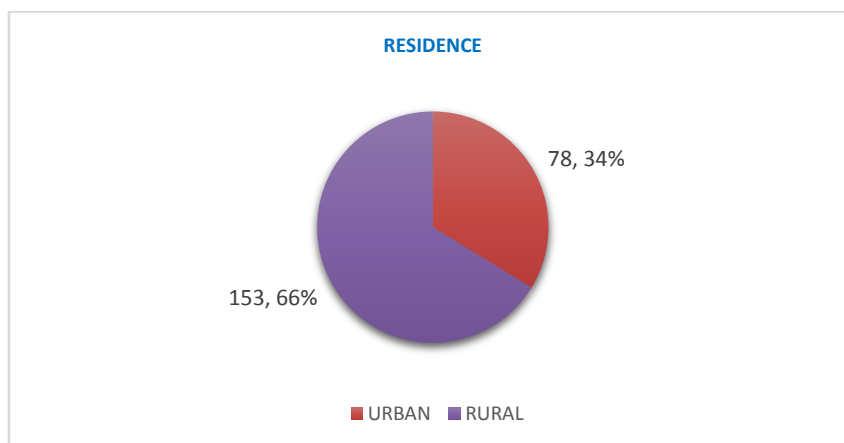


Table no4: 127 children (54.9 %) were of the age group 1yr -4 yr 11mo followed by 59 (25.6 %) children of age group 5yrs- 8 yr 11mo. Minimum age was 1 year and maximum was 12 year , Mean age being 5.1 ± 3.3 years.

Age Group (years)	Frequency	Male/Female	Rural/Urban	Percentage
1yr-4yr11mo	127	67/60	82/45	54.9
5yr-8yr11mo	59	41/18	39/20	25.6
9yr-12yr	45	27/18	32/13	19.5
Total	231	135/96	153/78	100

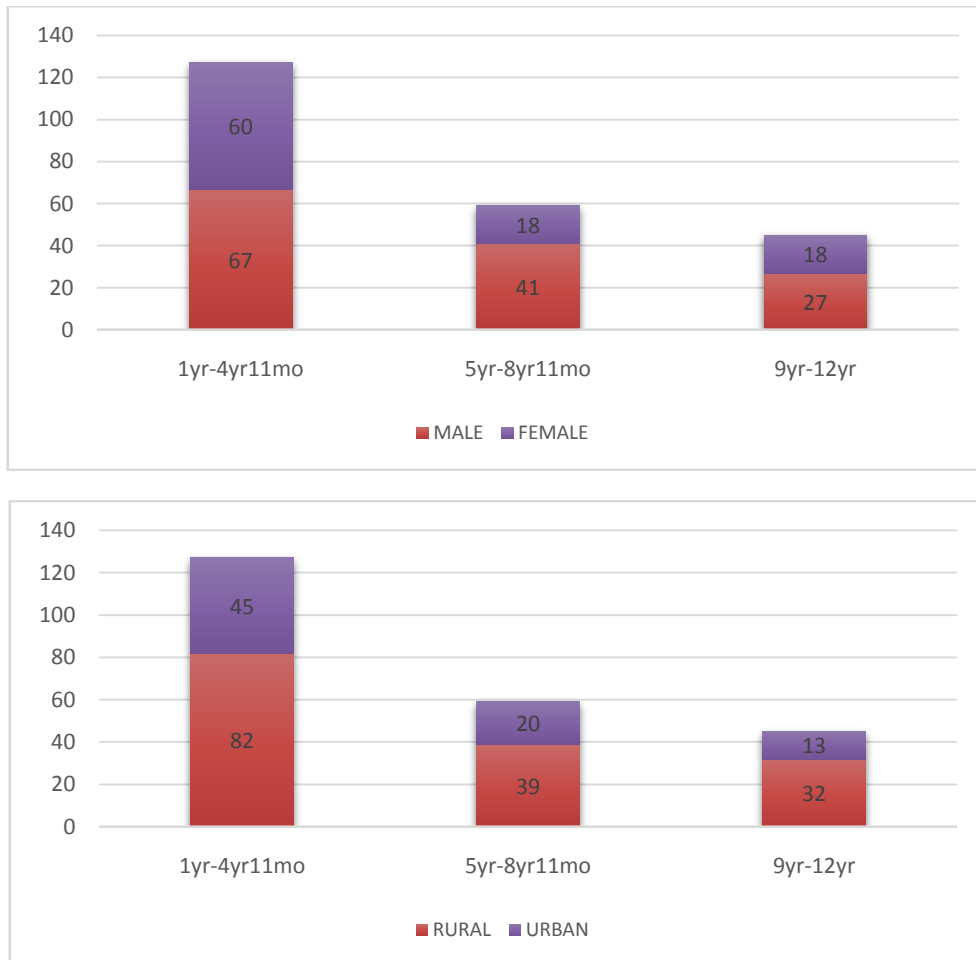


Table no 5: Out of 231 children , 109 (47.2%) belonged to families with SES - upper lower or Class IV while 62 (26.8%) belonged to lower middle SES or Class III

Table no 5

SES Class	Frequency	Percentage
UPPER (I)	1	0.5
UPPER MIDDLE (II)	14	6.1
LOWER MIDDLE (III)	62	26.8
UPPER LOWER (IV)	109	47.2
LOWER (V)	45	19.4
TOTAL	231	100

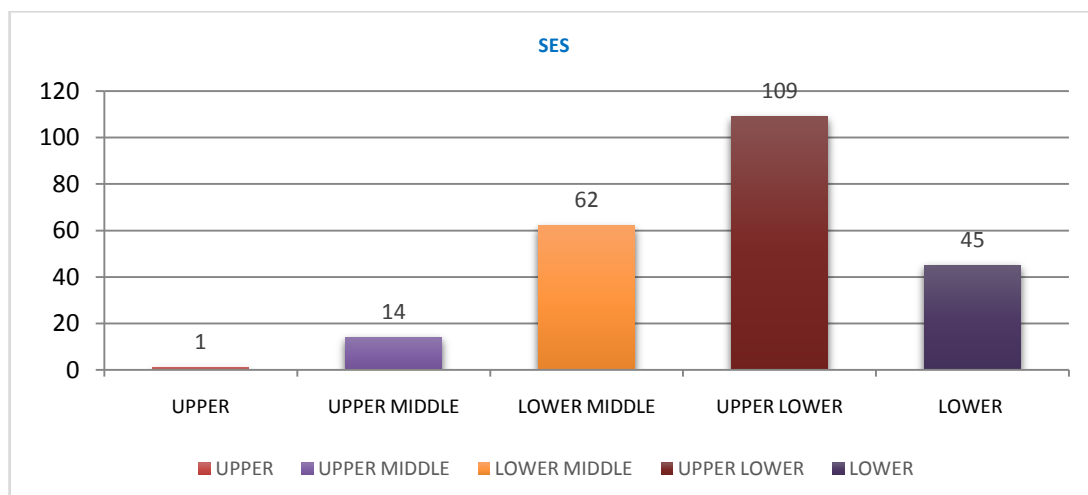


Table no 6: Seasonal variation – overall in Summer (February – May) was 114 cases (49.4%) , in Rainy season (June - September) was 68 cases (29.4%) and Winter (October – January) 49 cases (21.2%).

Table no 6

Season	Frequency	Percentage
Summer	114	49.4
Rainy	68	29.4
Winter	49	21.2
TOTAL	231	100

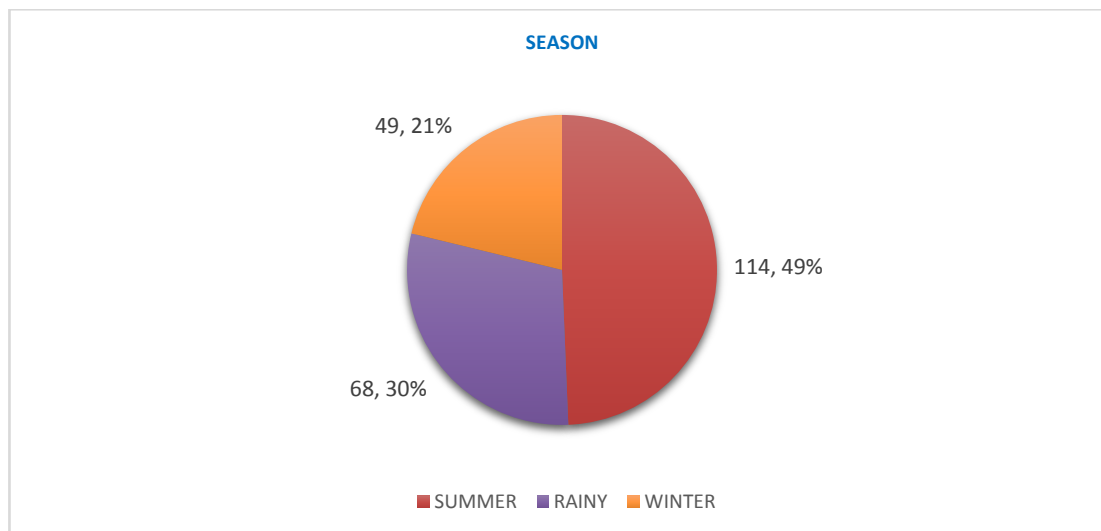


Table no 7: Most of the poisoning happened in the home environment (n= 189, 81.8%).

Table no 7

Place of poisoning	Frequency	Percentage
Indoor	189	81.8
Outdoor	42	18.2

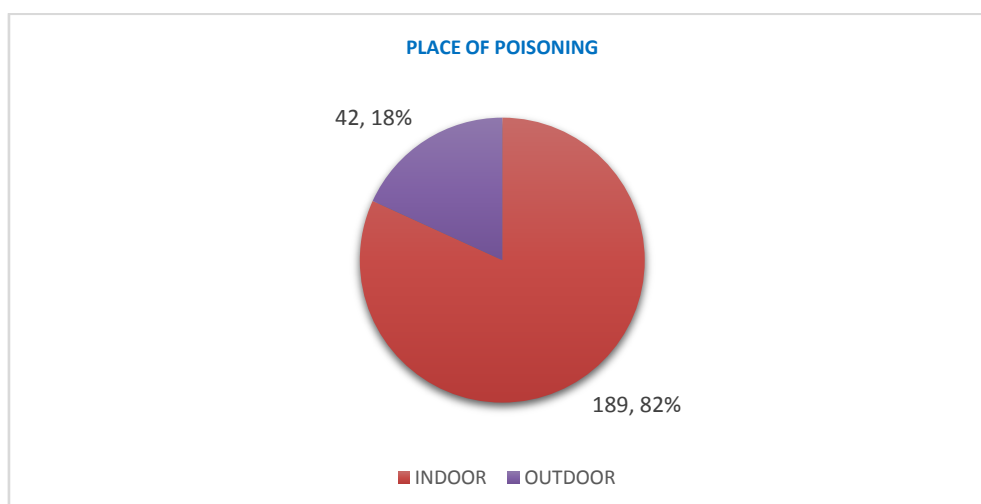


Table no 8: Toxic agent intake responsible for poisoning in most cases was by ingestion . (n= 192 , 83.2%)

Table no 8

Mode of poisoning	Frequency	Percentage
Ingestion	192	83.2
Parenteral	39	16.8

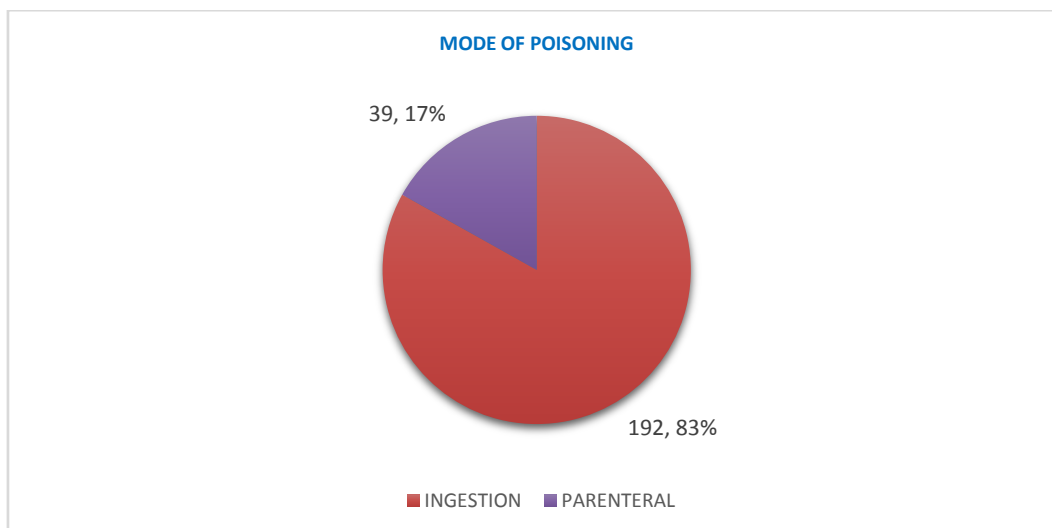


Table no 9: Regarding the type of agents involved volatile hydrocarbons (mostly kerosene and terpene) accounted for the highest proportion of poisonings (84 cases, 36.3%), followed by agricultural pesticides like organophosphates, organochlorines, carbamates (46 cases, 19.9%) and parenteral poisoning (bites and stings) (n=39, 16.8%) . Drugs like acetaminophen, sedatives (clonazepam), iron preparations, antihistaminics (cyproheptadine), and anticonvulsants (phenobarbitone) accounted for 26 cases,(i.e 11.2 %). Household insecticides and rodenticides like pyrethroids, zinc phosphide/rat poison (17 cases , 7.4%); vegetable poisons such as Datura, Lathyrussativus (n=10, 4.3 %); household items, cleaning agents e.g. phenyl, detergents, disinfectants (n=5, 2.1 %), and corrosives like hydrochloric, sulphuric and nitric acids , oxalic acid (n=4, 1.7%) were the other substances implicated.

Table no 9

Type of poison	Frequency	Percentage
Volatile hydrocarbons (kerosene/terpene)	84	36.3
Agricultural pesticides(OP/carbamates)	46	19.9
Parenteral poisonings(snake bites/stings)	39	16.8
Drugs	26	11.2
Household insecticides/rodenticides	17	7.4
Vegetable poisons(dhatura,lathyrus)	10	4.3
Household cleaning agents(phenol/detergents/soaps)	5	2.1
Corrosive agents(acids)	4	1.7
TOTAL	231	100

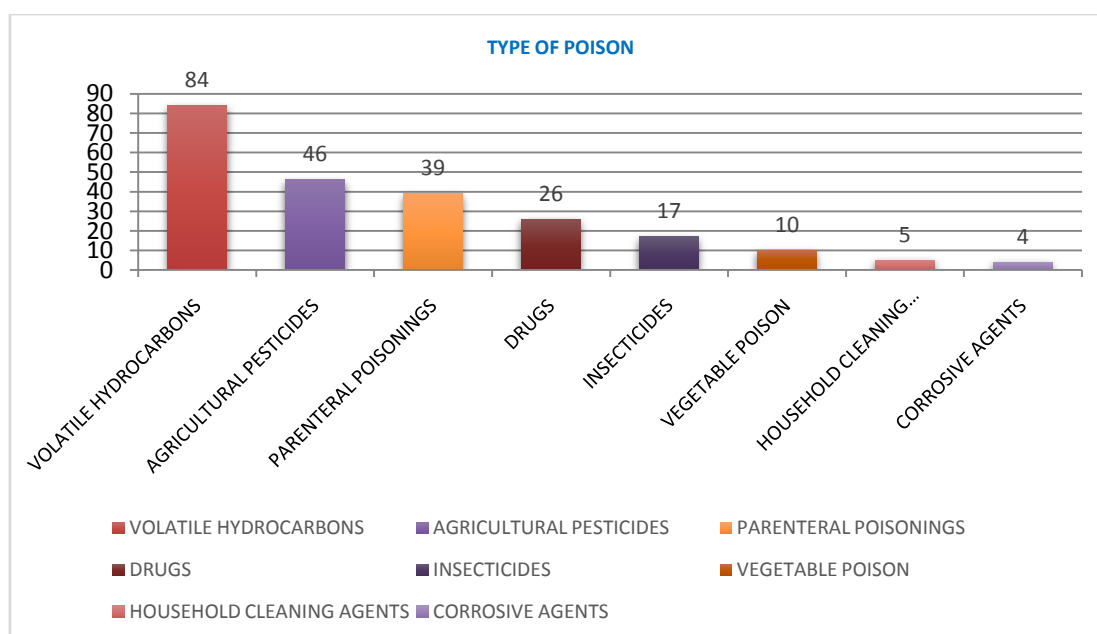


Table no 10: Signs and symptoms – most common symptoms were those of GI system (nausea , vomiting, abdominal pain , diarrhea) – 17.3% , CNS (seizure, altered sensorium) – 12.9% , RESPIRATORY (cough, respiratory distress, chest pain) – 9.95 % and CVS (circulatory failure and tachyarrhythmias) – 4.76% .

Table no 10

Type of poison	Asymptomatic	GI	CVS	CNS	RESP
Volatile hydrocarbons (kerosene/terpene)	48	13	0	3	20
Agricultural pesticides(OP/carbamates)	25	7	0	11	3
Parenteral poisonings(snake bites/stings)	22	0	8	9	0
Drugs	13	8	1	4	0
Household insecticides/rodenticides	11	5	0	1	0
Vegetable poisons(dhatura,lathyrus)	3	3	2	2	0
Household cleaning agents(phenol/detergents/soaps)	2	3	0	0	0
Corrosive agents(acids)	3	1	0	0	0
TOTAL	127	40	11	30	23

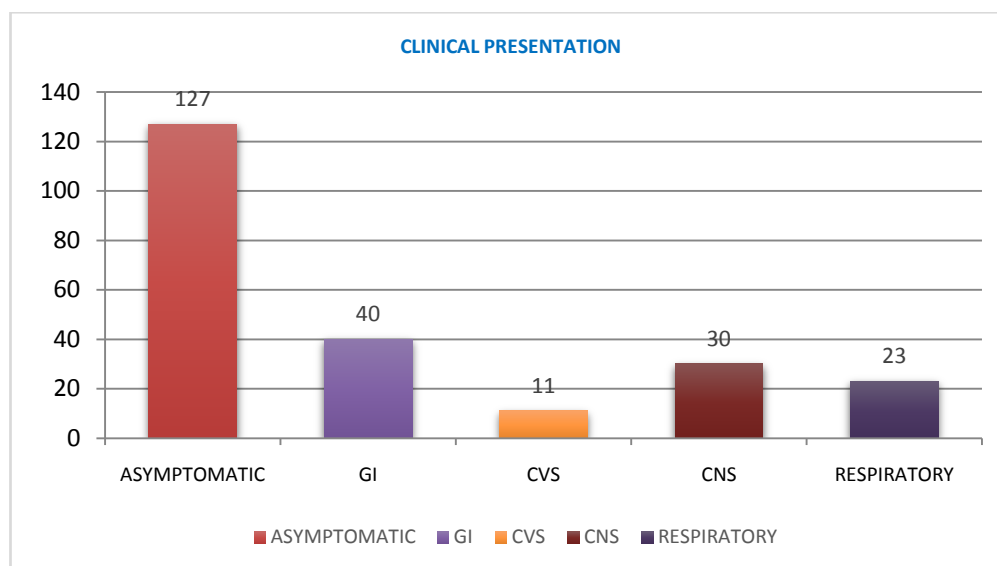


Table no 11: Number of patients who were asymptomatic on presentation was 127 (54.9%). But, they had history of exposure to poisonous agents, were kept under observation and discharged within 24 hours. Average duration of stay was 2.3 ± 2.1 days.

Table no 11

Duration of stay	Frequency	Percentage
<1 day	127	54.9
1-3 days	76	32.9
>3 days	28	12.2

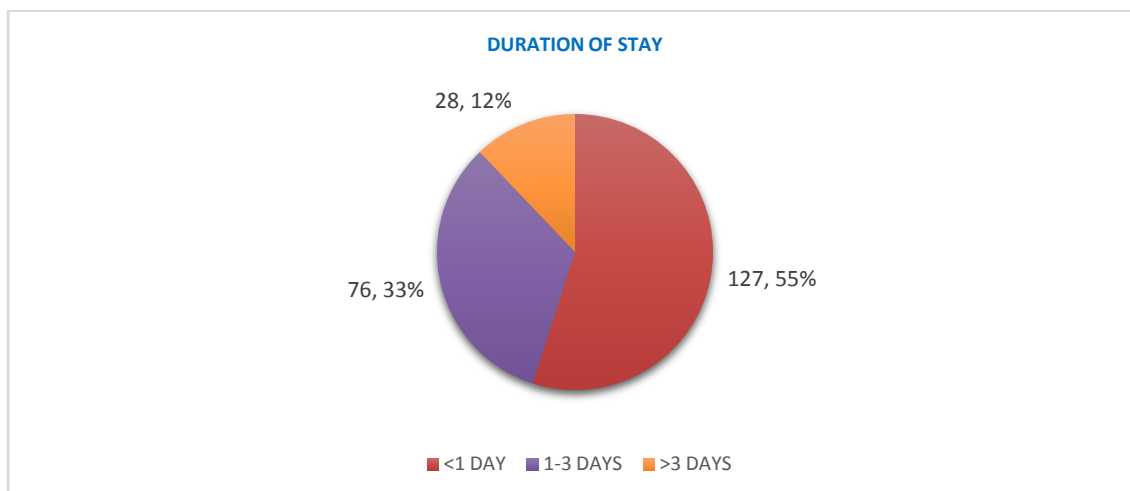


Table no 12: Overall survival rate noted in the present study is 91.8% (n=212) , 14 patients left against medical advice because of financial and domestic problems . 5 patients succumbed to death.

Table no 12

Outcome	Frequency	Percentage
Survived	212	91.8
Death	5	2.2
LAMA	14	6.0

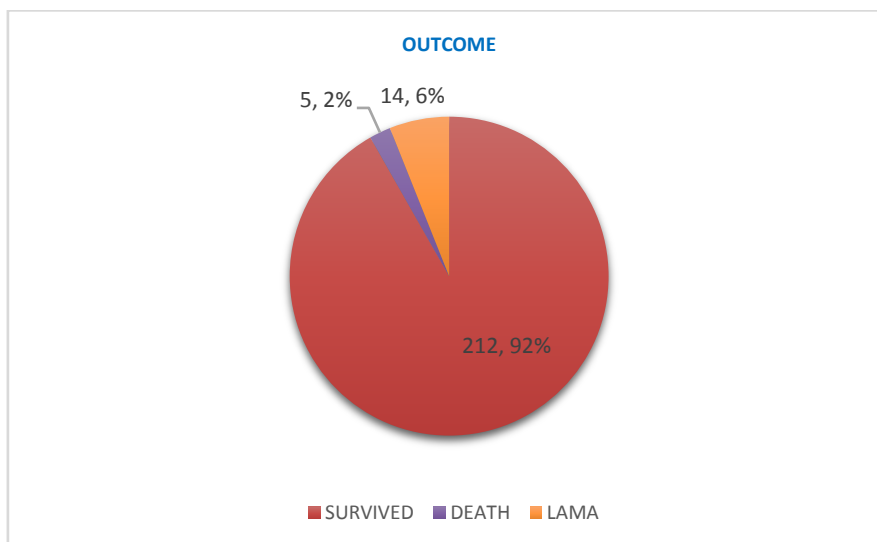
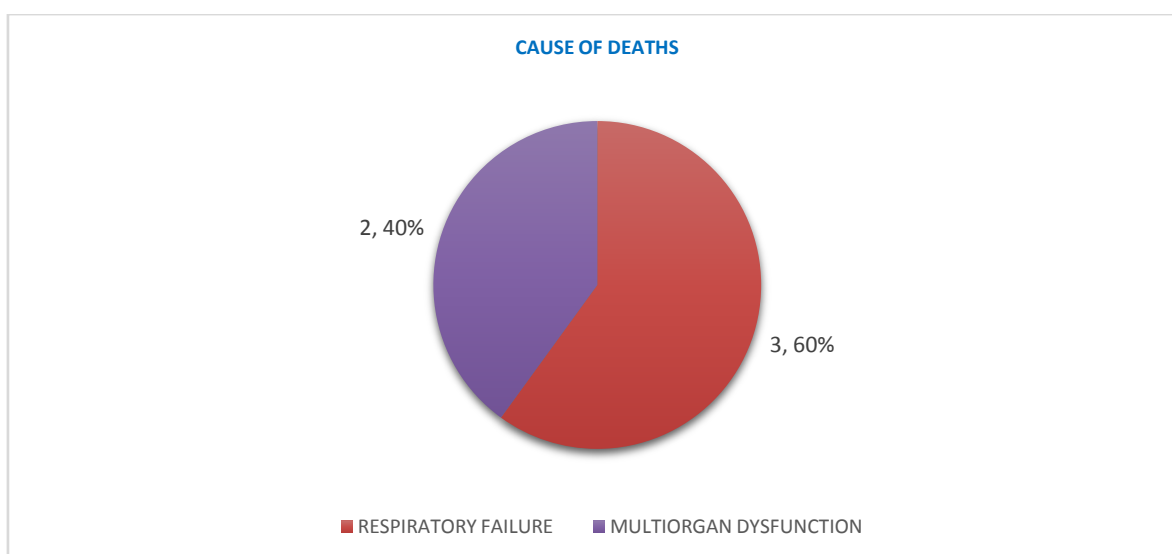


Table no 13: Out of 5 deaths , 3 – respiratory failure , 2 –multiorgan dysfunction. Main causes implicated were OP poisoning and hematotoxic and neurotoxic snakebites presenting late to hospital.

Table no 13

Deaths	Frequency	Percentage
Respiratory failure	3	60
Multiorgan dysfunction	2	40
Total	5	100



IV. Discussion

Children are curious and explore their world with all their senses, including taste. As a result, the home and its surroundings can be a dangerous place when poisonous substances are inadvertently ingested – every year hundreds of children are admitted to emergency departments. Poisoning patterns change according to age group, type of exposure and the nature and dose of the poison.⁷ The present study was done to know the profile and outcome of children admitted with accidental poisoning .

In our study out of total admissions in emergency pediatric ward , poisoning cases accounted for 2.2 % , accidental poisoning being 1.57% which is in range of reported incidence of childhood poisoning in India (0.3 to 7.6 %) ^{3,17,18} . Incidence of poisoning as reported in other studies include Sil et al 1.9% ¹⁵ , Mandal et al 1% incidence ¹⁷ , Sridhar PV et al. 5.667% ³ , Khadgawat et al 1.1% ¹⁴ , Dutta et al reported incidence at 8 centres between 0.23 – 3.3%. ¹⁶

Male preponderance was found which is similar to other studies which indicates exploratory nature of boys compared to girls . About two-third cases were from villages indicating that access to early adequate care is important in preventing complications .

In our study mean age of presentation was 5.1 ± 3.3 years. It was observed that maximum number of acute poisoning were in age group 1-4 years (54.9%), similar age distribution of admission is reported by study conducted by Kariyappa M et al. ¹⁹ , Budhathoki S et al. ²⁰ , Sridhar PV et al. ³ and Sil et al. ¹⁵ High incidence of poisoning in preschool children is a direct consequence of developmental stage of the child. As the infant starts to crawl, creep and then walk around one year of age, his human instinct leads him into exploring the environment and putting the objects into his mouth. By two and a half to three years of age the child's motor development makes himself vulnerable for exposure to potentially noxious things. Incidence of accidental poisoning decreases after four years of age as the child gets more selective in choosing objects for mouthing and ingestion. ¹⁷

Seasonal variation in patterns of poisoning definitely present with about 50% cases occurring in summer . Kumar V also reported high incidence in summer . ¹³

Time interval between occurrence of poisoning and hospitalisation played an important role in determining the final outcome and complications . Most cases from rural areas, because of lack of resources suffered more than urban residents. Signs of poisoning and therefore the hospital stay was prolonged in those cases. Average time to hospitalisation was 4.5 ± 2.1 hours. The socioeconomic status in majority of affected was upper lower class according to modified Kuppaswamy Scale . Similar study findings noted by Kumar V. ¹³ and Sridhar PV et al. ³

In most cases poisoning occurred in home environment by household items only .similar findings reported by Shashidhar V et al. ²¹ , Aggarwal et al. ²² and Sridhar PV et al. A large proportion of snakebites too occurred inside house .It is therefore necessary to keep noxious and poisoning substances in sealed places out of reach of children .Necessary action to be also taken against snakes and other harmful insects if found in and around homes .

About 80% cases of accidental poisoning were through ingestion of household items and drugs .Sil et al. and Mandal et al. also reported similar findings . ^{15,17}

Volatile hydrocarbons , agricultural pesticides and snake bites formed majority of the cases in order of frequency . similar findings noted in most of studies done on poisoning in Indian children .

Most of children were asymptomatic at presentation. Among symptomatic children most complained of nausea , vomiting, abdominal pain, cough, respiratory distress, seizure and altered sensorium. Sridhar PV et al. , Kumar V. , Mandal et al. ,Khadgawat et al. had similar findings. Aggarwal et al. reported more agricultural pesticide poisonings than hydrocarbons . ²²

Majority of cases were kept under observation for 24 hours and then discharged. Average duration of stay at hospital was 2.3 ± 2.1 days. Only 12% cases (n=28) required hospital stay longer than 3 days , 5 out of which had fatal outcome .

Mortality was 2.2% of which multiorgan dysfunction and respiratory failure were major causes. Some patients left against medical advice because of domestic and personal problems . Most of these cases presented late to hospital .

V. Conclusion

From the study following conclusions can be drawn :

1. Most of childhood poisonings are accidental and are preventable. Incidence more in boys than girls because of their curious nature and carelessness .
2. Majority of childhood poisonings occur below 5 years of age .
3. A definite seasonal variation present with maximum occurrence in summer season
4. Majority of the families belonged to modified Kuppaswamy SES class IV.
5. Most of the accidental poisonings occur in home environment and with household items
6. Most children are asymptomatic on presentation and require only observation
7. Earlier the presentation to health centres better was the prognosis.

Following suggestions are given

1. Educating the parents and creating awareness in them ,prevention of time waste with local, traditional faith-healers (ojhas).

2. Safe storage of poisonous substance palaces away from reach of children
3. Child proof packs usage
4. Avoiding storage of kerosene or other liquid poison compounds in empty water bottle or soft drink bottles
5. Basic health education during schooling .
6. Flow charts for emergency management and specific antidotes should be available at all health centres.
7. National programmes need to be implemented to counter the increasing morbidity and mortality associated .

As our study population is single hospital based , so multi-centred large scale studies are required in future for drawing more significant conclusion. More community based studies need to be done to find out the actual magnitude of the problem in different areas . In our study toxicological analysis was not done . It was also not possible to visit every child's home for proper advice .With increasing urbanization and rapid socioeconomic development in India, change in pediatric poisoning profile is expected and needs to be explored.

References

- [1]. Anderson M, Accidents And Poisoning. In: Lissauer T, Carroll W, editors. Illustrated Textbook Of Paediatrics 5thed, Europe , Elsevier ,1997. p.97-108
- [2]. Kristin S , Poisoning , In: Feld LG , Mahan JD ,editors. Succinct Paediatrics Evaluation And Management For Common And Critical Care , USA, AAP Publishing Staff, 2015.p. 655-667
- [3]. Sridhar PV, Sandeep M, Thammanna PS. Clinical profile and outcome of poisoning in pediatric age group at a tertiary care teaching hospital, Mandya, Karnataka, India. *Int J Contemp Pediatr*. 2016;3:514-7.
- [4]. Sachdev A, Pao M, Mani RK, Khilnani P, Poisoning and Bites, In: Khilnani P ,editor. Practical Approach to Pediatric Intensive Care , 2nded, New Delhi, Jaypee Brothers Medical Publishers (P) Ltd ,2009, p. 823-855
- [5]. Dart RC, Rumack BH, Wang GS, Poisoning ,In: Hay WW, Detering RR, editors. Current Diagnosis and Treatment Pediatrics , 23rd edition ,USA, McGraw-Hill Education, 2016 p. 331-359
- [6]. Nares MA, Cantwell GP, Weisman RS, Poisoning, In: Nichols DG, Shaffner DH, editors. Rogers Textbook Of Pediatric Intensive Care , 5th Ed ,USA,Wolters Kluwer,2016,p. 477-498
- [7]. Holder Y, Matzopoulos R, Smith N, Poisoning, In: Peden M, Oyegbite K, editors. World report on child injury prevention, Switzerland, World Health Organization, 2008, p. 123-142
- [8]. Singh UK, Poisoning In Children , 4th Edition , Haryana, Jaypee Brothers Medical Publishers (P) Ltd,1998. p.3-7
- [9]. Kennedy RM, Casey EE, Poisonings , In: White AJ,editor, Washington Manual of Pediatrics , 2nd Edition, USA, Wolters Kluwer, 2016. p.50-63
- [10]. Singh UK, Poisoning In Children , 4th Edition ,Haryana, Jaypee Brothers Medical Publishers (P) Ltd,1998. p.78-105
- [11]. Dulaurier M, Bowman MJ, Snakebite , In: Feld LG , Mahan JD ,editors. Succinct Paediatrics Evaluation And Management For Common And Critical Care , USA, AAP Publishing Staff, 2015.p.749-757
- [12]. Tibballs J, Winkel KD, Envenomation Syndromes , In: Nichols DG, Shaffner DH, editors. Rogers Textbook Of Pediatric Intensive Care , 5th Edition ,USA, Wolters Kluwer, 2016, p. 515-540
- [13]. Kumar V , Accidental Poisoning In South West Maharashtra , *Indian Paediatrics* ,1991 Jul,28:731-735
- [14]. Khadgawat R, Garg P, Bansal P, Arya A, Choudhary B, Accidental Poisoning , *Indian Paediatrics*,1994 Dec ,31:1555-1557
- [15]. Sil A, Ghosh TN, Bhattacharya S, Konar MC, Soren B, Nayek K., A Study on Clinico-Epidemiologic al Profile of Poisoning in Children in a Rural Tertiary Care Hospital. *J Nepal Paediatr Soc* 2016;36(2):105-109.
- [16]. Dutta AK, Seth A, Goyal PK, Aggarwal V, Mittal SK, Sharma R et al , Poisoning In Children : Indian Scenario , *Indian J Pediatr* 1998;65: 365-370
- [17]. Mandal A, Pal AC, Das PK, Dutta AK, Clinico-Epidemiological Profile of Poisoning In Children in a Rural Based Medical College and Hospital , *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* ,2016 Apr, Volume 15, Issue 4(XIV) : 50-55
- [18]. Singh S, Singhi S, Sood NK, Kumar L, Walia BS, Changing pattern of childhood poisoning (1970-1989): experience of a large north Indian hospital. *Indian Pediatr* 1995; 32: 331-6.
- [19]. Kariyappa M, Benakappa A, Kejjaiiah AK. Spectrum of Poisoning in Children: Study from Tertiary Care Hospital in South India. *Journal of Evidence based Medicine and Healthcare*. 2015;2(33):4989-99.
- [20]. Budhathoki S, Poudel P, Shah D, Bhatta NK, Dutta AK, Shah GS. Clinical profile and outcome of children presenting with poisoning or intoxication: a hospital based study. *Nepal Med Coll J*. 2009;11(3):170-5.
- [21]. Shashidhar V, Yogesh G. Profile of Pediatric Poisoning at District Hospital Gulbarga. *Int J Med Res Rev*. 2013;1(5):245-9.
- [22]. Aggarwal B, Rana SK, Chhavi N, Pattern of Poisoning in Children, an Experience From a Teaching Hospital in Northern India , *JK Science*,2014 Oct - Dec ,16(4): 174-178.
- [23]. Balasubramaniam S, Common Poisonings In Childhood, In: Parthasarathy A, Menon PSN, editors. IAP Textbook of Paediatrics , 5th Edition ,New Delhi, Jaypee Brothers Medical Publishers (P) Ltd,1999. p. 932-939 .
- [24]. Lyons R, Goldsmit JM, Kibel MA, Mills AE, Fleming PJ, Blair P , Accidents , Poisoning and SIDS, In: McIntosh N, Helms PJ, Smyth RL, Logan S, Forfar and Arneil's Textbook of Paediatrics , 7th Ed ,China, Elsevier,2008 p. 55-80.

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