Asian Journal of Epidemiology

ISSN 1992-1462

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Asian Journal of Epidemiology 5 (4): 123-129, 2012
ISSN 1992-1462 / DOI: 10.3923/aje.2012.123.129

Poisoning in Children from an Educationally and Economically Advanced Urban Area of South India

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ABSTRACT

Poisoning, a major cause of morbidity among children may be accidental or deliberate. This study was undertaken to assess the factors associated with poisoning in children in a south Indian city with high levels of education and health care facilities. The study included all children 18 years and below, admitted with poisoning during a four year period at the PSG institute of medical science and research, Coimbatore. The relevant data including the substance(s) consumed, time interval at presentation to the casualty, Poisoning Severity Score (PSS) and outcome were noted on a pre-designed questionnaire. There were 121 cases of poisoning, constituting 0.5% of total pediatric admissions. Among them, 86 (70.2%) children consumed poison for Deliberate Self Harm (DSH) and in 35 (29.8%) it was accidental. In 31 of the 35 children with accidental poisoning, easily available household items (drugs, insecticides, cleaning solutions) were responsible. The median age of children with accidental poisoning was 2 years, while in DSH it was 16 years. One third of children with DSH had an underlying psychiatric disorder. A majority (75%) of children were brought to hospital within six hours. The poison severity score was none or mild in 91 (75.2%), while 17 had moderate and 10 had severe poisoning. The overall mortality was only 2.5%. Poisoning is usually accidental in young children and its prevention requires educating the public regarding safe storage of drugs, pesticides, floor cleaners etc., In older children, DSH is the commonest reason for poisoning. All children with DSH should have a psychiatric evaluation. Most children with poisoning have low PSS and the prognosis is good.

Key words: Accidental poisoning, deliberate self harm, poisoning severity score, cow dung powder, organophosphorus compound, depressive disorder

INTRODUCTION

Poisoning is a major cause of morbidity among children all over the world. The reported incidence of childhood poisoning in India varies from 0.3 to 7.6% (Buhariwala and Sanjanwalla, 1969; Satpathy and Dass, 1979; Khadgawat *et al*., 1994; Dutta *et al*., 1998). Increased hospitalizations, Emergency Department (ED) visits and deaths have been reported among children in western countries due to accidental poisoning from drugs in the first decade of this century (Bond *et al*., 2012). While the profile of poisoning is influenced by the social, economic and cultural practices of the region, the outcome depends on the quality of medical facilities available. Coimbatore is among the better developed cities in south India, with high literacy rate and health indicators as well as advanced health care facilities. Poisoning in children may be accidental or deliberate self harm. While accidental poisoning is common among younger

children, deliberate self harm predominates in adolescents (Resch *et al.*, 2008; Hawton and Harriss, 2008; Das, 2007). Many studies from the developed countries show that common household products, rather than pharmaceuticals, are now implicated in the majority of pediatric poisoning (Lamireau *et al.*, 2002; Marchi *et al.*, 1998) and preventing these self-ingestions is an important pediatric patient safety issue (Schillie *et al.*, 2009). Deliberate Self Harm (DSH) is defined as an act with a non- fatal outcome in which an individual deliberately initiates behavior which causes bodily injury or ingests a substance in excess of the therapeutic dose or ingests a non-ingestible sub stance (Hawton *et al.*, 2002). It has been demonstrated that adult suicidal behavior is associated with unemployment and social deprivation. The association between self harm and social deprivation in young people is less clear (Ayton *et al.*, 2003). This study was undertaken to assess the various factors associated with poisoning in children and its outcome at PSG institute of medical science and research in urban Coimbatore.

MATERIALS AND METHODS

Study design and data collection: This was a prospective tertiary care hospital based study. All children 18 years and below, admitted between first August, 2007 and July 31, 2011 with poisoning were included in the study. Children with accidental solid foreign body ingestion, idiosyncratic drug reactions, poisonous bites and stings were excluded from the study. The duty pediatrician elicited the relevant details from the closest relative (in most instances, mother or grandmother) who was available. Age, sex, type and quantity of substance(s) consumed, time interval at presentation to the emergency department were noted on a pre-designed questionnaire. When possible, the substance was obtained from the family for confirmation. Clinical examination was carried by the pediatrician and the relevant investigations were done.

Patient management: Children were all managed as per the departmental protocol. Poisoning Severity Score (PSS) was calculated for all children (Persson *et al.*, 1998). Children with scores of 2 and above were managed in the ICU. All children with DSH had a consultation with a psychologist before discharge.

Statistical analysis: Information was filled in by the admitting pediatrician in a pre-prepared questionnaire. The data was subsequently entered into the computer and analyzed using SPSS 19.0 software. Chi-square test was used to compare the type of poisoning with age and with PSS p-value <0.05 was considered as statistically significant.

RESULTS

There were 25,688 children below 18 years admitted to the hospital during the study period. Of these, 121 (0.5%) were admitted with poisoning, with 73 (60.3%) girls and 48 (39.7%) boys. The age distribution of patients is given in Table 1. Among the 121 patients, 86 children consumed poison for deliberate self harm and in 35 it was accidental. The median age of children with DSH was 16 years, while in accidental poisoning it was 2 years. In 31 of the 35 children with accidental poisoning, easily available household items were responsible. In children below 6 years, accidental poisoning was common, while in the 6-12 years age group DSH was more common and the difference was statistically significant ($\chi^2 = 91.65$, $p<0.001$).

Table 1: Age distribution of children with poisoning

			Poison consumption	
Age (year)	No. of children	%	Deliberate self harm	Accidental
<2	21	17.4	Nil	21
2-6	6	5.0	Nil	6
6-12	9	7.4	5	4
12-18	85	70.2	81	4
Total	121	100.0	86	35

Table 2: Type of poison consumed

Poison consumed	No. of children (n = 121)	%
Yellow cow dung powder	31	25.6
Organophosphorus compound	18	15.0
Drugs	26	20.5
Neem oil	4	3.3
Plant derivative	4	3.3
Lysol	3	2.5
Good night	4	3.3
Kerosene	4	3.3
Camphor	3	2.5
BHC powder	5	4.1
Rat killer	5	4.1
Others[@]	14	11.6

[@]Propox, Ink, Cleaning solution, Kores whitener, Turpentine, Talcum powder, Bleaching powder, Endosulfan, Pipe fixing solution, Hair dye, Phenol, Harpic

The various agents responsible for poisoning are presented in Table 2. Yellow cow dung was the most common agent and accounted for 31 (25.68%) cases. Drugs were the second most common group with 25 (20.5%) cases and included oral hypoglycemics, anti-hypertensives, anti-epileptics, fluoxetine, cough syrup, NSAIDS and antibiotics. These were drugs which were available at home, being used either by the child or the parents and grandparents. Among insecticides, organophosphorus was the most common agent and accounted for 18 (14.9%) cases.

Most patients 95 (78%) presented to the emergency department within 6 h of ingestion. The three children, who were brought only after 24 h, were referred in after being treated at local hospitals. Median time of presentation to the pediatric emergency was 1 h. Among the presenting symptoms, vomiting was the most common symptom followed by pain abdomen, drowsiness and breathing difficulty. Some clinical features were specific to the ingested poison.

The majority of cases were discharged by five days. Seven children stayed in hospital for more than ten days. Of the 121 children, 109 (90.1%) recovered completely and three (2.5%) died. The distribution of cases according to the poisoning severity score is given in Table 3. The poison severity score was 0 or 1 in 91 patients and there were 3 fatalities. Among the children who died, one was a 1 year old who died from accidental neem oil overdose by the grandmother. Two deaths were from DS H-a 16 year old from rat killer poison and a 17 year old from cow dung powder. Nine (7.4%) had persisting medical problems after discharge (pneumonia, seizures, stress ulcer in stomach). One child with neem oil poisoning developed severe neurological sequelae with uncontrolled seizures. In low poisoning severity score (0, 1), 67 (73.6%) cases were DSH, where as in high PSS (2, 3, 4), 19 (63.3%) cases were DSH. The difference was not statistically

Table 3: Poison severity score in relation to the type of poisoning

Poison severity grades	Deliberate self harm group	Accidental poisoning group	Total
0	12	12	24
1	55	12	67
2	9	8	17
3	8	2	10
4	2	1	3
Total	86	35	121

Table 4: Reason for deliberate self harm

Reason	No. of children (n = 86)	%
Stress at school	19	22.0
Stress at home	27	31.3
Psychiatric	29	33.7
Impulsive behavior	3	3.4
Others	7	8.1
Total	86	100.0

significant ($\chi^2 = 1.163$, $p = 0.281$) DSH was the reason in 86 (70.2%) children, while in the rest were accidental. In 53% of patients, the reason for DSH was stress at school or home (Table 4). The commonest mode of DSH was ingestion of yellow cow dung powder (30.2% of DSH cases) which is a banned substance in Coimbatore. Among the 86 children who attempted DSH, 29 (34%), had an underlying psychiatric disease. Of these, 12 had depressive disorder, four had adjustment reaction, two had obsessive compulsive disorder and the remaining had evolving personality disorders. Seven of them had attempted DSH earlier, while two children made a repeat attempt after discharge from hospital. Most of them had chosen a different mode of DSH on repeat attempts. One adolescent aged 15 years had made four attempts, including trying to jump in front of a train. Three children had family history of suicidal deaths.

DISCUSSION

Poisoning is one of the common emergencies in pediatric practice. Published data show an incidence of 0.3-7.6% in various parts of India (Kohli *et al*., 2008). In the present study done in an urban tertiary care set up, the incidence was 0.5% of hospital admissions. The median age of children with accidental poisoning was only 2 years, compared to 16 years in DSH. Among children below 12 years, accidental poisoning was most common in our study. According to a recent study 36.6% of calls to the National Poisons Information Center were to report pediatric poisoning and the age distribution that was reported is similar to our study (Gupta *et al*., 2003). Of the 35 children with accidental poisoning, 21 were below two years of age. Poisonous liquids being stored in soft drinks bottle was responsible in six cases. Infants and toddlers being very curious and inquisitive, tend to put anything into their mouth, making them the most vulnerable group. In 31 of the 35 children, easily available household items were responsible. The possible reason is inappropriate or careless storage of these items, which then becomes easily accessible to children. Accidental poisoning is easily preventable with adequate parent education. In four children Neem oil, a commonly used household remedy had been accidentally administered by the caretaker in high doses.

Most studies show a male preponderance in childhood poisoning (Adejuyigbe *et al.*, 2002; Oguche *et al.*, 2007) except those from Ankara and Trinidad (Andiran and Sarikayalar, 2004; Pillai *et al.*, 2004). Our study showed no sex predilection in accidental poisoning while there was a female predominance in DSH.

On the poisoning severity score, a majority (91 of 121) had a score of 0 or 1, indicating none or minor poisoning, while only 13 children had a score of 3 or above. This is the reason for the hospital stay being less than 5 days in over 80% of the children as well as the mortality rate of only 2.5%. Among the 86 children with DSH, 81 were above 12 years of age. Two were ten years old and the other three were between 11 and 12 years of age. The median age of DSH by poisoning in our study was 16 years . The lifetime prevalence of DSH among adolescents was reported to be 18% in a school based study from Delhi (Krishnakumar *et al.*, 2011) and poisoning was the commonest mode (Sidhartha and Jena, 2006). The common psychiatric disorders noted in children with attempted DSH include mood disorder, conduct disorder, ADHD and substance abuse (Jacobson *et al.*, 2008). Nixon *et al.* (2008) found strong association between depressive mood symptoms, impulsive behavior and non suicidal self harm. Our study showed that in more than half the cases, the cause for DSH was acute or chronic stress at home or school. Around one-third of the children who attempted DSH by poisoning had an underlying psychiatric problem like depressive disorder, adjustment reaction, obsessive compulsive disorder and evolving personality disorders. Some of them were already on treatment and some were diagnosed after the parasuicidal behavior. The intention for suicide was found to be low in the self report survey done by Hawton *et al.* (2002) who also emphasizes the need for school based mental health initiatives and screening of the children at risk for such behavior.

About 30% of DSH in the present study were due to Yellow cow dung powder. This contains acridine orange and heavy metals which is mixed with liquid cow dung and used for decoration of floor in homes in this region as a religious practice. Since this is a locally prepared and used powder, it has not been reported from any previous study. It is interesting to note that this powder has been so widely used in DSH even in adults, that the district authorities banned the sale of this product in 2007. However it is still widely available and there was no trend of a decrease in the incidence of cow dung powder poisoning during the study period. This underscores the fact that banning such substances, without educating the public or tackling the fundamental cause of DSH will not succeed. Various studies conducted in India in the 90's had shown kerosene to be the most common agent responsible for accidental poisoning. More recent publications report easily available household items, drugs and pesticides as being responsible (Adejuyigbe *et al.*, 2002; Singh *et al.*, 1995). Drugs and organophosphorus compounds were the next most common agents in our study and together accounted for about 35% of cases. In Bangladesh household products and pesticides are common causes of poisoning (Bakar *et al.*, 1999).

The mortality rate in our study was 2.5%. Other studies from India have reported mortality rates of up to 11.6%. The low mortality in our study can be attributed to early hospital admission and availability of advanced critical care facilities. More than 75% of patients were brought to the emergency department within 6 hours of exposure to the poison, with 17% reaching the ER in less than one hour. A majority of those admitted after 12 h were those who had been admitted in local hospitals, stabilized and then referred in for intensive care.

This study shows that accidental poisoning in young children occurs from common household items and that it is common even in educated urban areas. Specific awareness campaigns on the need for safe storage of all household toxic chemicals and drugs may help reduce this problem.

Integrating poison prevention education into well baby and immunization clinics (Lall, 1998) and effective use of mass media are possible solutions. There is also a need to regulate over the counter sale of drugs and curtail easy availability of pesticides and toxic chemicals.

CONCLUSIONS

Our study shows that accidental poisoning is most common in young children, with a median age of 2 years. Sixty percent of all accidental poisoning occurs in children below 2 years of age and involves easily available household items like drugs, insecticides, cleaning solutions etc., This should be preventable by appropriate parental education. Poisoning for Deliberate self harm occurs in adolescents, with a median age of 16 years. Ninety four percent of DSH cases were above the age of 12 years. Stress at home or school (53.5%) and underlying psychiatric disorders (33.7%) were responsible in a majority. The poison severity score was low (0-1) in 75% of children. Early hospital admission (78% within 6 h) and low mortality (2.5%) was noted in this study and reflects the educational status of the community and the easy access to quality medical care.

RECOMMENDATIONS

Accidental poisoning is preventable by appropriate parent education. Since this is occurring in an educationally advanced urban area, specific and problem oriented educational programs may be required. DSH is very common in older children and a search for an underlying psychiatric disorder is mandatory in them. Early detection of risk taking behavior in adolescents may to some extent prevent DSH . In the current competitive era, the pressure for academic excellence places a lot of stress on the child that adds on to the risk taking/impulsive behavior. A regular counseling program for all high school children either by an in house trained faculty or a child psychologist may be a solution. Schools should have a helpline cell, which students can contact for help. This will help identify those who need special care and further evaluation.

ACKNOWLEDGMENT

Thanks to Prof. Anil C. Mathew, Department of Community Medicine, PSG IMS&R for his valuable comments to improve the presentation of the manuscript.

REFERENCES

Adejuyigbe, E.A., A.A. Onayade, I.O. Senbanjo and S.E. Oseni, 2002. Childhood poisoning at the Obafemi Awolowo University Teaching Hospital, Ile-Ife, Nigeria. Niger J. Med., 11: 183-186.

Andiran, N. and F. Sarikayalar, 2004. Pattern of acute poisonings in childhood in Ankara: What has changed in twenty years? Turk J. Pediatr., 46: 147-152.

Ayton, A., H. Rasool and D. Cottrell, 2003. Deliberate self-harm in children and adolescents: Association with social deprivation. Eur. Child Adolescent Psychiatry, 12: 303-307.

Bakar, M.A., S.M.M. Ahsan and P.K. Chowdhury, 1999. Acute poisoning-nature and outcome of treatment in a teaching hospital. Bang. Med. J., 32: 19-21.

Bond, G.R., R.W. Woodward and M. Ho, 2012. The growing impact of pediatric pharmaceutical poisoning. J. Pediatrics, 160: 265-270.

Buhariwala, R.J. and Sanjanwalla, 1969. Poisoning in children: A study of 303 cases. Indian Pediatr., 6: 141-145.

Das, R.K., 2007. Epidemiology of insecticide poisoining at A.I.I.M.S Emergency Services and role of its detection by gas liquid chromatography in diagnosis. Medico-Legal Update: Int. J., 7: 49-60.

Dutta, A.K., A. Seth, P.K. Goyal, V. Aggarwal and S.K. Mittal *et al.*, 1998. Poisoning in children: Indian scenario. Indian J. Pediatr., 65: 365-370.

Gupta S.K., S.S. Peshin, A. Srivastava and T. Kaleekal, 2003. A study of childhood poisoning at National Poisons Information Center, All India Institute of Medical Sciences, New Delhi. J. Occup. Health, 45: 191-196.

Hawton, K. and L. Harriss, 2008. Deliberate self-harm by under-15- year-olds: Characteristics, trends and outcome. J. Child Psychol. Psychiatry, 49: 441-448.

Hawton, K., K. Rodham, E. Evans and R. Weatherall, 2002. Deliberate self harm in adolescents: Self report survey in schools in England. Br. Med. J., 325: 1207-1211.

Jacobson, C.M., J.J. Muehlenkamp, A.L. Miller and J.B. Turner, 2008. Psychiatric impairment among adolescents engaging in different types of deliberate self-harm. J. Clin. Child Adolesc. Psychol., 37: 363-375.

Khadgawat, R., P. Garg, P. Bansal, A. Arya and B. Choudary, 1994. Accidental poisoning. Indian Pediatr., 31: 1555-1557.

Kohli, U., V.S. Kuttiat, R. Lodha and S.K. Kabra, 2008. Profile of childhood poisoning at a tertiary care centre in North India. Indian J. Pediatr., 75: 791-794.

Krishnakumar, P., M.G. Geetha and A. Riyaz, 2011. Deliberate self harm in children. Indian Pediatr., 48: 367-371.

Lall, S.B., 1998. Accidental pediatric poisoning-a preventable medical emergency. Indian J. Pediatr., 65: 363-364.

Lamireau, T., B. Llanas, A. Kennedy, M. Fayon, F. Penouil, J.C. Favarell-Garrigues and J.L. Demarquez, 2002. Epidemiology of poisoning in children: A 7-year survey in a paediatric emergency care unit. Eur. J. Emerg. Med., 9: 9-14.

Marchi, A.G., S. Renier, G. Messi and F. Barbone, 1998. Childhood poisoning: A population study in Trieste, Italy, 1975-1994. J. Clin. Epidemiol., 51: 687-695.

Nixon, M.K., P. Cloutier and S.M. Janson, 2008. Non suicidal self harm in youth: A population based survey. Can. Med. Assoc. J., 178: 306-312.

Oguche, S., D.N. Bukbuk and I.M. Watila, 2007. Pattern of hospital admissions of children with poisoning in the Sudano-Sahelian North eastern Nigeria. Niger. J. Clin. Pract., 10: 111-115.

Persson, H., G. Sjoberg, J. Haines and J.P. de Garbino, 1998. Poisoning severity score: Grading of acute poisoning. Clin. Toxicol., 36: 205-213.

Pillai, G.K., K. Boland, S. Jagdeo and K. Persad, 2004. Acute poisoning in children. Cases hospitalized during a three-year period in Trinidad. West Indian Med. J., 53: 50-54.

Resch, F., P. Parzer, R. Brunner and BELLA Study Group, 2008. Selfmutilation and suicidal behaviour in children and adolescents: Prevalence and psychosocial correlates: Results of the BELLA study. Eur. Child Adolesc. Psychiatry, 17: 92-98.

Satpathy, R. and B.B. Dass, 1979. Accidental poisoning in childhood. Indian Pediatr., 13: 190-192.

Schillie, S.F., N. Shehab, K.E. Thomas and D.S. Budnitz, 2009. Medication overdoses leading to emergency department visits among children. Am. J. Prev. Med., 37: 181-187.

Sidhartha, T. and S. Jena, 2006. Suicidal behaviors in adolescents. Indian J. Pediatr., 73: 783-788.

Singh, S., S. Singhi, N.K. Sood, L. Kumar and B.N. Walia, 1995. Changing pattern of childhood poisoning (1970-1989): Experience of a large north Indian hospital. Indian Pediatr., 32: 333-336.