Trends in paediatric poisoning in Anuradhapura District: a tertiary care center experience.

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Abstract

Evidence on paediatric poisoning which is preventable has been lacking in Anuradhapura District of Sri Lanka. This prospective study identifies the trends in poisoning including the demographic profiles, risk factors, complications, and the outcome of acute poisoning among children residing in Anuradhapura District.

All children presented acutely with either accidental or deliberate poisoning to all paediatric casualties at Anuradhapura teaching hospital were included in the study and, were assessed prospectively using clinical interviews, focused group discussions, clinical observations and bed head ticket based records over a period of eight months from March 2012.

Among 167 children 53% were male and 91% were below six years of age. Accidental poisoning was predominantly observed (97%) and commonest poison was kerosene oil (24.9%). Risk factor analysis revealed inadequate supervision by parents (87.5%) as the commonest

risk factor. Poor storage of household chemicals (52%) and medicines (40%) were commoner among other risk factors.

Children become victims of acute poisoning mostly secondary to inadequate supervision by their parents and unsafe storage of poisons. As poor storage of medicines, household chemicals are increasingly associated with accidental poisoning, community education and safe storage will reduce the incidence of paediatric poisoning.

Keywords: Childhood poisoning, Patterns and risk factors, Prevention

Introduction

Acute poisoning in children is a major preventable cause of morbidity and mortality. It is a world-wide problem although the nature of poison consumed may vary in developed and developing countries due to variable accessibility. According to WHO, mortality due to acute poisoning in children up to 4 years of age varies between 0.3 to 7 per 100,000 populations in different countries of the world[i].(World Health Statistics Annual,1988).

With changes in the socio-economic environment in many countries, the importance of childhood accidents has been highlighted even at the global level and poisoning is considered to be an important subgroup within the overall group of accidents[ii]. (Hatton F, Tiret L, Nicand

V,1986) Poisoning and suspected poisoning in childhood are common and represent over half the cases referred to poison information services in some countries[iii]. (Henry J, Volans G,1984)

Anuradhapura District forms the major part of North-Central province of Sri Lanka and is a key agricultural contributor to the country's economy[iv] (Annual Health Bulletin, 2006) The district comprises of many rural territories with both grassy and forestry lands spread across the villages and the climate is dry over a major part of the year. Pertaining to these circumstances poisoning due to agro-pesticides, weedicides, and ingestion of poisonous plants are commoner in these geographical areas compared to other parts of the country. Weerasuriya et al. in their paper on "Pesticide poisoning in Sri Lanka" stated that Anuradhapura district was among the top five districts found to have the highest incidence of pesticide poisoning. Accidental poisoning is also high due to incorrect handling of pesticides and lack of storage of these chemicals[v]. In addition to these reasons many farming parents in the rural territories of the province also engage their children in the field work and agriculture has been interwoven with the majority's lives. Increased agrochemical use, lack of use of personal protective equipment, children helping in farming after returning from the school may make children more susceptible to poisoning by agrochemicals. Increased presence of both identified and unidentified poisonous plants due to low forest clearance also characterize the same region keeping

children at risk for accidental plant poisoning. Therefore, Anuradhapura District which has not been studied for this purpose and with its unique geographical and climacteric characteristics and different population characteristics may have different results to previously published Sri Lankan studies.

Up to date there has been no evidence from either prospective or retrospective studies regarding the patient profile, risk factors or outcome of paediatric acute poisoning victims in Anuradhapura district.

Objectives

1. To describe the patterns of acute paediatric poisoning Anuradhapura District.
2. To describe the effect of demographic factors in the causation of paediatric poisoning.
3. To identify areas (MOH/PHM divisions) which are at a higher risk for acute paediatric poisoning.
4. To analyse complications and outcomes of poisoning in children.
5. To identify risk factors for paediatric poisoning.

6. To analyse causes for delayed patient presentation to the hospital.

Method

All children presented acutely with either accidental or deliberate poisoning to all paediatric casualties at Anuradhapura teaching hospital were included in the study and, were assessed prospectively using clinical interviews, focused group discussions, and bed head ticket based records over a period of eight months from March 2012 to November 2012.

Data were collected by principal investigator himself using an interviewer administer, pretested, structured, data collection sheet (DCS). Part 1 of DCS explored the demographic profile of the children and respective Medical officer of health (MOH) and Public health Midwife (PHM) divisions to map them based on health sector related residential location.

Part 2 of DCS was designed to assimilate information regarding the nature of poisoning, the quantity and the type of poison ingested. Summaries of management following the hospital admissions were on a case by case basis to analyze issues such as special diagnostic and therapeutic interventions, medical induction of emesis, ICU admissions and management at ICU, prescription of antidotes and management of poisoning related complications.

Part 3 of DCS assessed morbidity and mortality characteristics including specific outcomes of poisoning among children such as complications, deaths, transfer to more specialized hospital outside the province for further management and discharge from the hospital following clinical improvement. Factors conductive to delayed patient presentations were also identified in the same questionnaire. "Delayed patient presentation" was defined for the study as a delay in patient's presentation to the emergency center that the fact itself altered subsequent management including decontamination as decided by the consultant paediatricians of respective casualty wards.

Part 4 of DCS was organized to identify the possible risk factors for paediatric poisoning in the North Central province. A proposed list of 24 risk factors based on extensive search of medical literature was included in this section and was used quantify relative prevalence of each of those risk factors.

Results

Among 167 children 88 (52.7%) were male and 152 (91%) were below six years of age. Majority of children were aged between 2-4 years and only 2.4% were aged more than 10 years. The following table depicts the age distribution of the study sample.

Table 1: Age wise breakdown of the study sample.

Age category	Number of children	Percentage (%)
<2 years	41	24.6
2-4 years	98	59.7
4-6 years	13	14.3
>6 years	15	2.4

Children were distributed among seventeen "Medical Officer of Health (MOH)" divisions with majority residing in Anuradhapura MOH (35.7%), followed by Nochchiyagama MOH (7.4%), Rajanganaya MOH (6.6%) and Madawachchiya MOH (6%). Twelve percent had been residing in Anuradhapura PHM area. 51.3% of fathers were educated at least up to ordinary level, but 1.8% had not been even to the primary school. Majority of them belonged to farming community (25.1%) and other common employments included manual labour (15.8), state defense service (14.6%), and local trade (13.8%). Seventy four percent of mothers had received secondary education; however 2.4% had not received any education. Seventy five percent of mothers had been staying at home looking after their children. 91.6% were Sinhalese and 89.8% were Buddhists.

Accidental poisoning was predominantly observed (97%) and only 5 cases of deliberate poisoning were reported. All 5 cases were associated

with non-lethal poisoning and subsequently no death was reported. All cases were poisoned by ingestion.

Commonest group of poisons ingested had been household poisons and it was followed by medicines, poisonous plants and agrochemical poisons. The following table describes the distribution of the types of poisonous substances in the studied sample.

Table 2: Distribution of the types of poisonous substances in the study sample

Type of poison	Number of children	Percentage (%)
1. Household poisons	52	31.1
2. Medicinal poisons	44	26.3
3. Plant poisons	36	21.6
4. Agrochemical poisons	13	7.9
5. Miscellaneous poisons	22	13.1

Poison ingestion had occurred in home garden in 27.5% and among these poisoning plants had been a common culprit. Twenty one percent of poisoning occurred in the living area of house and they were commonly secondary to ingestion of drugs. Importantly there were 8 cases of inappropriate dosing by parents and 2 cases of erroneous high dose prescriptions by general practitioners. Kitchen area of the house had been the location for 20% of poisoning and of which kerosene oil had been the commonest culprit.

Among the 56 poisons reported kerosene oil had been the commonest poison (24.9%). Other commonly observed poisons include Weta Endaru (*Jatropha circus*) (10.2%), paracetomol (7%), and Olinda (*Abrus precatorius*) (6%). Twenty seven percent had practiced 'first aid measures' at home following ingestion to induce vomiting. These measures included serving of water (10.2%), coconut water (9.4%), milk or soap water (3%), and insertion of finger in mouth (3%). All these measures are not scientifically proven and could be associated with hazardous events such as aspiration. Two cases were reported as having aspiration pneumonia secondary to inappropriate water ingestion to induce vomiting following kerosene oil poisoning.

Reasons for delayed medical care included lack of transport (14%) and knowledge (12%), lack of concern regarding urgency (12%) and financial problems (8%). No case was reported with a delay in management secondary to delayed attention by the medical team. 62.9%

of cases were transferred patients from peripheral hospitals for specialized management. They were transferred mainly from Madawachchiya (15 cases), Nochchiyagama (10 cases), Rajanganaya (9 cases) and Padaviya peripheral hospitals (8 cases).

Commonly observed complications included chemical pneumonitis (9 cases), acute liver injury (3 cases) and convulsions (3 cases). Chemical pneumonitis was usually secondary to hydrocarbon poisoning such as kerosene oil, diesel or petrol ingestion. Acute liver injury was observed in children with paracetomol poisoning. Siezures were secondary to Olinda poisoning and electrolyte imbalances. Other reported complications were severe dehydration, bradycardia, acute dystonic reactions and metabolic acidosis.

Table 3: Prevalence of risk factors among the studied population for paediatric poisoning

Risk Factor	Number of children (n=167)	Percentage (%)
1. Inadequate supervision by parents	146	87.5
2. Poor storage of household	87	52

chemicals		
3. Poor storage of medicines	67	40
4. Lack of extended family support	63	37.7
5.Inadequate housing space and storage facilities	62	37
6. Presence of poisonous plants in neighborhood	53	31.7
7. Poor maternal education	39	23.3
8. Unsafe handling of agrochemical poisons	23	13.8
9. Past history of poisoning	13	7.8

Discussion

Literature has shown that boys are more likely to be poisoned compared to girls[vi]. (Wiseman HM, Guest K, Murray VSG, Volans, GN,1987) However, in the current study we observed 53% to be male compared to

47% for being female and the difference was not statistically significant.

Many studies from the developing and developed countries show that common household products, rather than pharmaceuticals, are now implicated in the majority of pediatric poisonings[vii] (Lamireau T, Llanas B, Kennedy A, Fayon M, Penouil F, Favarell-Garrigues JC *et al*, 2008, (Marchi AG, Renier S, Messi G, Barbone F,1998) We observed kerosene oil, a commonly used household energy source specially among the rural communities as the commonest culprit. We also observed a similar, though to a lesser degree, contribution from medicinal drugs to cause acute childhood poisoning and incidence is higher compared to reported incidence in developed countries[9]. (Lawson GR, Craft AW, Jackson RH, 1983) Decrease in cases of pediatric poisoning related to drugs and pharmaceuticals in developed countries is due to introduction of child proof packs and bottles[viii] (Lawson GR, Craft AW, Jackson RH (1983) Changing Pattern of poisoning in children in Newcastle, 1974-81. *BMJ* 1983; 287 : 15-17.) a measure which is yet to be implemented in many developing countries including Sri Lanka. Poisoning has never been a very significant cause of death in childhood[ix](Jackson RH,1983) The low mortality in childhood poisoning was also highlighted in a study where out of 1,500 cases, with only 12 deaths being reported (CFR = 0.8%)[x]. (Lucas GN,1994) .

In the current study, we did not observe any deaths following severe poisoning and observed complications were similar to other studies in literature[11](Lucas GN,1994)

Morbidity due plant poisons is rare as the child eats only a few leaves or seeds owing to curiosity, and spitting or involuntarily vomiting out the contents as soon as he or she feels the funny and irritant feeling in the mouth[xi] (Wee Y C, Gopalakrishnakone P. A,1990) Plant poisons are found to be ten percent contributory to total incidence of paediatric poisoning in a study conducted at Lady Ridgeway Hospital, Colombo[xii] (Lucas GN,2006) which has been the largest study conducted in our country on acute paediatric poisoning[xiii]. (Lucas GN,2009) However, due to increased presence of poisonous plants specially in rural territories of Sri Lanka this finding may not be consistently observed in all areas of the country and we observed 21.7% of acute poisoning secondary to ingestion of poisonous plants. Kerosene oil was the commonest household product ingested in the aforementioned study and was the leading cause of poisoning in Sri Lankan children, accounting for 36% of the total. This finding was consistent in other Sri Lankan studies[9,xiv] (Lawson GR, Craft AW, Jackson RH,1983) Seneviratne B, Thambipillai S,1974) in a including our study.

Patterns of poisoning and as well as subsequent outcome are always related to the underlying socio-cultural circumstances. Observation of

scientifically unproven yet culturally based first aid practices by some parents as observed in this study can be associated with detrimental effects. Therefore providing knowledge to at risk communities regarding such issues is helpful in bringing down childhood poisoning related morbidity and mortality.

The only measure, shown to reduce the incidence of childhood poisoning in Sri Lanka, is the use of child-resistant containers[14] (Lucas GN,2009) Lucas et al(2009). had highlighted that lack of adult supervision together with careless storage and disposal of toxic substances as the chief factors responsible for accidental poisoning[14] We in addition to these risk factors identified presence of poisonous plants in neighborhood, poor maternal education level and lack of family support also as major risk factors leading to acute childhood poisoning.

Studies have reported that children who are poisoned are more likely to belong to families with few social resources[16].(Mintegi S, Fernández A, Alustiza J, Canduela V, Mongil I, Caubet I, et al,2006)

In our study we found that 49% of families of whom the children were poisoned had poor extended family support and scarce social resources. So acute poisoning in children seems to be rooted from a multitude of risk factors which spans from inadequate supervision, poor storage to unsafe environmental conditions and to adverse social circumstances. In

this background awareness of care takers with regard to modifiable risk factors such as safe storage of medicinal drugs, agrochemicals, and household chemicals, assurance of safe environment thus reducing access to poisonous plants, strengthening of parental knowledge with regard to gravity of the problem may bring down the incidence of acute poisoning among children residing in North Central province and the effectiveness of such interventions should further be evaluated.

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