ORIGINAL ARTICLE

Mothers' education and working status; do they contribute to corrosive poisoning among paediatric patients of Karachi, Pakistan?

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Abstract

Objectives: To determine the causative factors behind corrosive poisoning in children like effect of working mothers, their educational status, financial background, family size and number of siblings.

Methods: The multi-centre, prospective, case series of all paediatric patients presenting to the Emergency Department of the National Institute of Child Health and the Aga Khan University Hospital, Karachi from August 2008 to July 2009 is presented. It comprised all paediatric patients with a history of corrosive poisoning at the two hospitals. SPSS 20 was used for statistical analysis.

Results: Out of 105 cases, 56(53%) related to the private-sector Aga Khan University Hospital, and 49(47%) to the public-sector National Institute of Child Health. Of the total, 82(78%) were in 1-5 age group; 61 (58%) were males; and 44(42%) were females. While 59 (56.2%) mothers were educated, only 21 (20%) were working. Of the 46 (43.8%) non-educated mothers, 20 (19%) were working. The type of poison was alkali in 81(77%) cases, acid in 23(22%). The corrosive varied from liquid in 80(76%) cases to powder/gel/semi-solid form in 25(24%) exposures. Besides, 65 (61.9%) families had 3 or more siblings, and the age of siblings was less than 10 in 60 (57.14%) cases, In 34 (32.38%) cases, the chemical were kept in the original container, while in 71 (67.61%) cases other commonly used and familiar containers were used to store these chemicals. Kitchen was the most common place with 51 (48.57%) cases. The time of incident was afternoon in 51(48.57%) cases. Majority cases (n=23; 21.9%) occurred in October.

Conclusion: There are multiple contributory factors in corrosive exposure among children rather than the mother's working status and her educational background.

Keywords: Corrosive poisoning, Working mothers, Paediatric, Karachi. (JPMA 63: 992; 2013)

Introduction

The World Health Organisation (WHO) estimated that 0.3 million people die due to various poisoning agents every year.[1] Thousands of children less than 5 years of age accidently poisoned themselves worldwide, mainly due to their inventive and exploratory nature and the tendency to take everything in the mouth.[2] According to data of calls from US poison control centres, more than a million children under 5 experience poisonous ingestions every year.[3] Most cases of exposures are reported in child's safest environment i.e. their home, especially kitchen and bathrooms.[4,5] Different agents such as pesticides and household products like petroleum, chemicals, medicines, heavy metals, detergents and corrosive agents have been accidentally ingested by children.

Poisoning is the third most common injury treated in Emergency Rooms (ER) for children less than 16 years of age, especially in developing countries.[6] The 1988 data from the National Institute of Child Health (NICH) Pakistan showed that 2.98% patients were coming to the Casualty with some forms of poisoning.[6] A population-based study from Pakistan reported an annual incidence of unintentional poisoning cases of 4.3%, in which corrosive ingestion was one of the major components.[7]

Ingestion of corrosive and other household cleaning substances may have extremely severe and acute morbidity and mortality of most domestic ingestion available after pesticides.[8,9] A number of household chemicals are within the reach of children; these may be disinfective agents, detergents (with phosphates and carbonates), and highly ionic corrosives which may cause mild to severe degree burn.[10] Corrosives may be classified as acidic (strong/weak), and alkali (strong/weak). Unintentional paediatric ingestion of corrosives, younger than 6 years, is one of the common domestic substance exposure.[11]

Data on corrosive ingestion from Pakistan does not reflect the nature of exposure and its causative factors. Previous studies focussed on general paediatric poisoning, but the magnitude of unintentional corrosive ingestion in children and the contributory factors, like role of working mothers and her educational status, socioeconomic background, other than number of siblings and family members, is still lacking. The current study was planned to fill the gap.

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Patients and Methods

The multi-centre, prospective, case series comprised all paediatric patients coming to the Emergency Department of the two busiest tertiary care teaching hospitals of Karachi: the private-sector Aga Khan University Hospital (AKUH) and the public-sector NICH. It was done from August 2008 to July 2009. The study was approved by the Ethics Committee of both the institutions. It included all paediatric patients of either gender less than 14 years of age, with a history of corrosives ingestion. At the NICH, data was collected by the assigned paediatric residents, while at the AKUH the data was collected by research officers/volunteers. Pre-designed and Pre-tested questionnaires were filled by the patients or the care-givers after they had provided informed written consent. The whole procedure was supervised by a consultant on board.

Cases with ingestion of chemicals other than corrosive; with drugs or other chemical ingestion; and of non-accidental poisoning were excluded.

The data was analysed using SPSS 20.

Results

Of the 105 cases, 56(53%) related to AKUH, and 49(47%) to NICH. In terms of age, Group I (>1 year) had 2(2%) cases; Group II (1-5 years) had 82(78%) cases; Group III (6-10 years) comprised 17(16%); and Group IV (11-14 years) had 4(4%) cases. Overall, 61(58%) were males and 44(42%) were females.

As for the financial status, 87 (83%) families disclosed their average family monthly income. Of them, 43(49.42%) families earned more than Rs.50,000 (>$19/day), while 40(46%) had less than Rs.50,000 (<$19/day) and 4(5%) earned under Rs.10,000 (<$04/day). Fifty nine (56%) mothers in the study were educated with 5 or less family members (both adults and children). Majority of the children lived in extended families. Regarding the numbers of siblings either younger or elder to the case, there were 65(68%) children with 3 or more siblings; 40(38%) had 2 or less siblings in the family. Particular gender of the siblings was not investigated.

Majority of mothers (n=59; 56%) were educated; 36(61%) had bachelor's degree, 4(6.7%) with Master's degree, and 19(32%) had studied till Matriculation/high school. Of the rest, 12(26%) had done middle school, 7(15%) just had primary education, and 27 (58.7%) had never gone to school or had any other formal/traditional education.

Of the total, 64(61%) cases of non-working mothers (from both educated and non-educated groups) were exposed to corrosive ingestion compared to 41(39%) children of working mothers. Of the 59 educated mothers, 38(64%) used to stay at home and yet their children were exposed to corrosives (Table-1).

The commonest type of corrosive ingestion was alkali which was found in 81(77%) children; acid in 23(22%); while 1 (1%) had oxidising agent exposure (Table-2). Children in Group II had ingested more alkali 66(80%) compared to only 16(20%) acid exposures. These corrosives varied from liquid in most 80(76%) cases, to powder/gel/semi-solid forms in 25(24%) exposures. The quantities of chemicals other than liquids were not noted, but 47(59%) reported that the approximately estimated ingested liquid was less than 5mm. The remaining 33(41%) mentioned that the child ingested more than 5mm of the corrosive.

In 34(32.38%) cases, these chemicals were kept in their

Table-1: Working mothers and educational status.

	Public Hospital 49 (46%)		Private Hospital 56 (53%)		Total
	Educated	Non educated	Educated	Non educated	
Working mother	4 (8)	19 (41)	17 (30)	1 (2)	41 (39)
Mothers staying at home	10 (21)	16 (35)	28 (50)	10 (20)	64 (61)
Total	14 (29%)	35 (71%)	45 (80%)	11 (20%)	105 (100%)

Table-2: Relation between age, gender and types of corrosives ingested.

	Male 61			Female 44			Total (105)
Age	(%)	Acid	Alkali	(%)	Acid	Alkali	
< 1 year	0	0	0	2 (4.5)	2(5)	0	02 (2 Acids)
1-5 year	52(85)	11(18)	41(67)	30(68)	5(11)	25(57)	82 (16 Acids & 66 Alkali)
6-10 year	6(10)	2(3)	4(7)	11(25)	1(2)	10(23)	17 (3 Acids & 14 Alkali)
11-14 year	03(5)	1(2)	1(2)	01 (2)	1(2)	0	04 (2 Acids, 1 Alkali)
Total 105	*61(58)	14 (23)	46(76%)	44(42)	9(21)	35(80)	*01with oxidizing agent, male, 1-14 year age group.

Table-3: Relation of number of family member, number of siblings and their ages.

Number of siblings	Number of family members				Age of siblings at the time of incident			
	> 5	3 - 5	< 3	Total	<5 years	6 - 10 years	11 - 14 years	Total
> 5	20	04	00	24	10	12	02	24
3 - 5	18	23	00	41	17	21	03	41
≤ 2	16	18	06	40	10	27	03	40
Total	54	45	06	105	37	60	08	105

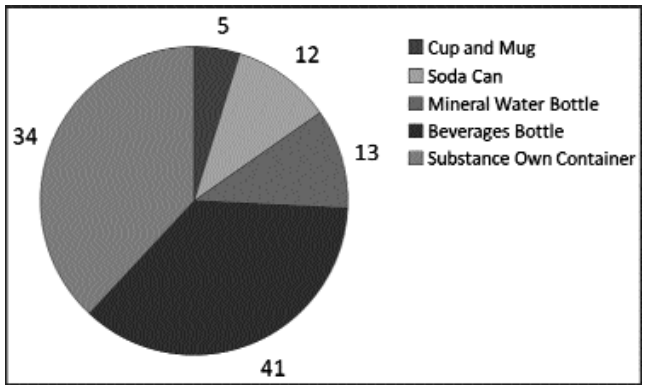

Figure-1: Percentage of various types of containers holding the poisoning substance.

own container, while in 71(75%) cases other commonly used and familiar containers were utilised to store the chemicals (Figure-1).

Kitchen was the commonest place of exposure in 53(48.57%) cases, followed by the bathroom 22(21%).

The most frequent time of incident was during the afternoons in 51(48.57%) cases, followed by evening in 25(24%), night in 17(16%), and morning hours 12(11%). Most cases (n=23; 21.9%) occurred during the month of October (Figure-2). Multiple response analysis showed that in 104(99%) cases,

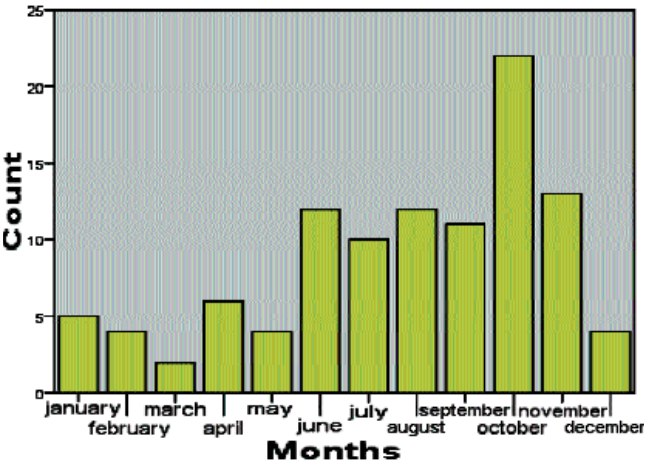

Figure-2: Comparision of poisoning incident with months of year.

ingestion was the primary mode of poisoning, while 6(5.7%) also had inhalation other than ingestion.

Increasing the number of siblings and other adult family members increased the chance of exposure; the same was true for the age of siblings (Table-3). There were 65 (61.90%) poisoned cases with 3 or more siblings in the family; 99 (94%) cases had large family size with 3 or more adult family members; and 60 (57.14%) cases had their sibling's age under 10 years at the time of corrosive exposure.

The mother was the first to see the affected child in 70(67%) cases, followed by grandparents 12(11%), siblings 9(9%), father 7(7%) or by others relatives 7(7%).

Among the members who were the first to find the child, 38(54%) were educated but not working. Among 21 educated and working mothers, 14 (67%) were the first person to identify the children with corrosive ingestion, while father, and siblings were the first ones in 2(9%) cases each. Among 27 uneducated stay-at-home mothers, 16 (59.25%) were the ones who found their poisoned child, followed by others.

Immediate action taken by the caregivers after the incident was to rush toward hospital in 82(78%) cases; 15(14%) tried to dilute the substance; household remedies 6(6%); and no immediate action in 2 (2%) cases who later brought the child to hospital. In the ER, managing the airway, breathing and circulation was carried out in 53(50%), while 47(45%) were kept for observation and were later discharged with follow-up in the out-patient department (OPD), the rest were admitted to surgical ward and endoscopy was carried out.

Discussion

Although most countries have developed legislation on the sale of caustic products in order to reduce its illegitimate use by adults and unintentional exposure among children, but data from developing countries shows that children less than 6 years of age are at particularly high risk of exposure to such products at home.[12] Studies from both paediatric emergency and general paediatrics demonstrate that caustic ingestion rank second amongst the commonest causes of unintentional ingested poisoning in

children.[13] A study identified corrosive ingestion as the second most common poisoning in children.[14]

Male dominance for most unintentional ingestion/poisoning is well described in most studies.[12,14-17] In our study, male-to-female ratio was 1.38:1. There was predominance of male exposure in children less than 10 years mostly because of their active and adventurous nature. Children at younger age have been exposed to ingestion of dangerous substances very often.[12,14-16] Most of our children ranged from 1-14 years, while children below 5 years of age were mostly exposed to some sort of corrosive ingestion. The nature of young children predisposes them to explore their surroundings. At younger age they are more independent, learn and try to explore things without knowing the hazards and always try to test their behaviour and performances. Their sense of taste is also not well-defined and they may ingest large amount of chemicals and corrosives, especially alkali.[2,15,16]

The use of corrosives is common and it is one of the useful household chemicals in our community as it is all over the world.[11] These corrosives are used for cleaning purposes as bleach, disinfectants, drain/oven/toilet cleaner, ammonia and detergents. Mostly unintentional ingestions in children are alkaline in nature.[18] These commercially available chemicals are easily accessible and freely available from the open market, in an ordinary bottle and containers without following the protection rules or child-proof cap or any warning sign/label on it. They are marketed in the form of strong to week acids and alkalis both for domestic and industrial purposes. Other than abundance of usage of alkali, they produce milder sensation of burn and pain. Children may experience larger amount leading to more deeper penetration and extensive burn to the inner mucosa and serious late complications in contrast to acids, which are bitter in taste and tend to burn the mucosa of the mouth very rapidly and cause intense pain, thus making it difficult to ingest large amount.[19] Most of these ingestions were in liquid form. Our children had ingested more alkali as was the experience from developed and underdeveloped countries.[11,14,17]

Household/family size in Pakistan is 6.8 persons per family[20] and we found equal number of cases from large (extended) and small (nuclear) families. Data from developed countries shows that children with small family size or with single caregiver are more prone to all types of injuries with a 3.14 fold increased risk of exposure to poisoning when the children are out of sight of their caregiver.[21] Our results are supported by literature.[15,22,23]

Similarly, number of siblings is reported to be directly proportional to increased risk of exposure.[15] It was found that the risk increased 2.37-fold with more than 2 siblings.[21] When the number of siblings were more than two, the odds ratio (OR) was 1.2; 95% confidence interval (CI) 0.6 to 2.0; $p<0.73$.[24] We found 62% cases with $\geq$3 siblings compared to an earlier study.[25] Other than numbers of children, the age of siblings increases probability of exposure to ingestion; younger the siblings, lesser the probability.[16]

It has been proved by previous studies that inappropriately stored dangerous chemicals in empty containers familiar to children attract them and may lead to accidental exposure.[15] The practice of putting dangerous chemicals in unsafe and attractive familiar containers/bottles like, mineral water, soft drink, and bottles of other beverages is a very common practice in Pakistan and elsewhere in South Asia.[15,25] Other than the placement of these corrosives in a safe lock, out of the reach of children, it is important to have child-proof caps or containers. This may not prevent the exposure of ingestion in children, over 5, but it is about the role of maternal education and family awareness for a safe home environment.

Studies from developing countries have demonstrated that unintentional paediatric injuries are more closely related to maternal education than any other socioeconomic factor.[26] The current study captured a diverse group of cases from both public and private hospitals with different levels of economic and educational status. Focussing on the maternal education we found more literate 45 of 56 (80%) mothers at the private hospital, while the majority of mothers coming to the public hospital were either illiterate or just had 7 years of school education 35 of 49 (71%). This is in contrast with the overall maternal literacy from earlier studies.[25] Literacy rate of mothers significantly correlates with poisoning cases, and was proved with the highest 73% poisoning cases in children with illiterate mothers,[6] but we found 44% mothers illiterate or with low education, while 56% mothers were educated and yet their children were exposed to corrosives. One-third of these were working mothers living in a nuclear family system. The age of mother may be another contributing factor which was not addressed in the study. The effect of maternal employment, working hours and children exposure to injuries has been described in literature.[27]

A high incidence of ingestion-related death and disability was observed mostly in low socioeconomic groups.[22] They are bound to live in small houses with overcrowded dwellings and limited space to store their domestic stuff and hazardous chemicals which are often kept unlocked or within the reach of children.[15] A study from a developed country showed half of the children exposed to the unsafe storage of poisonous products within their house.[28] Low socioeconomic status was independently associated with childhood poisoning. Studies from

developing countries have indicated that the occurrence of unintentional childhood injuries is more closely related to familial awareness and maternal education than any other socioeconomic factor.[25]

The tradition of taking afternoon nap is a common practice in our society especially during the hot summer which lasts from April to October. The colourless alkali liquids with insignificant taste in bathroom or kitchen may be accidentally ingested by the children mostly during the six summer months, especially in the afternoons when their parents are either not at home or are sleeping. The risk of poisoning exposure for children playing alone increased 78-fold compared with children sleeping.[7]

The study's design did not gather information about age-related risk factors, which is a limitation.

Conclusion

There are multiple contributory factors in corrosive exposure among children rather than mother's working status, and her educational background. Lack of poison control centres coupled with a negligent attitude, explains why accidental paediatric poisoning is still a major cause of admission to paediatric emergencies in Pakistan.

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