Original Article

Epidemiology of Poisoning In Hospitalized Children: A 10 Years Cross-Sectional Study in a Teaching Pediatric Hospital, Baghdad, 1993-2002

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Summary:

Background and Objectives:
Poisoning is an important cause of childhood and adolescence hospital emergency presentations and admissions and a major health problem in this population sector. The present study was designed to describe the epidemiology and pattern of poisoning in addition to its case fatality rate.

Methods:
A total of 1450 pediatric cases with poisoning admitted to the Central Teaching Hospital of Pediatrics, Baghdad, during the 10 years study period extending from the 1st of January 1993 to 31st of December 2002, were analyzed.

Results:
The peak age for poisoning cases in the present study was 1-4 years, constituting about three quarters of total pediatric admissions with poisoning. Males were more frequent than females in the present work, and this gender bias was more evident in younger ages and less evident in teenagers. Non-medicinal substances were responsible for the major part (three-quarters) of poisoning cases, especially petroleum products and pesticides. The overall case-fatality rate was 2.6%. The risk of death was higher in the more vulnerable age groups (infants and neonates). It was also higher in males and in cases with poisoning by other noxious substances eaten as food, followed by metals (mainly lead), systemic antibiotics and pesticides. However out of a total of 37 deaths attributed to poisoning that occurred during the present study period of 10 years, non-medicinal substances (especially petroleum products, pesticides and metals) were responsible for three-quarters of these deaths.

Conclusion:
Children under 5 years of age are the most-vulnerable group for poisoning incidents. In addition Petroleum products, insecticides and lead metal were responsible for the highest proportion of poisoning admission and fatality necessitating special steps directed towards the prevention of these problems.

Keywords: Poisoning, childhood, inpatients, drugs, organic solvents, Baghdad.

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Introduction:

Poisoning has been identified as one of the major causes of childhood and adolescence hospital emergency presentations and admissions in most developed countries (1). In developing countries, poisoning has also been recognized as a major health problem among children and adolescents (2). Epidemiological properties differ from country to country. Thus special epidemiological surveillance for each country is necessary to determine the problem according to which preventive measures can be taken (3). In addition there is a growing recognition of the need to maximize efforts to bring evidence into practice in low resource settings (4), following increased realization that the gap between evidence and practice in developing countries results in ineffective treatments that drain limited resources in health systems (5).

The purpose of the present study was to describe the epidemiology and pattern of poisoning cases admitted to a referral pediatric hospital. The second objective was to assess the case fatality rate and relate it to the causative agent.

Materials and Methods

Study population:

A total of 151,250 pediatric admissions to the Central Teaching Hospital of Pediatrics, Baghdad, covering the 10 years period extending from the 1st of January 1993 to 31st of December 2002, were available in a ready to analyze database system.

The database was constructed according to ICD-10 rules at an earlier time (6). No sampling procedure was employed in the present study since all the subjects in the population with poisoning as a reason for admission were studied. A total of 1450 subjects with reasons for admission belonging to the following ICD-10 categories were analyzed, these include: Poisoning by drugs and biological substances and toxic effects of substances chiefly non-medicinal as to source. The classification scheme for poisoning types followed the ICD-10 coding system (7).

Statistical analysis:

Statistical analysis was computer aided using SPSS (Statistical Package for Social Sciences) version 13. Frequency distribution for selected variables in addition to cross tabulation were done. No test of significance were necessary since no sampling procedure was employed and all poisoning cases admitted to hospital during the 10 years study period were analyzed.

The case-fatality rate was used to assess the risk of dying in a specific subgroup, while the proportionate mortality ratio (PMR) was used to show the relative importance of a specific cause of death in relation to all deaths. This measure provides an answer for the question "What proportion of deaths is attributable to disease X?" (8)

$$\text{PMR} = \frac{\text{Number of deaths from a given cause in a specified time period}}{\text{Total deaths in the same time period}} \times (100 \text{ or } 1000)$$

Results:

The results of the present work were based on the analysis of 1450 hospitalized pediatric cases with a diagnosis of poisoning. Children 1-4 years of age constituted the highest proportion (74.2%) of poisoning cases. Males constituted a higher proportion of cases (61%) with an overall male to female ratio of 1.6:1. The male preponderance was higher than the overall figure in the ages younger than 5 years, and below this figure in teenagers, in which the male to female ratio is as low as 1.3:1, table 1 and 2.

As shown in figure 1, toxic effects of substances chiefly non-medicinal as to source constituted three quarters (75.9%) of total poisoning cases, while poisoning by drugs and biological substances were the reason for admission in 24.1% of cases.

Among 349 cases, in which the reason for admission was poisoning by drugs and biological substances, the type of drug was unspecified in the majority (92.6%) of cases. Agents primarily affecting the gastrointestinal system cam second in frequency (3.2%) followed by systemic antibiotics (2%), table 3.

Among 1101 cases, in which the reason for admission was toxic effects of substances chiefly non-medicinal as to source, organic solvents (mainly petroleum products) constituted the major part (85.9%) of cases

followed by pesticides (5.7%), others and unspecified substances (4.7%) and metals (mainly lead) (2.1%), table 4.

As shown in table 5, the overall case-fatality rate for admitted poisoning cases is 2.6%. The rate was obviously higher in neonates (10.5%) and post-neonatal age infants (8.6%). The fatality rate was obviously higher among males (3.1%) compared to females (1.8%). The case-fatality rate showed no important differences between the 2 major classes of poisoning. Among the subgroups of poisonous substances the highest fatality rate was observed for "other noxious substances eaten as food" (30%), followed by metals (17.4%), systemic antibiotics (16.7%) and pesticides (8.1%), table 6.

As shown in table 7, a total of 3 7 deaths occurred among cases with poisoning. Toxic effects of substances chiefly non-medicinal as to source was the most frequently reported reason for admission among deaths constituting 73% of them. Drugs were responsible for the remaining 27% of deaths. Organic solvents (mainly petroleum products) were responsible for the highest proportion of total poisoning deaths (35.1%) followed by unspecified drugs (21.6%), pesticides (13.5%), metals (10.8%) and other noxious substances eaten as food (8.1%). Systemic antibiotics and other systemic anti-infectives and anti-parasitics were responsible for only 5.4% of deaths, table 8.

Discussion

Realizing the wide gap between evidence and practice of medical care in Iraq the present work attempts to describe the epidemiologic history of poisoning in pediatric depending on a fairly large sample of hospitalized cases in a referral pediatric hospital.

The peak age for poisoning cases in the present study was 1-4 years, constituting about three quarters of total pediatric admissions with poisoning. The predilection of poisoning for this age group was shown in published literatures (1,9,10,11,12,13,14). The age range extending from post-infancy to pre-school age is the most susceptible to injury and poisoning, since it coincides with developmental achievements such as independent mobility, exploratory behavior and hand to mouth activity. The child at this age is able to access hazards but has not yet developed cognitive hazard awareness and avoidance skills. Other literatures from affluent countries like Washington state (USA) and New-South-Wales (Australia) showed a second peak for poisoning cases among teenagers, which were mostly suicidal in (13,15).

Males were more frequent than females in the present work, and this gender bias was more evident in younger ages and less evident in teenagers. Similar pattern was observed in a small scale Iraqi study (14) The predominance of male gender in poisoning cases, especially in young children and in less developed countries was shown in previous studies (1,10,12,16). Females dominate poisoning cases especially among teenagers and in developed countries, which are mostly intentional (suicidal) (1,12,15,16,17). The higher proportion of males among admitted poisoning cases in an under-developed country like Iraq may be attributed to deliberate neglect and discrimination against female children in access to health services. Males are also more active both indoor and outdoor in the social context of Iraq, making them more vulnerable to Injury and poisoning incidents.

In the present study non-medicinal substances were responsible for the major part (three-quarters) of poisoning cases, especially petroleum products and pesticides. This finding is expected, since petroleum products are widely used in Iraqi houses as fuel (for heating and catering) and light source, in addition these types of poisoning usually requires hospitalization. An Iraqi study in 1989 showed that Kerosene poisoning was the most frequent, responsible for 45.1% of hospitalized cases (14). The type of poisoning depends on such factors as income level of the country, geographical location and educational level in addition to other social and legislative determinants. Previous studies showed that drugs account for the largest part of all pediatric poisoning encounters in developed countries (1,12,15,17,18,19). Among hospitalized pediatric poisoning cases the non-medicinal chemicals were responsible for the highest proportion of (9,20). This finding was more obvious in developing countries, where petroleum products and insecticides were the most frequently reported (9,10,20).

The overall case-fatality rate in the present work was 2.6%. The risk of death was higher

in the more vulnerable age groups (infants and neonates). It was also higher in males and in cases with poisoning by other noxious substances eaten as food, followed by metals (mainly lead), systemic antibiotics and pesticides. However out of a total of 37 deaths attributed to poisoning that occurred during the present study period of 10 years, non-medicinal substances (especially petroleum products, pesticides and metals) were responsible for three-quarters of these deaths. When comparing our fatality figures to those reported in literature, it was found that the overall case-fatality rate depends on type of poisoning and the age distribution of cases. Medicinal poisoning in young children is unintentional (accidental) and of low risk (21). Some literature reported higher case-fatality rate of more than 5% (10,17). Others reported very low figures (<0.5%) (1,12,15).

In conclusion the under 5 years of age children are the most-vulnerable group for poisoning incidents. This group should be targeted in any future efforts to reduce poisoning accidents through primary preventive measures like parental education to improve their safety practices, enforcing legislative acts on safety caning and storage of chemicals and facilitating public contact with the Consultation Center for Poisoning Treatment.

Knowledge that petroleum products, insecticides and lead metal were responsible for the highest proportion of poisoning admission and fatality necessitates special steps directed towards the prevention of these problems.

Table 1: Frequency distribution of the study sample by age and sex

	N	%
Age group		
Neonate (<30 days)	20	1.4
Post-neonatal age infants (30 days to < 1 year)	96	6.6
(1-4) years	1076	74.2
(5-9) years	188	13
Teenagers (10-18) years	70	4.8
Total	1450	100
Gender		
Female	565	39
Male	885	61
Total	1450	100

Table 2: Gender distribution stratified by age group

	Gender						
	Female		Male		Total		Male:Female Ratio
Age group	**N**	**%**	**N**	**%**	**N**	**%**	
Neonate (<30 days)	7	35	13	65	20	100	1.9:1
Post-neonatal age infants (30 days to < 1 year)	40	41.7	56	58.3	96	100	1.4:1
(1-4) years	405	37.6	671	62.4	1076	100	1.7:1
(5-9) years	83	44.1	105	55.9	188	100	1.3:1
Teenagers (10-18) years	30	42.9	40	57.1	70	100	1.3:1
Total	565	39	885	61	1450	100	1.6:1

Table 3: The relative frequency of selected categories of pharmaceutical preparations out of all poisoning cases by drugs and biologic substances

Poisoning by drugs and biological substances	N	%
Diuretics and other and unspecified drugs, medicaments and biological substances	323	92.6
Agents primarily affecting the gastrointestinal system	11	3.2
Systemic antibiotics	7	2
Antiepileptic, sedative-hypnotic and anti-parkinsonism drugs	3	0.9
Non-opioid analgesics, antipyretics and antirheumatics	2	0.6
Other systemic anti-infectives and antiparasitics	1	0.3
Hormones and their synthetics substituents and antagonists, not elsewhere classified	1	0.3
Topical agents primarily affecting skin and mucus membrane and by ophthalmological and dental drugs	1	0.3
Total	349	100

Table 4: The relative frequency of selected categories of non-medicinal chemicals out of all poisoning cases by substances chiefly non-medicinal as to source

Toxic effects of substances chiefly non-medicinal as to source	N	%
Organic solvents (mainly petroleum products)	946	85.9
Pesticides	63	5.7
Other and unspecified substances	52	4.7
Metals (mainly lead)	23	2.1
Other noxious substances eaten as food	10	0.9
Corrosive substances	4	0.4
Alcohol	1	0.1
Soaps and detergents	1	0.1
Other gases, fumes and vapors	1	0.1
Total	1101	100

Table 5: The case-fatality rate by age and gender

	Total	Death as an outcome	
	N	N	%
Age group			
Neonate (< 30 days)	19	2	10.5
Post-neonatal age infants (30 days to < 1 year)	93	8	8.6
(1-4) years	1063	22	2.1
(5-9) years	186	2	1.1
Teenagers (10+ years)	69	3	4.3
Gender			
Female	559	10	1.8
Male	871	27	3.1
Total	1430	37	2.6

Table 6: The case-fatality rate by type of poisoning

	Total	Death as an outcome	
	N	N	%
Poisoning by drugs and biological substances	346	10	2.9
Systemic antibiotics	6	1	16.7
Other systemic anti-infectives and anti-parasitics	1	1	100
Hormones and their synthetic substituents and antagonists, not elsewhere classified	1	0	0
Non-opioid analgesics, antipyretics and antirheumatics	2	0	0
Antiepileptic, sedative-hypnotic and anti-parkinsonism drugs	3	0	0
Agents primarily affecting the gastrointestinal system	11	0	0
Topical agents primarily affecting skin and mucous membrane and by ophthalmological and dental drugs	1	0	0
Diuretics and other and unspecified drugs, medicaments and biological substances	321	8	2.5
Toxic effects of substances chiefly non-medicinal as to source	1084	27	2.5
Alcohol	1	0	0
Organic solvents (mainly petroleum products)	933	13	1.4
Corrosive substances	4	0	0
Soaps and detergents	1	0	0
Metals (mainly lead)	23	4	17.4
Other gases, fumes and vapors	1	0	0
Pesticides	62	5	8.1
Other noxious substances eaten as food	10	3	30
Other and unspecified substances	49	2	4.1

Table 7: Proportionate mortality ratio of the first level of classification of poisoning types among a total of 37 deaths with a diagnosis of poisoning

	N	**%**
Poisoning by drugs and biological substances	10	27.0
Toxic effects of substances chiefly non-medicinal as to source	27	73.0
Total	37	100

Table 8: Proportionate mortality ratio of the second level of classification of poisoning types among a total of 37 deaths with a diagnosis of poisoning

	N	**%**
Organic solvents (mainly petroleum products)	13	35.1
Diuretics and other and unspecified drugs, medicaments and biological substances	8	21.6
Pesticides	5	13.5
Metals (mainly lead)	4	10.8
Other noxious substances eaten as food	3	8.1
Other and unspecified substances	2	5.4
Systemic antibiotics	1	2.7
Other systemic anti-infectives and anti-parasitics	1	2.7
Total	37	100

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