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Epidemiology of acute poisoning in children presenting to the poisoning treatment center at Ain Shams University in Cairo, Egypt, 2009–2013

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Abstract

Introduction—Pediatric poisonings represent a major and preventable cause of morbidity and mortality throughout the world. Epidemiologic information about poisoning among children in many lower- and middle-income countries is scarce. This study describes the epidemiology of acute poisonings in children presenting to Ain Shams University's Poisoning Treatment Center (ASU-PTC) in Cairo and determines the causative agents and characteristics of acute poisoning in several pediatric age groups.

Methods—This retrospective study involved acutely poisoned patients, 0 to 18 years of age, who presented to the ASU-PTC between 1/1/2009 and 12/31/2013. Data were extracted from electronic records maintained by the ASU-PTC. Collected data included demographics, substance of exposure, circumstances of the poisoning, patient disposition, and outcome.

Results—During the 5-year study period, 38,470 patients meeting our criteria were treated by the ASU-PTC; 19,987 (52%) were younger than 6 years of age; 4,196 (11%) were 6 to 12 years; and 14,287 (37%) were >12 years. Unintentional poisoning accounted for 68.5% of the ingestions, though among adolescents 84.1% of ingestions were with self-harm intent. In all age groups, the most frequent causative drugs were non-opioid analgesics, antipyretics, and antirheumatics. The

most common nonpharmaceutical agents were corrosives in preschool children and pesticides in adolescents. Most patients had no/minor effects (29,174 [75.8%]); hospitalization rates were highest among adolescents. There were 119 deaths (case fatality rate of 0.3), primarily from pesticide ingestion.

Conclusion—Poisoning in preschool children is mainly unintentional and commonly due to nonpharmaceutical agents while poisoning in adolescents is mainly intentional (self-harm). Pesticides, mainly organophosphorous compounds and carbamates, were the most frequent agent leading to morbidity and mortality.

Introduction

Pediatric poisonings are a common and preventable cause of morbidity and mortality throughout the world. According to the World Health Organization (WHO), acute poisoning accounts for an estimated 45,000 deaths annually among children and youth under the age of 20 years.[1] In 2012 in the United States, more than 1.4 million poisonings in children and adolescents under the age of 20 years were reported. The youngest are most at risk—approximately 50% of all poisonings occur in children under the age of 6 years.[2]

The epidemiology of pediatric poisonings, including substances ingested and patient outcomes, differs from country to country. Children are influenced by the prevalent social, occupational, economic, and cultural practices as well as the availability of specific poisons. This reveals the great need for epidemiologic studies that are specific for each country and region to distinguish the features of this problem as this help to plan for its prevention. [3] However, it is difficult to estimate the magnitude of childhood poisonings in many developing countries due to the lack of reliable data.[1]

Ain Shams University Poisoning Treatment Center (ASU-PTC) is the first and largest tertiary care center in Egypt for the emergent management of patients with poisonings. It has a separate emergency department, a 7-bed intensive care unit for management of critical cases, an inpatient department for management of non-critical cases and a separate lab that performs tests for toxicological analysis. It receives all suspected cases of poisoning either primarily presented to the center or referred from other health care facilities (hospitals or clinic) and receives walk-in visits from the street. Located in Cairo, the 15th largest metropolitan region globally, the ASU-PTC receives almost 20,000 patients annually from all governorates in Egypt.[4] It also provides phone call services to the public and information services to primary health care physicians to guide for first aid measures in toxicological emergencies. It provides services 24 hours a day, 365 days per year.

The objective of this study is to describe the epidemiology of acute poisoning among children who presented to ASU-PTC during a 5-year period and to determine the agents involved in the exposures and the characteristics of acute poisonings in different age groups.

Methods

Study Population

This retrospective observational study involved all acutely poisoned patients aged 0 to 18 years old, who presented to the ASU-PTC during the 5-year period from 1/1/2009 to 12/31/2013. Cases with chronic toxicity, such as lead poisoning, and cases with incomplete data were excluded from the study. The Institutional Review Boards (IRB) of Ain Shams University and the University of Maryland, Baltimore, approved the protocol prior to study initiation. Administrative approval for the study was obtained from ASU-PTC.

Study Variables

The following data elements were collected: patient demographics (age, gender, and governorate of residence), substance of exposure, manner of poisoning (intentional or unintentional), place and time of poisoning; route of exposure, patient's disposition, and outcome (discharge after observation for short periods (≤6 hours), admission, or death).

Data Management

Data were extracted from electronic records in the Microsoft Access (Seattle, WA) database maintained by the ASU-PTC. These electronic records were abstracted for all cases presented to the center from the paper hospital medical records by employers in the "Documentation Unit" as part of routine data management. The information was imported into an Excel (Seattle, WA) spreadsheet. The data were reviewed, coded, and prepared for statistical analysis as part of the standard clinical operations. The Poisoning Severity Score (PSS) was used to grade the severity of poisoning as indicated by the patient's clinical features.[5] This system has five grades:

- None: no symptoms or signs related to the poisoning
- Minor: mild, transient, and spontaneously resolving symptoms or signs
- Moderate: pronounced or prolonged symptoms or signs
- Severe: severe or life-threatening symptoms or signs
- Fatal: death

Statistical Analysis

The data were tabulated and statistically analyzed using SPSS, v19. Patients were organized into three age groups: <6 years (preschool age), 6 to 12 years (school age), and 13 to 18 years (adolescents). The chi-squared test was used for statistical comparison of frequencies between the groups. All reported P values are two-sided, and P values <0.05 were considered statistically significant.

Results

During the 5-year study period, a total of 87,375 patients were treated for exposure to poisons at the ASU-PTC. Of these patients, 38,533 (44.1%) were under the age of 18 years. Sixty-three pediatric cases were excluded from our analysis: 36 with chronic lead poisoning

and 27 with incomplete data. Our study focused on the remaining 38,470 cases. A total of 38,809 exposures were identified, as 292 cases (0.8%) involved exposure to more than one agent.

Most of the 38,470 patients (94.7%) were brought directly to ASU-PTC; 2,040 (5.3%) were referred to the ASU-PTC from public health care facilities (1,788 [4.7%]) or private health care facilities (252 cases [0.7%]). The majority of patients in all age groups were residents of Cairo (27,523 [71.5%]) and nearby governorates, including Kalioubeya (16,041 [15.7%]) and Giza (3,904 [10.2%]). Only 937 patients (2.4%) lived in more distant governorates, and residence was unknown for 65 patients (0.2%).

Baseline demographics and circumstances of poisoning are shown in Table 1. The number of cases did not vary significantly from year to year. Boys predominated in the preschool and school-age groups, whereas the adolescent group had significantly more girls than boys (X^2: 3761.4, $P<0.001$). The greatest proportion of cases presenting to ASU-PTC were 2- and 3-year-old children. Seasonal variation in the incidence of poisoning was noted.

The manner of exposure varied by age. Unintentional poisonings accounted for most exposures in the preschool and school age groups (99.6%). Among adolescents, intentional exposures predominated, primarily as self-harm (84% overall, with 79.4% of that group being self-harm) (Table 2). Overdose of substances of abuse accounted for about 5% of all intentional poisonings and 25% of intentional poisonings in adolescent males. Overall, male gender was significantly associated with accidental poisoning (85.8% vs. 54.9%) and female gender was significantly associated with intentional poisoning (44.7% vs. 10.2%) ($P<0.001$).

Non-opioid analgesics, antipyretics, and antirheumatics (mainly non-steroidal anti-inflammatory drugs [NSAIDs]) were the most frequent pharmaceutical agents in all age groups (Table 3). The most frequent nonpharmaceutical agents in the preschool group were corrosives, microbial food poisoning in school-aged children, and pesticides (mainly organophosphate and carbamates) among adolescents (Table 4).

Most patients presented with minimal or no effects of the exposures (29,174, 75.8%) and were managed as outpatients after being observed for a short time (<6 hours). Moderate effects were evident in 6,856 cases (17.8%) and severe effects in 1,459 cases (3.8%). The percentage of patients admitted to the inpatient ward or intensive care unit of the ASU-PTC was significantly higher in the adolescent group (4,186 cases [29.3%]) than in the younger age groups (preschool group, 3,370 cases [16.9%]; school-aged group, 759 cases [18.1%]) ($P<0.05$).

Patient outcomes in relation to the substance involved are shown in Tables 5 and 6. The most common agents resulting in moderate or severe manifestations that required more than a 6-hour admission to the ASU-PTC were drugs that act on the respiratory system (mainly theophylline), followed by cardiovascular drugs and anticonvulsants. Among nonpharmaceutical exposures, pesticides were the most common agents resulting in moderate or severe toxicity as well as the most common reason for admission, followed by corrosives and solvents.

There were 119 deaths: 62 in the preschool group (0.31%), 11 among school-aged children (0.26%), and 46 among the adolescents (0.32%). The overall case fatality rate was 0.3%. Pesticides (mainly organophosphorous compounds, carbamates) were the most frequent cause of death in all age groups (55 cases), followed by kerosene (14 cases) and corrosives (8 cases) in preschool children and carbon monoxide in the older age groups (4 cases). Nine patients died after exposure to unknown substances.

Discussion

In our study, we found that children seen at the ASU-PTC most often died after exposure to pesticides and corrosive agents. This is in contrast to developed countries. In Egypt, pesticides are widely used at home and the packaging is not regulated. Child resistant containers are not required. Children accounted for 44.1% of the total number of cases presenting to the ASU-PTC during the study period. About 52% of the cases involved preschool children, with the greatest frequency around the age of 2 years. The school-aged group (6–12 years) had the lowest frequency of exposure to poisons. These findings are consistent with the results of previous epidemiologic studies on pediatric poisoning, which found a bimodal age distribution of poisoning, with a high incidence among toddlers and a second peak during adolescence.[6–14]

In the preschool and school-aged groups, boys outnumbered girls and unintentional poisoning was predominant. In contrast, female cases were significantly more common in the adolescent group and intentional poisoning (mainly self-harm) predominated. These findings agree with those of previous studies that reported significant associations between male gender and unintentional poisoning and female gender and intentional poisoning.[7,14–18] Higher rate of self-harm in adolescent females was reported by previous studies and it was explained by higher tendency of internalizing emotional and behavioral problems in female adolescents.[19,20] Moreover, previous studies on gender differences in suicide attempts report that females tend to use non-violent methods such as asphyxia by carbon monoxide poisoning, drug toxicity, and alcohol toxicity while males tend to use more violent methods like firearms or jumping from a height.[21, 22]

This study revealed different types of exposures among the age groups. Pharmaceutical agents were more frequently the agent involved in the adolescent age group while nonpharmaceutical agents, such as corrosives and pesticides, were a more frequent source in younger age groups. Previous studies also revealed age-related patterns for a variety of causative agents.[8, 23-27] Schmertmann and colleagues found that the odds of poisoning by medicinal substances compared with non-medicinal substances changed with age.[28] Younger children were more likely to be poisoned by non-medicinal or household substances than older children, which is partially explained by the common storage of these substances close to the floor, where they are accessible to young children.[29]

The reason that non-opioid analgesics are the most common pharmaceutical cause of poisoning is probably that they are easily accessible. They are commonly prescribed by medical practitioners and are available as over-the-counter preparations. In addition, some of these products are colorful and have pleasant flavors, making them attractive to young

children. Ozanne-Smith and associates also discussed the widespread use of over-the-counter medications as a factor in the occurrence of unintentional poisonings.[30] In Egypt, childproof caps are not widely used in the packaging of these medications.

Similar findings have been reported from studies of other populations, but they are not consistent. The most common pharmaceutical compounds linked to poisoning were non-opioid analgesics in studies based in Turkey,[7] Australia,[31] Kuwait,[32] United Arab Emirates,[33] Spain,[11] Hong Kong,[17,18] and Saudi Arabia.[34] In contrast, benzodiazepines were the most frequently involved drugs in France,10 antimicrobials were the most frequent in Israel,[29] while opium was the most frequent causative agent in Iran.[35] This variation might be due to differences in drug prescription patterns by country, as well as country-specific modifications to the packaging and the constituents of medicines and household chemicals.

Regarding nonpharmaceutical agents responsible for pediatric poisoning, in our study, corrosives were the most frequent agent in the preschool age group while pesticides were the most frequent agent in older age groups. Pesticides were the most common agent resulting in significant manifestations and deaths. The higher frequency of corrosives and kerosene in the preschool age group in this study could be related to the habit of storing detergents and liquid cleaners in used milk and juice bottles. These substances are also commonly stored near the floor and are thus easily accessible to young children.

Similar studies in other regions revealed variable results related to nonpharmaceutical pediatric poisonings. Pesticides were found to be the most common agent in India,[3,36] cosmetics and personal care products were found to be the most common agent in young children (≤5 years of age) in the United States,[2] cleansing products were found to be the most frequent in France[10] and China,[15] while kerosene was the most common agent in young children in Kuwait,[32] Bahrain,[37] South Africa,[38] Nigeria,[12] Pakistan,[39] and Zimbabwe.[40] The exposure frequency reflects product availability, accessibility to the child in the home, and packaging, rather than an inherent toxicity.[41] Hence, the common source agents differ among countries. In developed countries, products that are most accessible to children, such as cosmetics and personal care products, cleaning products, analgesics, and cough and cold medicine, are responsible for the majority of unintentional exposures and poisonings. In developing countries, kerosene, paraffin, and pesticides are the most common agents causing unintentional poisoning in children.[42]

This reveals the importance of child-resistant packaging as it has been used in most of developed countries for packaging of medications, fuels, household chemicals and pesticides with documented success as one of the most effective preventive measures of unintentional poisoning of young children.[1]

This study found that pesticides (mainly organophosphorous compounds and carbamates) were the most frequent causative agent of morbidity and mortality stemming from pediatric poisoning. The use of organophosphate has been widely increased all over the world both in agriculture and for home use due to their lesser risk of long-term accumulation in the environment as they have unstable chemical structure and rapidly hydrolyzed. This resulted

in increased hazards of exposures and poisoning by organophosphate especially in developing countries.[43]

Several studies showed higher rates of poisoning after exposure to pesticides and herbicides in developing countries, especially in rural areas.[7,44] This elevated incidence was attributed to occupational and unintentional exposures as well as deliberate self-poisoning, since pesticides are poorly regulated and easily available in the developing world.[45] The variation between countries and populations has been attributed to socioeconomic status and cultural practices, as well as to local industrial and agricultural activities.[1]

Although the vast majority of cases of the ingestions of toxic substances by children resulted in no or minimal injury, our study group had an overall case fatality rate of 0.3%. Several authors have reported patterns of high morbidity, low mortality, and short hospitalization in pediatric poisonings.[11,29,46-48] Mortality rates were found to be highest in infants and to decrease with age until 14 years. Then, almost worldwide, they increase again among children who are 15 years of age and older. This increase might be linked to substance use or occupational exposure.[1]

One of the striking findings of this study is the increased incidence of corrosive ingestion by young children in the spring compared to other seasons. The most common corrosive causing pediatric poisoning in our study was potash, which is used to bleach clothes and its use is not expected to vary by season. Therefore, further prospective studies of pediatric poisoning with corrosive are recommended to investigate this association.

Strengths and Limitations

The strengths of this study lie in the large number of cases we were able to include in our analysis, and the quality and consistency of the records maintained by the ASU-PSS. Limitations include the retrospective design and a potential selection bias induced by the small number of cases from distant governorates, limiting the generalizability of our results to smaller cities and more rural areas in Egypt.

Conclusions

Poisoning in preschool children is mainly unintentional and commonly to be due to nonpharmaceutical agents which indicate the need for use of child-resistant closures and education of care givers with the preventive measures. Intentional poisoning in adolescents represent a significant health problem that should be investigated to determine its risk factors. Pesticides, mainly organophosphorous compounds and carbamates, were the most frequent substance of exposure and the most frequent agent leading to morbidity and mortality. Restrictive measures should be taken to control the use and storage of pesticides, and more efforts are needed to increase public awareness of the safety measures that should be followed during the use of pesticides. Additional population-based studies should be conducted to enhance our understanding of the epidemiology of childhood poisonings throughout Egypt.

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References

1. Peden, M.; Oyegbite, K.; Ozanne-Smith, J., et al., editors. World Report on Child Injury Prevention. World Health Organization; 2008. Available at: whqlibdoc.who.int/publications/2008/9789241563574_eng.pdf [July 8, 2015]
2. Mowry JB, Spyker DA, Cantilena LR Jr, Bailey JE, Ford M. 2012 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 30th Annual Report. Clin Toxicol (Phila). 2013; 51(10):949–1229. [PubMed: 24359283]
3. Bhat NK, Dhar M, Ahmad S, Chandar V. Profile of poisoning in children and adolescents at a North Indian tertiary care centre. JIACM. 2011; 13(1):37–42.
4. El Masry MK, Azab SMS. Inappropriate management and transfer of cases with acute poisoning referred to poisoning treatment center –Ain Shams University – Cairo. Egyptian Journal of Forensic Sciences. 2013; 3:1–7.
5. Persson H, Sjoberg G, Haines J, et al. Poisoning severity score (PSS) – grading of acute poisoning. Clin Toxicol. 1998; 36(3):205–213.
6. Bateman DN. The epidemiology of poisoning. Medicine. 2007; 35:537–539.
7. Andıran N, Sarıkayalar F. Pattern of acute poisonings in childhood in Ankara: what has changed in twenty years? Turk J Pediatr. 2004; 46(2):147–152. [PubMed: 15214744]
8. Hjern A, Ringbäck-Weitoft G, Andersson R. Sociodemographic risk factors for home-type injuries in Swedish infants and toddlers. Acta Paediatr. 2001; 90(1):61–68. [PubMed: 11227336]
9. Demorest RA, Posner JC, Osterhoudt KC, Henretig FM. Poisoning prevention education during emergency department visits for childhood poisoning. Pediatr Emerg Care. 2004; 20(5):281–284. [PubMed: 15123897]
10. Lamireau T, Llanas B, Kennedy A, Fayon M, Penouil F, Favarell-Garrigues JC, Demarquez JL. Epidemiology of poisoning in children: a 7-year survey in a paediatric emergency care unit. Eur J Emerg Med. 2002; 9(1):9–14. [PubMed: 11989508]
11. Mintegi S, Fernández A, Alustiza J, Canduela V, Mongil I, Caubet I, et al. Emergency visits for childhood poisoning: a 2-year prospective multicenter survey in Spain. Pediatr Emerg Care. 2006; 22(5):334–338. [PubMed: 16714960]
12. Oguche S, Bukbuk DN, Watila IM. Pattern of hospital admissions of children with poisoning in the Sudano-Sahelian North eastern Nigeria. Niger J Clin Pract. 2007; 10(2):111–115. [PubMed: 17902501]
13. Shannon M. Ingestion of toxic substances by children. N Engl J Med. 2000; 342(3):186–191. [PubMed: 10639545]
14. Even KM, Armsby CC, Bateman ST. Poisonings requiring admission to the pediatric intensive care unit: a 5-year review. Clin Toxicol (Phila). 2014; 52(5):519–524. [PubMed: 24738737]
15. Lin Y, Wu T, Liu T, Chou C, Wu H. Poison exposure and outcome of children admitted to a pediatric emergency department. World J Pediatr. 2011; 7(2):143–149. [PubMed: 21574031]
16. Hincal F, Hincal AA, Muftu Y, et al. Pattern of children poisonings in Ankara: a ten year survey. Vet Hum Toxicol. 1987; 29:118–120.
17. Hon KLE, Ho JKY, Leung TF, Wong Y, Nelson EAS, Fok TF. Review of children hospitalised for ingestion and poisoning at a tertiary centre. Ann Acad Med Singapore. 2005; 34:356–361. [PubMed: 16021225]

18. Yip WL, Ng HW, Tse ML, Lau FL. An Epidemiological study of paediatric poisoning in Hong Kong. HK J Paediatr. 2011; 16:25–31. Available at: www.hkjpaed.org/pdf/2011;16;25-31.pdf.
19. Madge N, Hewitt A, Hawton K, de Wilde EJ, Corcoran P, Fekete S, van Heeringen K, De Leo D, Ystgaard M. Deliberate selfharm within an international community sample of young people: comparative findings from the Child and Adolescent Self-harm in Europe (CASE) Study. Journal of Child Psychology and Psychiatry. 2008; 49(6):667–77. [PubMed: 18341543]
20. Kaess M, Parzer P, Haffner J, Steen R, Roos J, Klett M, Brunner R, Franz Resch F. Explaining gender differences in non-fatal suicidal behavior among adolescents: a population-based study. BMC Public Health. 2011; 11:597–603. [PubMed: 21794184]
21. Soor GS, Vukin I, Bridgman-Acker K, Marble R, Barnfield P, Edwards J, Cooper B, Alfonsi J, Hunter J, Banayan DJ, Bhalerao S. The effects of gender on adolescent suicide in Ontario, Canada. J Can Acad Child Adolesc Psychiatry. 2012; 21(3):179–185. [PubMed: 22876263]
22. Tsirigotis K, Gruszczynski W, Tsirigotis M. Gender differentiation in methods of suicide attempts. Med Sci Monit. 2011; 17(8):PH65–PH70. [PubMed: 21804473]
23. Marchi AG, Renier S, Messi G, Barbone F. Childhood poisoning: a population study in Trieste, Italy, 1975–1994. J Clin Epidemiol. 1998; 51(8):687–695. [PubMed: 9743317]
24. Agran PF, Anderson C, Winn D, Trent R, Walton-Haynes L, Thayer S. Rates of pediatric injuries by 3-month intervals for children 0 to 3 years of age. Pediatrics. 2003; 111(6 Pt 1):e683–692. [PubMed: 12777586]
25. Gulliver P, Dow N, Simpson J. The epidemiology of home injuries to children under five years in New Zealand. Aust N Z J Public Health. 2005; 29(1):29–34. [PubMed: 15782868]
26. O'Connor PJ. Differentials in poisoning rates of young Australian children according to residential location and geographical remoteness. Inj Prev. 2005; 11(4):204–206. [PubMed: 16081746]
27. Ahmed B, Fatmi Z, Siddiqui AR, Sheikh AL. Predictors of unintentional poisoning among children under 5 years of age in Karachi: a matched case control study. Inj Prev. 2011; 17(1):27–32. [PubMed: 20923985]
28. Schmertmann M, Williamson A, Black D. Unintentional poisoning in young children: does developmental stage predict the type of substance accessed and ingested? Child Care Health Dev. 2014; 40(1):50–59. [PubMed: 22929012]
29. Bentur Y, Obchinikov ND, Cahana A, Kovler N, Bloom-Krasik A, Lavon O, Gurevych B, Lurie Y. Pediatric poisonings in Israel: National Poison Center data. Isr Med Assoc J. 2010; 12(9):554. –559.30. [PubMed: 21287800]
30. Ozanne-Smith J, Day L, Parsons B, Tibbals J, Dobbin M. Childhood poisoning: access and prevention. J Paediatr Child Health. 2001; 37(3):262–265. [PubMed: 11468041]
31. Cripps, R.; Steel, D. [July 8, 2015] Childhood poisoning in Australia. Australian Institute of Health and Welfare Canberra. Oct. 2006 Available at: www.nisu.flinders.edu.au/pubs/reports/2006/injcat90.php
32. Abahussain EA, Ball DE. Pharmaceutical and chemical pediatric poisoning in Kuwait: a retrospective survey. Pharmacy Practice (Internet). 2010; 8(1):43–49.
33. Dawson KP, Harron D, McGrath L, Amirlak I, Yassin A. Accidental poisoning of children in the United Arab Emirates. Eastern Mediterranean Health Journal. 1997; 3:38–42.
34. Izuora GI, Adeoye A. A seven-year review of accidental poisoning in children at a military hospital in Hafr Al Batin, Saudi Arabia. Ann Saudi Med. 2001; 21(1-2):13–15. Available at: http://www.kfshrc.edu.sa/annals/Old/211_212/00-082.PDF. [PubMed: 17264581]
35. Cheraghali F, Taymori M. Epidemiological study of drug intoxication in children. Acta Medica Iranica. 2006; 44(1):37–40.
36. Srivastava A, Peshin SS, Kaleekal T, Gupta SK. An epidemiological study of poisoning cases reported to the National Poisons Information Centre, All India Institute of Medical Sciences, New Delhi. Hum Exp Toxicol. 2005; 24(6):279–285. [PubMed: 16004194]
37. Zein Aldeen HA, Khan IM, Al-Madani R. Accidental poisoning in children in Bahrain. Bahrain Med Bull. 1999; 21(1):13–16.
38. Balme KH, Roberts JC, Glasstone M, Curling L, Mann MD. The changing trends of childhood poisoning at a tertiary children's hospital in South Africa. S Afr Med J. 2012; 102(3 Pt 1):142–146. [PubMed: 22380907]

39. Manzar N, Saad MAS, Manzar B, Fatima SS. The study of etiological and demographic characteristics of acute household accidental poisoning in children - a consecutive case series study from Pakistan. BMC Pediatr. 2010; 10:28. [PubMed: 20438635]
40. Tagwireyi D, Ball DE, Nhachi CFB. Poisoning in Zimbabwe: a Survey of Eight Major Referral Hospitals. J Appl Toxicol. 2002; 22:99–105. [PubMed: 11920933]
41. Liebelt EL, DeAngelis CD. Evolving trends and treatment advances in pediatric poisonings. JAMA. 1999; 282:1113–1115. [PubMed: 10501099]
42. Meyer S, Eddleston M, Bailey B, Desel H, Gottschling S, Gortner L. Unintentional household poisoning in children. Klin Padiatr. 2007; 219(5):254–270. [PubMed: 17763291]
43. Soltaninejad, K.; Shadnia, S. History of the Use and Epidemiology of Organophosphorus Poisoning. In: Balali-Mood, M.; Abdollahi, M., editors. Basic and Clinical Toxicology of Organophosphorus Compounds. Springer-Verlag; London: 2014. p. 32
44. Childhood Pesticide Poisoning: Information for Advocacy And Action. Geneva: Chemicals Programme of the United Nations Environment Programme, Food and Agriculture Organization, World Health Organization; 2004. Available at: www.who.int/entity/ceh/publications/pestpoisoning.pdf [July 8, 2015]
45. Eddleston M, Karalliedde L, Buckley N, Fernando R, Hutchinson G, Isbister G, Konradsen F, Murray D, Piola JC, Senanayake N, Sheriff R, Singh S, Siwach SB, Smit L. Pesticide poisoning in the developing world--a minimum pesticides list. Lancet. 2002; 360(9340):1163–1167. [PubMed: 12387969]
46. Wilkerson R, Northington L, Fisher W. Ingestion of toxic substances by infants and children: what we don't know can hurt. Crit Care Nurse. 2005; 25(4):35–44. [PubMed: 16034032]
47. Lam LT. Childhood and adolescence poisoning in NSW, Australia: an analysis of age, sex, geographic, and poison types. Inj Prev. 2003; 9(4):338–342. [PubMed: 14693896]
48. Ulmeanu C, Niteskcu Girnia VG. Mortality rate in acute poisoning in a pediatric toxicology department. Przegl Lek. 2005; 62:453–455. [PubMed: 16225093]

Table 1

Population Characteristics and Circumstances of Acute Poisoning in Children, ASU-PTC, Cairo (2009-2013)

Age Groups / Characteristics	<6 years 19,987 (52%) N (%)+	6-12 years 4,196 (11%) N (%)+	>12 years 14,287 (37%) N (%)+	Total 38,470 N (%)+
• No. of cases by year				
- 2009	3,506 (17.5)	676 (16.1)	2,391 (16.7)	6,573 (17.1)
- 2010	4,671 (23.4)	1,061 (25.3)	3,260 (22.8)	8,992 (23.4)
- 2011	3,673 (18.4)	747 (17.8)	2,947 (20.6)	7,367 (19.2)
- 2012	3,502 (17.5)	711 (16.9)	2,695 (18.9)	6,908 (18.0)
- 2013	4,635 (23.2)	1,001 (23.9)	2,994 (21.0)	8,630 (22.4)
• Gender				
- Female	8,727 (43.7)	1,919 (45.7)	10,876 (76.1)	21,522 (55.9)
- Male	11,260 (56.3)	2,277 (54.3)	3,411 (23.9)	16,948 (44.1)
• Place of exposure				
- Home	19,885 (99.5)	3,925 (93.5)	13,833 (96.8)	37,643 (97.8)
- Outdoor	100 (0.5)	267 (6.4)	423 (3.0)	790 (2.1)
- Others[1]	1 (0.0)	4 (0.1)	25 (0.2)	30 (0.1)
- Unknown	1 (0.0)	0 (0.0)	6 (0.0)	7 (0.0)
• Route of exposure				
- Ingestion/oral	19,580 (98)	3,736 (89.0)	13,714 (96.0)	37,030 (96.3)
- Inhalation/nasal	196 (1.0)	258 (6.2)	308 (2.2)	762 (2.0)
- Others[2]	230 (1.2)	209 (5.0)	278 (1.9)	717 (1.9)
• Causative agent*				
- Pharmaceutical	6,739 (33.7)	1,022 (24.4)	7,707 (53.9)	15,468 (40.2)
- Nonpharmaceutical	11,658 (58.3)	2,875 (68.5)	5,298 (37.1)	19,831 (51.6)
- Unknown[3]	1,662 (8.3)	322 (7.6)	1,526 (10.5)	3,510 (9)

+Percentage by column (age group)

*The total exceeds 100% because some patients had multiple or co–ingestions.

[1]Include work (19 cases [0.05%]) and school (11 cases [0.03%]).

[2]Include bite/sting (559 cases [1.5%]), dermal (133 cases [0.4%]), injection (21 cases [0.1%]), sublingual (1 case), ocular (1 case) and sniffing (2 cases).

[3]Patients who presented with a history of no known exposure (no infective or traumatic cause) but with the sudden onset and spontaneous resolution of symptoms.

Table 2

Gender Distribution of the Manner of Exposure to Poisons in Children with Acute Poisoning, ASU-PTC, Cairo (2009-2013)

Age Groups		<6 years 19,987 (52%) N (%)+		6-12 years 4,196 (11%) N (%)+		>12 years 14,287 (37%) N (%)+		Total 38,470 N (%)+	
Manner		**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**
Unintentional		8,696 (40.4)	11,212 (66.2)	1,910 (8.9)	2,263 (13.4)	1,203 (5.6)	1,073 (6.3)	11,809 (54.9)	14,548 (85.8)
Intentional	Suicidal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	9,612 (44.7)	1,730 (10.2)	9,612 (44.7)	1,730 (10.2)
	Overdose	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	44 (0.2)	594 (3.5)	44 (0.2)	594 (3.5)
	Criminal	22 (0.1)	36 (0.2)	6 (0.0)	10 (0.1)	9 (0.0)	7 (0.0)	37 (0.2)	53 (0.3)
Iatrogenic/therapeutic error		9 (0.0)	9 (0.1)	1 (0.0)	4 (0.0)	6 (0.0)	6 (0.0)	16 (0.1)	19 (0.1)
Unknown		0 (0.0)	3 (0.0)	2 (0.0)	0 (0.0)	2 (0.0)	1 (0.0)	4 (0.0)	4 (0.0)
Total		8,727 (40.6)	11,260 (66.4)	1,919 (8.9)	2,277 (13.4)	10,876 (50.5)	3,411 (20.1)	21,522 (100)	16,948 (100)

+Percentage by column (gender)

Table 3

Classification of Pharmaceutical Agents Responsible for Acute Poisoning in Children, ASU-PTC, Cairo (2009-2013)

Age Groups / Poisonous Agents	<6 years 6739 (44%) N (%)+	6-12 years 1,022 (7%) N (%)+	>12 years 7,707 (50%) N (%)+	Total N: 15,468 N (%)+
Non-opioid analgesics, antipyretics, and antirheumatics	1,010 (15)	141 (13.8)	1,578 (20.5)	2,729 (17.6)
Drugs acting on respiratory system	356 (5.3)	108 (10.6)	1,140 (14.8)	1,604 (10.4)
Antimicrobials	538 (8)	100 (9.8)	946 (12.3)	1,584 (10.2)
Drugs affecting cardiovascular system	707 (10.5)	68 (6.7)	719 (9.3)	1,494 (9.7)
Anticonvulsants	420 (6.2)	133 (13)	562 (7.3)	1,115 (7.2)
Opioids	520 (7.7)	95 (9.3)	459 (6)	1,074 (6.9)
Hormones and synthetic substitutes antagonists	884 (13.1)	38 (3.7)	59 (0.8)	981 (6.3)
Antipsychotics	417 (6.2)	87 (8.5)	252 (3.3)	756 (4.9)
Antidiabetics	193 (2.9)	29 (2.8)	471 (6.1)	693 (4.5)
Sedative hypnotics	250 (3.7)	38 (3.7)	333 (4.3)	621 (4)
Others*	1,444 (21.4)	185 (18.1)	1,188 (15.4)	2,817 (18.2)

+Percentage by column (age group)

Other pharmaceutical agents include antihistamines (567 cases [3.7%]), antidepressants (535 cases [3.5%]), hallucinogens (425 cases [2.7%]), nutrients and supplements (342 cases [2.2%]), drugs affecting GIT (273 cases [1.8%]), preparations for common cold (173 cases [1.1%]), drugs affecting coagulation (115 cases [0.7%]), skeletal muscle relaxants (73 cases [0.5%]), anti-emetics (64 cases [0.4%]), anti-parkinsonian medications (59 cases [0.4%]), topical agents (51 cases [0.3%]), anti-gout medications (47 cases [0.3%]), and miscellaneous (93 cases [0.6%]).

Table 4

Classification of Nonpharmaceutical Agents Responsible for Acute Poisoning in Children, ASU-PTC, Cairo (2009-2013)

Age Groups		**<6 years 11,658 (59%) N (%)[+]**	**6-12 years 2875 (14%) N (%)[+]**	**>12 years 5298 (27%) N (%)[+]**	**Total 19,831 N (%)[+]**
Causative Agents					
Pesticides	Organophosphate and carbamates insecticides	2,384 (20.4)	350 (12.2)	1,827 (34.5)	4,561 (23)
	Phosphides	252 (2.2)	35 (1.2)	671 (12.6)	958 (4.8)
	Other pesticides	209 (1.8)	12 (0.4)	31 (0.6)	252 (1.3)
Corrosives		4,522 (38.8)	314 (10.9)	384 (7.2)	5,220 (26.3)
Food poisoning (microbial)		1,546 (13.3)	1,534 (53.4)	1,577 (29.8)	4,657 (23.5)
Solvents	Kerosene	1,727 (14.8)	80 (2.8)	63 (1.2)	1,870 (9.4)
	Others	357 (3.1)	31 (1.1)	32 (0.6)	420 (2.1)
Gaseous agents	Carbon monoxide	164 (1.4)	243 (8.5)	209 (3.9)	616 (3.1)
	Other gases	11 (0.1)	5 (0.2)	5 (0.1)	21 (0.1)
Venomous animals[†]		159 (1.4)	178 (6.2)	252 (4.8)	589 (3)
Alcohols		111 (1)	5 (0.2)	202 (3.8)	318 (1.6)
Others[*]		216 (1.9)	88 (3.1)	45 (0.9)	349 (1.8)

[+] Percentage by column (age group)

[†] Includes snake bites, scorpion stings, and unknown stings.

[*] Fish and shellfish poisoning (144 cases [0.7%]), non-toxic agents (68 cases [0.3%]), paints and dyes (56 cases [0.3%]), plants and mushrooms (49 cases [0.2%]), tobacco and nicotine toxicity (12 cases [0.1%]), and miscellaneous (20 cases [0.1%]).

Table 5

Poison Severity Score Outcomes of Acute Poisoning with Pharmaceutical Agents in Children, ASU-PTC, Cairo (2009-2013)

Poisonous Agent	No/Minor Effects N (%)*	Moderate N (%)*	Severe N (%)*	Death N (%)*	Total
Non-opioid analgesics, antipyretics, and anti-rheumatics	2,563 (93.9)	146 (5.3)	19 (0.7)	1 (0.04)	2,729
Drugs acting on respiratory system	378 (23.6)	1,169 (72.9)	56 (3.5)	1 (0.1)	1,604
Antimicrobials	1,581 (99.8)	3 (0.2)	0	0	1,584
Cardiovascular drugs	832 (55.7)	272 (18.2)	386 (25.8)	4 (0.3)	1,494
Anticonvulsants	491 (44)	562 (50.4)	58 (5.2)	4 (0.4)	1,115
Opioids	709 (66)	216 (20.1)	144 (13.4)	5 (0.5)	1,074
Hormones	976 (99.5)	4 (0.4)	1 (0.1)	0	981
Antipsychotics	349 (46.2)	382 (50.5)	24 (3.2)	1 (0.1)	756
Antidiabetics	274 (39.5)	398 (57.4)	21 (3)	0	693
Sedative hypnotics	523 (84.2)	88 (14.2)	10 (1.6)	0	621
Others	2,408 (85.5)	328 (11.6)	78 (2.8)	3† (0.1)	2,817
Total	**11,084 (71.7)**	**3,568 (23.1)**	**797 (5.2)**	**19 (0.1)**	**15,468**

*Percentage by row

†The causative agent was an antidepressant in two cases and a cytotoxic drug in one case.

Table 6

Poisoning Severity Score Outcomes of Acute Poisoning with Nonpharmaceutical Agents in Children, ASU-PTC, Cairo (2009-2013)

	No/Minor Effects N (%)*	Moderate N (%)*	Severe N (%)*	Death N (%)*	Total
Pesticides	3,168 (54.9)	2,243 (38.9)	305 (5.3)	55 (1)	5,771
Corrosives	4,517 (90.4)	388 (7.8)	81 (1.6)	8 (0.2)	4,994
Food poisoning	4,611 (99)	42 (0.9)	4 (0.1)	0	4,657
Solvents	1,926 (84.1)	263 (11.5)	87 (3.8)	14 (0.6)	2,290
Poisonous gases	543 (85.2)	31 (4.9)	54 (8.5)	9 (1.4)	637
Venomous animals	497 (84.4)	29 (4.9)	62 (10.5)	1 (0.2)	589
Alcohols	302 (95)	8 (2.5)	6 (1.9)	2 (0.6)	318
Fish and shellfish	107 (74.3)	36 (25)	1 (0.7)	0	144
Plants and mushrooms	13 (26.5)	36 (73.5)	0	0	49
Others	341 (89.3)	14 (3.7)	25 (6.5)	2† (0.5)	382
Total	**16,025 (80.8)**	**3,090 (15.6)**	**625 (3.2)**	**91 (0.5)**	**19,831**

*Percentage by row

†Causative agents were hydrogen cyanamide and paraphenylene diamine.