Original Article
http://mjiri.iums.ac.ir

Medical Journal of the Islamic Republic of Iran (MJIRI)
Iran University of Medical Sciences

A case-control study on risk factors for unintentional childhood poisoning in Tehran

Kamyar Mansori[1], Hamid Soori*[2], Fariba Farnaghi[3], Sohila Khodakarim[4]
Shiva Mansouri hanis[5], Mahmoud Khodadost[6]

Received: 30 September 2015 Accepted: 13 December 2015 Published: 13 April 2016

Abstract

Background: Poisoning is a major public health problem and is one of the most frequent causes of emergency hospital admissions. The aim of this study was to identify the main risk factors for unintentional childhood poisoning in Tehran, Iran and to suggest possible causes and preventative measures.

Methods: In this case-control study (case, n=140; control, n=280), two controls were selected for every case. Controls were matched by age, sex, and date of hospital attendance. All children and their guardians were then interviewed by the same person using a standard questionnaire that covered the demographic, behavioral, and risk factors associated with accidental poisonings.

Results: The most common type of poisoning was related to narcotics (58.6%); and among the narcotics, methadone was the most prevalent poisoning agent (74.7%). Multivariate conditional logistic regression model revealed that addiction in the family (OR=14.6; 95% CI:6.2-34.6), previous poisoning (OR=7; 95% CI:2.4-20.2), maternal occupation (OR=4; 95% CI:1.3- 12.3), and inaccessibility of poisoning products (OR=0.03; 95% CI:0.01- 0.12) were the main risk factors in unintentional childhood poisoning.

Conclusion: Addiction in the family as a risk factor and inaccessibility of poisoning products as a protecting factor were recognized to have the highest correlation with the unintentional child poisoning. These two factors were considered as priorities in health education programs.

Keywords: Risk Factors, Unintentional Childhood Poisoning, Case-Control, Hospital.

Cite this article as: Mansori K, Soori H, Farnaghi F, Khodakarim S, Mansouri hanis Sh, Khodadost M. A case-control study on risk factors for unintentional childhood poisoning in Tehran. *Med J Islam Repub Iran* 2016 (13 April). Vol. 30:355.

Introduction

Poisoning is a major public health problem and is one of the most frequent causes of emergency hospital admissions (1). According to the World Health Organization (WHO) Global Burden of Disease (GBD) project, an estimated 345,814 people of all ages died worldwide due to accidental poisoning in 2004. Although the majority of these accidental poisonings were among adults, 13% occurred among children and young people under the age of 20. Among 15–19 year-olds, poisoning ranks as the 13th leading cause of death (2). A survey of 16 middle-income and high-income countries revealed that of the different external causes of unintentional injury and death among children aged 1-14 years, poisonings ranked fourth in 2000-01, after road traffic crashes, fires and drowning (2).

Acute poisoning accounted for an estimated 45,000 deaths annually in children and young people under the age of 20 (3). The global death rate from poisoning for

[1]. PhD Student, Department of Epidemiology, Faculty of Public Health, Iran University of Medical Sciences, Tehran, Iran. kamyarmansori@yahoo.com
[2]. (**Corresponding author**) Professor of Epidemiology, Safety Promotion and Injury Prevention and Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran. hsoori@yahoo.com
[3]. Assistant Professor of Pediatric Clinical Toxicology Fellowship, Shahid Beheshti University of Medical Sciences, Tehran, Iran. faribafarnaghi@yahoo.com
[4]. Assistant Professor of Biostatistics, Department of Epidemiology, Faculty of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran. lkhodakarim@gmail.com
[5]. Student Research Committee, Kurdistan University of Medical Sciences, Sanandaj, Iran. mansorishiva@gmail.com.
[6]. PhD Student, Gastroenterology and Liver Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran. mahmodkhodadost@yahoo.com

children younger than 20 is 1.8 per 100,000 populations. This rate is 0.5 per 100,000 in high-income countries, while it is four times higher, at 2.0 per 100,000 in low-income and middle-income countries (3). Africa, the middle-income countries of Europe, and the Western Pacific region have the highest rates of childhood poisoning. In general, low-income and middle-income countries have higher poisoning death rates than high-income countries (3).

Many studies have been conducted about the causes of poisoning and its distribution in different parts of the world. The results revealed a wide range of causes of poisoning and the findings varied with time and regions. In Tehran, ingesting oil was the most common cause of poisoning in children during 1986 and 1991. Ingesting drugs, however, has since been identified as the cause of most poisonings in 1997 (4). The pattern of poisonings has changed over the past years. This change follows the introduction of new poisonous products, the increased number of new consumer products being introduced (5) and greater accessibility and exposure of children to them (5). Medical therapies can control most of these poisonings, so they will not lead to death. However, they will cause irreparable damage to the economy, and the physical and mental health of the families. In addition, the emotional burden and familial anxiety caused by poisoning are significant and should be considered when assessing different aspects of this issue (6). The existing evidence suggests that epidemiological information about poisoning is limited due to lack of data. Given this assumption, it appears that reliable information in low and middle income countries is constrained (7). There is little research on the epidemiology of unintentional childhood poisoning in Iran. Moreover, previous studies identifying child and family related risk factors through a case-control study are rare. The related risk factors for childhood poisoning are presented in this study, and the epidemiology of such injuries is described among children living in Tehran, Iran.

Methods

A hospital based case-control study was performed. Data were collected from the Loghman hospital in Tehran, the capital of Iran. One hundred-forty consecutive cases of unintentional poisoning were selected from 10 March 2013 to 25 July 2013. The participants were younger than 15 and had been taken to the Pediatric Poisoning Department of Loghman hospital. For every case, two controls were selected from children with suspected problems of the respiratory and digestive system or infectious diseases who were taken to the outpatient clinics of the hospital. Neurological and metabolic diseases, brain infection and trauma were considered as exclusion criteria. Case and controls were matched by age (within a six-month range), sex, and date of hospital attendance. Informed consent was obtained from the parents or guardians. The same person interviewed all children and their guardians, using a standard questionnaire that covered demographic, behavioral, and risk factors of accidental poisonings. The risk factors were as follows: Maternal occupation (Housewife, other), paternal educational status (non-academic, academic), paternal smoking status, status of adult supervision, previous poisoning, addiction in the household, mental illness in the family members, availability of poisoning products/substances and family size. The nature of the study did not allow blinding of the interviewer with respect to the case-control status of the child. For all cases, information was also obtained concerning type and conditions of poisoning. On the other hand, usually we are not able to determine the characteristics of the reference population of the hospitals to which patients are admitted. Therefore, it is more reasonable to compare the patients and controls, who are admitted to a specific hospital, and belong to the same community. This procedure attempts to compensate any selection bias of the hospital cases by selecting a control group from the same reference population. Data were collected and analyzed using Stata11. To evaluate the risk factors,

univariate and multiple conditional logistic regression analysis were employed. Finally, the crude and adjusted odds ratios (OR) with 95% confidence interval (CI) were calculated.

Results

In this study, 140 poisoned children and 280 controls were investigated. The results revealed that the most common types of poisoning were related to narcotics 58.6% (n=82) and medicinal products 30% (n=42.) Among the narcotics, methadone was the most frequent poisoning agent with 75.6% (n=62). The main cause of methadone poisoning in all children was due to the consumption of methadone that was mistakenly put and maintained in water/drink bottles by parents. Table 1 demonstrates the distribution of injury characteristics of poisoned children admitted to Loghman hospital. Most poisoning incidents occurred in the living room or bedroom 50% (n=70) and the kitchen 41.4 % (n=58). In addition, the results indicated that 25% (n=35) of the poisoned children were alone and not under the care of parents and other family members at the time of the incident. The distribution of poisoned children versus the control group is shown in Table 2.

Univariate conditional logistic regression analysis was performed to identify the most important factors affecting poisoning. To track the non-important variables, the first significance level for α error was set at 0.1. The results of this analysis showed that maternal occupation, maternal education, paternal education, paternal smoking, maternal smoking, status of supervision, previous poisoning, addiction in the family, mental illness in the family, unavailability of poisoning products and size of household have a significant impact on the incidence of poisoning in children ($p<0.1$) (Table 2). Findings in the univariate analysis revealed a significant association between the presence of addiction in the family and unintentional childhood poisoning (OR=17.4; 95% CI:8.7-34.6).

In the multiple conditional logistic regression, using the stepwise method (backward stepwise) and after adjusting for the confounding variables, significant as-

Table 1. Frequency Distribution of Unintentionally Poisoned Children by Injury Characteristics (n=140)

Characteristics	No (%)
Type of poisoning agent	
Narcotics	82 (58.6)
Medication	42 (30)
Petroleum products	9 (6.5)
Carbon monoxide	3 (2.1)
House cleaning products	2 (1.4)
Other	2 (1.4)
Type of drug	
Methadone	62 (75.6)
Opium	10 (12.2)
Other	10 (12.2)
Place	
Living room/bedroom	70 (50)
Kitchen	58 (41.4)
Yard/garden	7 (5)
Other places	5 (3.6)
Outcomes of poisoning	
Hospitalization	138 (98.6)
Death	2 (1.4)
Way of poisoning	
Digestive	124 (88.6)
Respiratory	14 (10)
Other	2 (1.4)
Parental supervision	
Absent	35 (25)
Present	105 (75)

Table 2. Distribution of Poisoned Children and Control Group and Univariate Conditional Logistic Regression Model

Variable	Cases (%)	Controls (%)	OR (95% CI)	p
Age (year)			-	-
≤1	16 (11.4)	40 (14.3)		
2-4	84 (60)	164 (58.6)		
>5	40 (28.6)	76 (27.1)		
Sex			-	-
Male	80 (57.1)	160(57.1)		
Female	60 (42.9)	120(42.9)		
Maternal occupation				
Housewife	123 (87.9)	264 (94.3)	Reference	0.03
Other	17 (12.9)	16 (5.7)	2.2 (1.1 - 4.5)	
Maternal education				
Academic	13 (9.3)	49 (17.5)	Reference	<0.001
Non-academic	127 (90.7)	231 (82.5)	0.86 (0.81 - 0.92)	
Paternal education				
Academic	16 (11.4)	69 (24.7)	Reference	< 0.001
Non-academic	124 (88.6)	211 (75.3)	0.87 (0.82- 0.92)	
Paternal smoking				
No	43 (30.7)	215 (76.8)	Reference	< 0.001
Yes	97 (69.3)	65 (23.2)	7.3 (4.4 to 12.2)	
Maternal smoking				
No	136 (97.1)	279 (99.6)	Reference	0.06
Yes	4 (2.9)	1 (0.4)	8 (0.89 to 71.6)	
Status of supervision				-
Both parents	135 (96.4)	280 (100)	-	
Other	5 (3.6)	0		
Previous poisoning				
No	99 (70.7)	262 (93.6)	Reference	< 0.001
Yes	41 (29.3)	18 (6.4)	6.5 (3.3 to 12.8)	
Addiction in family				
No	53 (37.9)	257 (91.8)	Reference	< 0.001
Yes	87 (62.1)	23 (8.2)	17.4 (8.7 to 34.6)	
Mental illness in Family				
No	110 (78.6)	265(94.6)	Reference	
Yes	30 (21.4)	15(5.4)	4.7 (2.4 to 9.1)	< 0.001
Inaccessibility of poisoning products				
Yes	75 (53.6)	270 (96.4)	Reference	
No	65 (46.4)	10 (3.6)	0.03 (0.01 to 0.09)	< 0.001
Household of size				
< 4	42 (30)	128 (45.7)	Reference	< 0.001
≥4	98 (70)	152 (54.3)	1.76 (1.4 to 2.3)	

sociations were found between addiction in the family OR=14.6 (95% CI:6.2-34.6), previous poisoning OR=7 (95% CI:2.4-20.2), maternal occupation OR=4 (95% CI:1.3- 12.3) and unavailability of poisoning products OR=0.03 (95% CI:0.01-0.12) and unintentional childhood poisoning (Table 3). After eliminating the confounding variables, we found a significant association between unavailability of poisoning products as a protective factor and addiction in the family, previous poisoning and maternal occupation as the main risk factors associated with unintentional childhood poisoning (p<0.05).

Discussion

This study revealed that inaccessibility of poisoning products was a protective factor, and addiction in the family, previous poisoning and maternal occupation were the main risk factors in unintentional childhood

Table 3. Odds Ratio and 95% Confidence Interval Derived from Multiple Conditional Logistic Regression Model

Variables	OR	CI 95%	p
Maternal occupation	4	1.3 – 12.3	0.03
Previous poisoning	7	2.4 – 20.2	<0.001
Addiction in family	14.6	6.2 – 34.6	<0.001
Unavailability of poisoning products	0.03	0.01 – 0.12	<0.001

poisoning. In this study, addiction in the family had the largest odds ratio. In the descriptive analysis, narcotics poisoning was the most common type of poisoning in children; and among narcotics poisoning, methadone was found to be the most common form of poisoning featuring in 74.7% of the occasions. Methadone is an addictive synthetic opioid. Unfortunately, the consumption, Emergency Unit referral and mortality due to Methadone overdose have increased dramatically in the recent years. For example, in Florida, USA, referral rates to Emergency Services due to methadone abuse increased by 612% from 1977 to 2004. Since the introduction of methadone therapy in 2003 and its subsequent expansion, more than 1,500 MMT centers have been active in the U.S. (8). This dangerous substance entered families unsafely causing children to be exposed to accidental ingestion resulting in the increase in cases of poisoning and death. The increasing consumption of Methadone and the lack of necessary actions to prevent poisoning by a hazardous substance have caused a greater likelihood of poisoning among children. In Canada, despite some preventative strategies such as drug distribution in containers that children cannot open, marking toxic medicines with warning labels, or forcing pharmacists to explain about the medicines, still there have been some cases of poisoning or even death from methadone (9). Unfortunately, the risk of child poisoning is greater in Iran where such preventative measures do not exist (8). Therefore, given the significant methadone consumption in the community, it is essential that families, physicians and health workers have adequate knowledge of the dangerous side effects of this drug. Educating parents about the proper maintenance and storage of these dangerous substances so that they are kept out of reach of children, educating methadone users themselves as well as encouraging doctors to provide adequate explanations about this drug can all be very useful (8). In this study, as is the case with other studies previously conducted in this field, previous poisoning of children was known to be an important risk factor that was significantly associated with child poisoning ($p<0.001$). For example, in a hospital based matched case-control study by Bilal Ahmed conducted in Pakistan, previous poisoning was identified as a risk factor (OR=8.6, 95% CI:1.7-43.5) (11). The elimination of this factor by providing a safer household environment together with extensive counseling to parents would help prevent child poisoning (10). In addition, making poisonous products unavailable to children and keeping them in an inconvenient location were identified as protective measures with regards to the incidences of poisoning (OR=0.03, 95% CI:0.01-0.12). These results are consistent with other similar case-control studies, which have been carried out in this field (10,11,13). For example, in a hospital based matched case - control study conducted in Brazil, children's access to poisoning products stored in a convenient place increased the probability of poisoning in children by 16 times (OR=16.59; 95% CI:2.86-96.20) (13). Child-resistant packaging is one of the best-documented achievements in preventing the unintentional poisoning of children (96). In England and Wales, unintentional poisoning deaths of children aged under 10 years fell steadily from 151 per 100,000 in 1968 to 23 per 100,000 in 2000 (23). Educating parents and child careers about the proper storage of toxic products and establishing legislation to prevent the usage of unsuitable containers by the manufacturers of these products together with the application of warning labels can substantially prevent the incidence of poisoning among children. Another significant risk factor in the development of poisoning in children was maternal occupation (OR=4; 95% CI:1.3-2.3). However, maternal occupation has not been shown to be a significant risk factor in other studies (11,12). For example, in one study conducted in Iran by Soori, this factor has not been detected as significant (OR=1.3; 95% CI:0.6-2.6) (12). Parental supervision was also identified as a signifi-

cant risk factor. It may be argued that maternal occupation outside the home somehow detracted from mother-to-child supervision. This result is consistent with other studies done in this field (11,12). Maternal occupation was not significant in the cited studies, and this may be because parental supervision and maternal occupation have been put in the model simultaneously, and this factor has been removed from the final model as a confounding variable. Moreover, in some studies, a significant association was found between poisoning occurrence and child supervision by another child or grandparents (16-19). In this study, other factors such as paternal education, maternal education, paternal smoking, maternal smoking, mental illness in the family and size of the household were identified as confounding factors, and this is consistent with the results of other studies conducted in this field (11,12).

Furthermore, this study, like many other case-control studies may face differential misclassification. Since the case groups were aware of their illness, they may have more readily remembered possible factors associated with their illness than the control group. In this case, recall bias between cases and controls would not occur equally and may cause a misclassification between the case and control groups, and may therefore confound the results. Use of hospital controls is one of the most common methods to control recall bias. In this study, we used hospital controls to mitigate the recall bias. Despite all of these methods used to decrease this bias, one of the limitations of this study was that usually hospital controls are different from the general population, meaning that the occurrence of exposure and risk behaviors in the hospital controls is greater than the general population, and it can be affected by these factors. However, the Loghman hospital is a referral center for the poisoned children (cases), but there were not any referral centers for the control group, and this may have affected the results.

Conclusion

Addiction in the family, maternal occupation and previous poisoning as risk factors and inaccessibility of poisoning products as a protecting factor were identified to have the highest correlation with the unintentional child poisoning. These four factors were suggested to be considered as priorities in health education programs.

Acknowledgments

We would like to thank Mr. David Mallinson for his editing assistance and the personnel of HakimLoghman hospital, especially the Pediatric Poisoning Department, who gave their sincere cooperation – it is much appreciated.

References

1. Lamireau T, Llanas B, Kennedy A, Fayon M, Penouil F, Favarell-Garrigues JC, et al. Epidemiology of poisoning in children: a 7-year survey in a paediatric emergency care unit. European Journal of Emergency Medicine 2002; 9(1):9-14.

2. Taft C, Paul H, Consunji R, Miller T. Childhood unintentional injury worldwide: meeting the challenge. Washington, DC: Safe Kids Worldwide 2002.

3. Fernando R, Fernando DN. Childhood poisoning in Sri Lanka. The Indian Journal of Pediatrics 1997;64(4):457-60.

4. Motlagh M, Nazari Z. Epidemiologic study of pediatric poisoning in amir kabir and abozar hospital of ahvaz in the year 2000. scientific journal of forensic medicine 2002;8(27):39-42.

5. Balai-Mood M. Pattern of acute poisonings in Mashhad, Iran 1993-2000. Clinical Toxicology 2004;42(7):965-75.

6. Rice DP, MacKenzie EJ, Jones A, Kaufman S, DeLissovoy G, Max W, et al. Cost of injury in the United States: a report to Congress 1989.

7. Lall S, Al-Wahaibi S, Al-Riyami M, Al-Kharusi K. Profile of acute poisoning cases presenting to health centres and hospitals in Oman. East Mediterr Health J 2003;9(5-6):944-54.

8. Farnaghi F, Jafari N, Mehregan FF. Methadone Poisoning among Children Referred to Loghman-Hakim Hospital in 2009. Pajoohandeh Journal 2012;16(6):299-303.

9. Gibson JC, Vulliamy A. Accidental methadone poisoning in children: A call for Canadian research action. Child abuse & neglect 2010;34(8):553-4.

10. Bilal A, Zafar F, Amna RS. Population attributable risk of unintentional childhood

poisoning in Karachi Pakistan. Injury prevention 2012;18(Suppl 1):A114-A.

11. Petridou E, Kouri N, Polychronopoulou A, Siafas K, Stoikidou M, Trichopoulos D. Risk factors for childhood poisoning: a case-control study in Greece. Injury prevention 1996;2(3):208-11.

12. Soori H. Developmental of risk factors for unintentional childhood poisoning. Saudi medical journal 2001;22(3):227-30.

13. Ramos CLJ, Barros HMT, Stein AT, Costa JSDd. Risk factors contributing to childhood poisoning. Jornal de Pediatria 2010;86(5):435-40.

14. CPSC requires child-resistant packaging for common household products containing hydrocarbons, including some baby oils. US Consumer Product Safety Commission. 2008; Available from: (http://www.cpsc.gov/cpscpub/prerel/prhtml02/02015. html.

15. Flanagan R, Rooney C, Griffiths C. Fatal poisoning in childhood, England & Wales 1968-2000. Forensic science international 2005; 148(2):121-9.

16. Azizi B, Zulkifli H, Kasim M. Risk factors for accidental poisoning in urban Malaysian children. Annals of tropical paediatrics 1993;13(2):183.

17. Reed RP, Conradie FM. The epidemiology and clinical features of paraffin (kerosene) poisoning in rural African children. Annals of tropical paediatrics 1997;17(1):49-55.

18. Wezorek C, Dean B, Krenzelok E. Accidental childhood poisoning: influence of the type of caretaker on etiology and risk. Veterinary and human toxicology 1988;30(6):574.

19. Matteucci MJ, Hannum JE, Riffenburgh RH, Clark RF. Pediatric sex group differences in location of snakebite injuries requiring antivenom therapy. Journal of medical toxicology 2007;3(3):103-6.