Unintentional Poisoning in Children: Analysis for Significant Risk Factors

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ABSTRACT

Background: Unintentional poisoning is one of the most common preventable causes of death in children younger than 6 years all around the world. Mortality rate is higher in developing countries (5% of children who received unintentional poisoning) than in developed countries.

Objective : To study risk factors of unintentional poisoning in children age between 6-60 months in Siriraj Hospital.

Methods: Retrospective case-control study. Children of the case group (n = 58) were diagnosed of unintentional (accidental) poisoning by drug or other substances and treated at Siriraj Hospital, Bangkok, Thailand, during January, 2007 to December, 2009. In the control group (n= 174) we evaluated children matched for sex and age who came to our outpatient unit, Siriraj Hospital, for other conditions.

Results: Most of the cases (87.9%) of unintentional poisoning occurred in the house and 6.9% of the cases had poisoning around the house. All children in the case group received poisoning by accidentally ingestion. Number of family members, low paternal income and maternal educational level less than secondary school were significant social risks. Significant behavioral risks were grandparent as a primary caregiver and lack of close supervision more than 30 minutes. Positive underlying diseases of family members that required medicinal control, improper storage and place of medicines or other chemical substances were environmental risk factors. No significant developmental risk factor was found in our study.

Conclusion: Social, behavioral and environmental risks contribute to unintentional poisoning. Anticipatory guidance in these issues can reduce unintentional poisoning significantly.

Keywords: Unintentional poisoning, children, risk factor

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INTRODUCTION

Unintentional injury was one of the leading causes of death in children 1 to 19 years. In the United States between years 2000 and 2006.[1] Prevalence was higher in younger children especially in the first third three years of life[1-4]. In Thailand, prevalence is also the highest in children under five years of age[5]. Unintentional injuries compose of drowning, falls, fires or burns, transportation-related injuries, poisoning, and suffocation. Poisoning is found in 2% of the nonfatal injuries among children 0 to 19 years of age. In young children, the cause of poisoning is mostly unintentional or accidental poisoning and is commonly occurred at home in preschool age[6,7]. According to Kendrick[8] and Baum[9], risk factors of unintentional poisoning were categorized into 4 risks including 1) social risk factor; education

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level of parent, occupation of parent, age of parent, relocation and marital status 2) environmental risk factor; substance storage methods, storage place, and storage packaging 3) behavioral risk factor; parental stress, parental close supervision of their children 4) developomental risk factor; developmental milestone. This study evaluated factors that influenced unintentional poisoning.

MATERIALS AND METHODS

This retrospective case-control study has been approved by the Institutional Research Board (IRB), Faculty of Medicine Siriraj Hospital. Thai children aged between 6-60 months were recruited into this study. Children with significant developmental delay or whose medical record was incomplete were excluded from this study. The case group included 58 children who were diagnosed of accidental poisoning by drug or other substances and treated at Siriraj Hospital during January 2001 and December 2009. The control group included 174 children matched for sex and age who came to our outpatient unit, Siriraj Hospital, for other conditions. Each participant answered a questionnaire. The collected data included socio-demographic data of primary caregiver, type of injury, social risk, environmental risk and behavioral risk.

Statistical analysis

The questionnaire data were entered into SPSS version 11.0 database. Descriptive data was analyzed and described as percentages. Then significant risk factors were analyzed using Chi-square test.

RESULTS

Two hundred and thirty two children aged between 6 and 60 months were categorized to the case group (n=58) and the control group (n=174). Sex and age were identically matched between case group and control group (Table 1).

All children in the case group received poisoning by accidental ingestion. More than half of cases (55.2%) ingested non-medicinal household substances, especially hydrocarbon (15.5%) and acid base (13.8%). Medicinal substances, which belonged to other family members, were ingested in 44.8% of cases (Table 2).

TABLE 2. Characteristics of poisoning incidents.

Variable	N (%)
Substance type	
Medicinal	26 (44.8)
Hydrocarbon	9 (15.5)
Acid-base	8 (13.8)
Insecticide	4 (6.9)
Detergent	3 (5.2)
Others	8 (13.8)
Place of ingestion	
In the house	51 (87.9)
Living room	28 (48.3)
Bedroom	5 (8.6)
Kitchen	10 (17.2)
Bathroom	7 (12.1)
Area around the house	4 (6.9)
Garage	2 (3.4)
Lawn/yard	2 (3.4)
Outside of the house	3 (5.2)

TABLE 1. Socio-demographic variable between case and control group.

Variable	Case (%)	Control (%)	*p*-value
Age (month)			
Mean±S.D.	28.12±15.62	28.15±15.34	0.99
Sex			
Boy	30 (51.7)	90 (51.7)	1.0
Girl	28 (48.3)	84 (48.3)	

Most of the cases (87.9%) had unintentional poisoning in the house. The First three common places that poisoning occurred, were living room (48.3%), kitchen (17.2%) and bathroom (12.1%) accordingly. Unintentional poisoning occurred more in weekdays, and at the time around 8 a.m. and 7 p.m.

Social risk factor

We evaluated age, highest education level, occupations and income of father and mother, marital status, number of family members, and relocation. Age of father in case and control groups was 31.09±7.30 and 32.07±7.53 years respectively. Mother's age in case and control groups was 29.13±7.28 and 28.98±6.88 years respectively. Parental age in both groups were not significantly different.

The results revealed that there were lower maternal education level and lower father's income in the case group than in the control group. (Table 3). These factors were statistically significant.

Behavioral risk factor

Primary caregiver and lack of close super vision were significant behavioral risks of

TABLE 3. Social risk variables between case and control group.

Variable	Case (%)	Control (%)	p-value
Father			
Highest education level			
Primary school	17 (30.4)	38 (22.4)	0.63
Secondary school	30 (53.6)	99 (58.2)	
Higher than secondary school	9 (16.0)	33 (19.4)	
Occupation			0.13
Government officer	7 (12.5)	20 (11.8)	
Employee	32 (57.1)	86 (50.6)	
Office worker	1 (1.8)	25 (14.7)	
Business owner	12 (21.4)	30 (17.6)	
Others	4 (7.1)	9 (5.3)	
Income			
Less than 10,000 Baht/month	31 (55.4)	68 (40)	0.04
From 10,000 Baht/month	25 (44.6)	102 (60)	
Mother			
Highest educational level			0.02
Primary school	18 (33.3)	44 (25.4)	
Secondary school	23 (42.6)	90 (52)	
Higher than secondary school	13 (24.1)	39 (22.6)	
Occupation			0.86
Government officer	7 (12.5)	20 (11.8)	
Employee	32 (57.1)	86 (50.6)	
Office worker	1 (1.8)	25 (14.7)	
Business owner	12 (21.4)	30 (17.6)	
Others	4 (7.1)	9 (5.3)	
Income			0.33
Less than 10,000 Baht/month	31 (55.4)	68 (40)	
From 10,000 Baht/month	25 (44.6)	102 (60)	
Marital status			0.15
Live together	50 (87.7)	159 (91.4)	
Separate/divorced	7 (12.3)	15 (8.6)	

unintentional poisoning. Sixty-two percent of cases had father and/or mother as primary caregivers. Number of children in house and birth order were not significant risk factors. When comparing between case group and control group, the authors found that grandparent as primary caregiver and lack of close supervision from 30 minutes were significant risks in the case group (Table 4).

Environmental risk factor

Positive underlying disease of family members that required medical control, type of packaging, and substance accessibility were significant environmental risk factors. Keeping substances in a room with or without door were not statistically significant risk to unintentional poisoning (Table 5).

TABLE 4. Behavioral variables between case and control group.

Variable	Case (%)	Control (%)	p-value
Primary caregiver			
Parent	36 (62.1)	137 (78.7)	
Grandparent	17 (29.3)	32 (18.4)	0.02
Other	5 (8.6)	5 (2.9)	
Total children			
Up to 2 children	50 (87.7)	161 (92.5)	0.26
More than 2 children	7 (12.3)	13 (7.5)	
Birth order			
First child	33 (57.9)	108 (62.1)	0.57
Other birth order	24 (42.1)	66 (37.9)	
Lack of close superveison at least 30 min			
No	42 (72.4)	148 (85.1)	0.03
Yes	16 (27.6)	26 (14.9)	

TABLE 5. Environmental variables compared between case and control group.

Variable	Case (%)	Control (%)	p-value
Underlying disease of family member			
Yes	7 (12.1)	7 (4.0)	0.02
No	51 (87.9)	167 (96.0)	
Type of packaging container			
Original container	42 (72.4)	169 (97.1)	< 0.01
Other container	16 (27.6)	5 (2.9)	
Container with lid			
Yes	48 (82.8)	173 (99.4)	
No	10 (17.2)	1 (0.6)	
Container with label			
Yes	38 (65.5)	171 (98.3)	< 0.01
No	20 (34.5)	3 (1.7)	
Keep medicine/chemical substance in child-can-reach place			
No	20 (34.5)	111 (63.8)	< 0.01
Yes	38 (65.6)	63 (36.2)	
Keeping place of substance			
With door	5 (8.6)	23 (13.2)	0.35
Without door	53 (91.4)	151 (86.8)	

TABLE 6. Developmental variables between case and control group.

Valuable	Case (%)	Control (%)	p-value
Gross motor development			
Age-appropriate	56 (96.6)	162 (93.1)	0.59
Advance for age	1 (1.7)	8 (4.6)	
Delay	1 (1.7)	4 (2.3)	
Fine motor development			
Age-appropriate	57 (98.3)	170 (97.7)	0.79
Advance for age	0 (0)	0 (0)	
Delay	1 (1.7)	4 (2.3)	
Personal-social development			
Age-appropriate	58 (100)	172 (98.9)	0.41
Advance for age	0 (0)	0 (0)	
Delay	0 (0)	2 (1.1)	

Developmental risk factor

We evaluated gross motor, fine motor and personal-social development. The result showed that developmental skill was not a statistically significant risk for unintentional poisoning (Table 6).

DISCUSSION

This study investigated four categories of risk factors for unintentional poisoning in children aged 6-60 months, including social, behavior and environmental and developmental factors. Site of exposure to unintentional poisoning took place more in home which was compatible with previous studies.[6,7] Significant social factors were low parental education level, which was compatible with the results of Beiki's and Kamal's study,[10,11] low father's income, and less proximal maternal supervision during risk taking activity were also found in Schmertmann's study[2] and Petridou E, et al's study.[12] In our study, inappropriate storage of substance was a significant environmental risk factors, which was consistent with previous studies.[12-14] Although social factors are hardly removed, environmental risk control is a possible strategy to prevent unintentional poisoning. Three common sites of exposure, were living room, kitchen and bathroom, which may be because adults stored many substances such as medicinal substances, and household cleaning substances which contain acid-based substances and hydrocarbons which are found in many solvents such as glue and kerosene. These common sites of exposure may relate to improper packaging. The result encouraged pediatricians to provide injury prevention guidance to parents especially in these issues.[15]

1. Keep medicines and household products out of sight and reach of children and locked up whenever possible.

2. Buy and keep medicines and household products in original child-proof containers and blister packs.

3. Keep the poison control telephone.

We hypothesized that developmental factor should be a risk for unintentional injury because typically developing children can mobile themselves and explore their environment. Moreover children around two years of age can open screw lid bottles and ingest substance easily. However, there were no statistically significant developmental risks in our study. This may be because there was a small proportion of developmental impairment children in our study.

CONCLUSION

Unintentional injury is one of the most common preventable causes of death in children younger than 3 years of age. In our study, social, behavioral and environmental risks were statistically significant, but only behavioral and environ-

mental risk factors are modifiable. Including anticipatory guidance for injury prevention in child health supervision might be the most advantageous strategy to reduce unintentional poisoning.

REFERENCES

1. Borse NN, Gilchrist J, Dellinger AM, Rudd RA, Ballesteros MF, Sleet DA. CDC Childhood Injury report: Patterns of Unintentional injuries among 0-19 Year olds in the United States, 2000-2006. December 2008.
2. Schmertmann M, Williamson A, Black D, Wilson L. Risk factors for unintentional poisoning in children aged 1-3 years in NSW Australia: a case-control study. BMC Pediatr. 2013; 13:88.
3. Siddiqui EU, Ejaz K, Siddiqui U. Unintentional, paediatric domestic injury in a semi rural area of Karachi. J Pak Med Assoc. 2012;62:638-43.
4. Azizi BH, Zulkifli HI, Kasim MS. Risk factors for accidental poisoning in urban Malaysian children. Ann Trop Paediatr. 1993;13:183-8.
5. Wananukul W, Sriapha C, Tongpoo A, Sadabthammarak U, Wongvisawakorn S, Kaojarem S. Human poisoning in Thailand: the Ramathibodi Poison Center's experience (2001– 2004). Clin Toxicol. 2007;45:582-8.
6. Mowry JB, Spyker DA, Cantilena LR, Jr., McMillan N, Ford M. 2013 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 31st Annual Report. Clin Toxicol (Phila) 2014;52: 1032-283.
7. 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: 949-1229.
8. Kendrick D. Guard against accidental poisoning. Arch Hellenic Med. 2008;25:27-33.
9. Baum C, Ahrens W. General principles. In: Erickson T, WR WA, Aks S, Baum C, Ling J, editors. Pediatric toxicology diagnostic and management of the poisoned child. New York: McGraw-Hill; 2005. p. 1-3.
10. Beiki O, Karimi N, Mohammadi R. Parental educational level and injury incidence and mortality among foreign-born children: a cohort study with 46 years follow-up. J Inj Violence Res 2014;6:37-43.
11. Kamal NN. Home unintentional non-fatal injury among children under 5 years of age in a rural area, El Minia Governorate, Egypt. J Community Health. 2013;38(5):873-9.
12. Petridou E, Polychronopoulou A, Kouri N, Karpathios T, Koussouri M, Messaritakis Y, et al. Unintentional childhood poisoning in athens: a mirror of consumerism? J Toxicol Clin Toxicol. 1997;35(6):669-75.
13. Millard YC, Slaughter RJ, Shieffelbien LM, Schep LJ. Poisoning following exposure to chemicals stored in mislabelled or unlabelled containers: a recipe for potential disaster. N Z Med J. 2014;127:17-23.
14. Ramos CL, Barros HM, Stein AT, Costa JS. Risk factors contributing to childhood poisoning. J Pediatr (Rio J). 2010; 86(5):435-40.
15. American Academy of Pediatrics committee on Injury, Violence, and Poison Prevention. Poison treatment in the home. American Academy of Pediatrics Committee on Injury, Violence, and Poison Prevention. Pediatric. 2003; 112:1182-5.