Acute Poison Exposure in the Emergency Department: a 2-Year Study in a University Hospital

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Background: *Pattern of acute poison exposure varies in the different areas. The information will be useful for prevention.*
Objective: *To evaluate pattern, severity and clinical outcome of acute poison exposure in the Emergency Department of a University Hospital in Thailand.*
Material and Method: *Medical records of all acute poison exposure cases, presented the Emergency Department of Thammasat University Hospital between October 1, 2006 and September 30, 2008 were reviewed retrospectively. Demographic characteristics, exposure time, agents, route and cause of exposure, clinical course and outcome were analyzed.*
Results: *Of the total 76,805 Emergency Department visits, 1,112 cases were related to acute poison exposures, which were accounted for 1.4%. Sixty-five percents were female. Patients whom their ages ranging from 21 to 40 years old showed the highest rate of acute poison exposures. Intentional and unintentional exposures accounted for 52.7% and 44.9%, respectively. Intentional exposure was the major cause of exposure in the age group of 11-40 years, while unintentional exposure was the major cause of exposure in children. Pharmaceutical products (38.1%) were the most common category of substances involved in acute poison exposure followed by bites and stings (31.7%) and household products (17.6%). The substances most frequently involved were acetaminophen (17.7%) and toilet cleaning agents (12.3%). Fifty-six (5%) cases developed severe clinical course and three (0.27%) patients died. Pesticide and toilet cleaning agents were responsible for all these fatalities.*
Conclusion: *Acetaminophen and toilet cleaning agents were commonly involved in acute poison exposure. Pesticide and toilet cleaning agents caused severe morbidity and mortality. Unintentional exposure was the major cause of exposure in children. Public education regarding the danger of these agents and prevention of the poison exposure in children should be emphasized.*

Keywords: *Acute poison exposure, Poisoning, Emergency Department, Thailand*

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Acute poison exposure is one of the most common reasons for visiting Emergency Department (ED). It causes significant morbidity and mortality, and uses substantial resources of emergency department. The information about characteristic, substances commonly involved and circumstance of acute poisoning will be useful for planning of prevention. The pattern of human poison exposure varies in the different countries[1]. There was a study from a poison center in Thailand presenting the incidence, characteristics of poisoning and clinical outcome[2]. This data might not represent the overall features of poison exposure in Thailand because it included only poisoning or poison exposure cases reported to the poison center.

Thammasat University Hospital is a 500-bed-teaching hospital located in Pathumthani province, suburban area of Bangkok, the capital of Thailand. Pathumthani province consists of agricultural and new growing industrial areas. There are many people migrated from other parts of Thailand to work in the areas. Epidemiological information about poisoning and poison exposure in the areas has never been reported. There was a retrospective study about the incidence of acute drug overdose in a university hospital, located in Bangkok. The study did not include other chemical poisonings, and patients aged less than 15 year old were not included[11]. Therefore, we conducted a retrospective study to evaluate characteristic, severity and clinical outcome of all acute poisoning or poison

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exposure patients presenting to Emergency Department of Thammasat University Hospital during two-year period from 2006 to 2008.

Material and Method

The list of patients with diagnosis of poisoning, overdose, poison exposure presented to Emergency Department of Thammasat University Hospital between October 1, 2006 and September 30, 2008 was obtained from Emergency Department record. Retrospective chart review of these patients was performed. This study includes acute poisoning or poison exposure of all age groups, all types of poison and all routes of exposure. Patients with food or drug allergy, side effect of medication, chronic poisoning or poison exposure were excluded. The data regarding age, gender, date and time of Emergency Department visit, home address, type of poison/agents, reason of exposure, route of exposure, exposure time, length of stay, complication, and discharge profile were collected from the medical records. Poisoning Severity Score was used to determine the severity of poisoning[4].

The data were analyzed by using SPSS version 17.0 program. Descriptive analysis was performed. Data were presented as percentage.

Results

The list of 1,146 cases with diagnosis of poisoning, overdose, poison exposure was obtained from Emergency Department record. After medical record review, 34 cases were excluded because relevant evidence revealed that 19 cases were chronic poison exposure, four cases were suffered from other causes rather than poisoning, five cases were food or drug allergy, and six cases were side effect of medication. There were 76805 Emergency Department visits at Thammasat University Hospital from October, 2006 to September, 2008. A total of 1,112 cases, involving 1,106 patients, were confirmed as acute poisoning or poison exposure. Six patients each had two visits during this period. This represented 1.4% of total Emergency Department visits.

Demographic data

Acute poisoning was more common in female (65%) than male (35%). The mean age of male was 27.52 $\pm$ 15.1 years (ranged 1 month to 82 years). The mean age of female was 27.37 $\pm$ 13.2 years (ranged 4 month to 87 years). The majority of the cases were young adults in the age group of 21-40 years old (52.2%), followed by teenagers in the age group of 11-20 years old (24.5%) as presented in Table1. Sixty five percents of all cases were from Pathumthani province. Almost 50% of all cases presented to Emergency Department during 16:00-24:00 period.

Agents involved in acute poison exposure

Among the total of 1,112 cases, 68 cases (6.1%) exposed to more than one agent on the same occasion. All of these cases exposed to drugs. They were defined as "multiple agents" and included in pharmaceutical products category as shown in Table 4. Of these, 54 cases involved more than one drug, 11 cases involved drug and household product, and three cases involved drug and pesticide.

Pharmaceutical products, accounted for 38.1% of all cases, were the most common category of substance involved in acute poisoning. Animal bites/ stings, household products, pesticide, technical and occupational products were 31.7%, 17.6%, 4.0% and 3.6% respectively (Table 2). Interestingly, if we counted the total cases involved in each substance,

Table 1. Age and sex distribution of acute poison exposure

Age (y)	Male		Female		Total	
	No.	Row %	No.	Row %	No.	Col %
Less than 1	4	57.1	3	42.9	7	0.6
1-4	23	48.9	24	51.1	47	4.2
5-10	19	52.8	17	47.2	36	3.2
11-20	91	33.5	181	66.5	272	24.5
21-40	191	32.9	390	67.1	581	52.3
40-60	51	38.6	81	61.4	132	11.9
More than 60	15	40.5	22	59.5	37	3.3
Total	394	35.4	718	64.6	1,112	100.0

Table 2. Category of substances involved in acute poison exposure

Categories	Male		Female		Total	
	No.	%	No.	%	No.	%
Pharmaceutical products	75	19.0	363	50.6	438	39.4
Bites and Stings	182	46.2	171	23.8	353	31.8
Household products	65	16.5	131	18.2	196	17.6
Pesticides	17	4.3	27	3.8	44	4.0
Technical and Occupational products	25	6.4	15	2.1	40	3.6
Hydrocarbons	22	5.6	6	0.8	28	2.5
Illicit drugs	4	1.0	2	0.3	6	0.5
Other	4	1.0	3	0.4	7	0.6
Total	394	100.0	718	100.0	1,112	100.0

Table 3. Substances most frequently involved in acute poison exposure

Substances	No.	% of all cases
Analgesic (Acetaminophen)	207 (197)	18.6 (17.7)
Toilet cleaning agents	137	12.3
Snake bites	116	10.4
Centipede bites	116	10.4
Hymenoptera stings	115	10.3
Sedative-hypnotics	64	5.7
Antihistamines	58	5.2
Detergents	46	4.1
Insecticides	37	3.3

acetaminophen (17.7%) was the most common substance involved in acute poisoning, followed by toilet cleaning agents (12.3%) as seen in Table 3.

The most frequent pharmaceutical products involved in acute poison exposure were acetaminophen, followed in frequency by sedative-hypnotic and antihistamine as shown in Table 4. Among 68 cases of multiple agents, 52 cases ingested acetaminophen along with other substances.

In the animal bites/stings category, snake bites, centipede bites, hymenoptera stings were 32.9%, 32.9% and 32.5% respectively as shown in Table 5. Cases with a history of witnessed snake bite with fang marks were included. Nonspecific or non-witnessed bites were excluded. Among 113 cases of snake bites, 12 cases developed neurological symptoms requiring antivenin, two cases developed coagulopathy requiring antivenin and five cases developed severe local effect requiring surgical intervention.

Table 6 shows household products involved in acute poison exposure. Toilet cleaning agents were most common, followed by detergent and bleach. Toilet cleaner which contained hydrochloric acid caused more severe gastrointestinal injury than others in this category. One case of toilet cleaner ingestion died during this two-year period. However, detergent caused only gastrointestinal irritation after ingestion.

In pesticides category, most of them were insecticides which accounted for 84.1%. Herbicide and rodenticide were 9.1% and 6.8% respectively as shown in Table 7. Among the total 44 pesticide poisonings, three cases developed severe respiratory and neurological symptoms, requiring intensive respiratory care, two cases died during this two-year period (Table 14 and 15).

Exposure profile

Most acute poison exposure cases (75.4%) presented to Emergency Department within three hours after exposure, which 48.1% presented within one hour. Ingestion (61.3%) was the major route of poison exposure, followed in frequency by bites and stings, ocular, dermal, inhalation and parenteral (Table 8).

Table 10 shows the cause of exposure in each age group. Intentional exposure accounted for 52.7% of all cases. 44.9% of cases were unintentional exposure, and the remaining 2.4% were other reason. Most cases of intentional exposure were in the age group of 11-40 years. While unintentional exposure was the major cause of exposure in children aged less than 11 years old and elderly aged more than 60 years old.

In children aged less than 11 years old and the age group of more than 40 year-old, unintentional

Table 4. Pharmaceutical products involved in acute poison exposure

Classification	No.	%	% of all cases
Analgesic (acetaminophen)	207 (197)	47.3 (45.0)	18.6 (17.7)
Sedative-hypnotics	64	14.6	5.7
Antihistamines	58	13.3	5.2
Antipsychotic	7	1.6	0.6
Antidepressants	5	1.1	0.4
Others	20	4.6	1.8
Multiple Agents	68	15.5	6.1
Unknown	9	2.0	0.8
Total	438	100.0	

Table 5. Bites and Stings involved in acute poison exposure

Bites and Stings	No.	%	% of all cases
Snake bites	116	32.9	10.4
Centipede bites	116	32.9	10.4
Hymenoptera stings	115	32.5	10.3
Scorpion stings	6	1.7	0.5
Total	353	100.0	

Table 6. Household products involved in acute poison exposure

Household products	No.	%	% of all cases
Toilet cleaning agents	137	69.9	12.3
Detergent	46	23.5	4.1
Bleach	13	6.6	1.2
Total	196	100.0	

Table 7. Pesticides involved in acute poison exposure

Pesticides	No.	%	% of all cases
Insecticides	37	84.1	3.3
Herbicides	4	9.1	0.3
Rodenticides	3	6.8	0.2
Total	44	100.0	

Table 8. Distribution of route of exposure

Route of exposure	No.	%
Ingestion	682	61.3
Bites and Stings	353	31.7
Ocular	65	5.8
Dermal	5	0.4
Inhalation	5	0.4
Parenteral	2	0.2
Total	1,112	100.0

animal bite and stings were the most common exposure. In the age group of 11-40 years-old, intentional drugs exposure was most common, followed by animal bites/ stings and intentional household product exposure as presented in Table 11.

Clinical severity and Outcome

In the total of 1,112 cases, 538 (48.4%) cases were discharged from the Emergency Department after successfully management. 474 cases (42.6%) were admitted to the hospital, 69 (6.2%) cases were referred to other hospital for admission, 31 (2.8%) cases left the Emergency Department without medical permission (Table 12). Three cases, accounted for mortality rate of 0.27%, died during hospital admission as shown in

Table 9. Distribution of duration from exposure to Emergency Department arrival

Duration (hour)	No.	%
0-1	535	48.1
More than 1-3	304	27.3
More than 3-6	108	9.7
More than 6-12	91	8.2
More than 12	65	5.8
Undetermined	9	0.8
Total	1,112	100.0

Table 10. Distribution of reason for exposure by age

Age (y)	Intentional		Unintentional		Other		Total	
	No.	Row %	No.	Row %	No.	Row %	No.	Col %
Less than 1	0	0	7	100.0	0	0	7	0.6
1-4	0	0	47	100.0	0	0	47	4.2
5-10	0	0	35	97.2	1	3.7	36	3.2
11-20	166	61.0	101	37.1	5	1.9	272	24.5
21-40	385	66.3	178	30.6	18	3.1	581	52.3
40-60	32	24.2	99	75.0	1	0.8	132	11.9
More than 60	3	8.1	32	86.5	2	5.4	37	3.3
Total	586	52.7	499	44.9	27	2.4	1,112	100.0

Table 15.

In case of hospital admission, 402 (84.8%) cases were admitted less than three days. Only 12 (2.5%) cases were admitted in the hospital more than seven days (Table13). There were 56 cases, accounted for 5% of all cases, developed severe clinical course during hospitalization as shown in Table 14.

Discussion

The incidence and pattern of human poison exposure vary in the different countries. In developed countries, the incidence of human poisoning was reported between 0.2 and 9.3 exposures per 1,000 populations per year[1]. American Association of Poison Control Center reported the human poison exposure of 8.2 per 1,000 populations per year in 2008[3]. According to Ramathibodi poison center report, poisoning and poison exposure was accounted for 0.06 per 1,000 populations per year. Pesticide, household products and pharmaceutical products were the most common poisons[2]. This data may not directly identify the overall incidence of poisoning in Thailand because the number of calls to poison center is still low. The frequency of poisoning related ED visit varies substantially, ranged from 0.18 to 1% of total ED visits[1,6,8,9,12]. From the present study, the rate of acute poison exposure at the Thammasat emergency department was found to be 1.4% of total ED visits.

The findings of the present study revealed a higher incidence of acute poison exposure in females than in males, especially in teenagers and adult. However, reports from India, Sri Lanka, Spain, Oman revealed that the incidence in male was higher[1,5,8,10]. The majority of acute poisoning in the present study happened in the age group of 21-40 years old.

The study found that acute poisonings from pharmaceutical products were most common, and acetaminophen was the most common drugs involved in acute poisoning. This finding was different from the report of Ramathibodi poison center and other studies from India and Sri Lanka which pesticides were the most common substances[2,5,10]. This might be explained by several reasons. First, the majority of acute acetaminophen poisonings were not reported to poison center. Second, Thammasat Hospital located in a growing industrial area. The availability of pesticide had been decreased. However, reports from the western and middle eastern countries described medication as the most common substance which is similar to our finding[1,6-9,12-14]. Poisonous animal bites/stings and toilet cleaning agents were important as well. Most poisonous animal bite/stings had benign clinical course, so most animal bites and stings were not reported to poison center. Although no fatality from snake bites was observed in this study, there were 14 cases required antivenin and five cases developed severe local effects requiring surgical intervention. Toilet cleaning agents were also popular because they were available in almost every house. It involved in both intentional and unintentional exposure. Exposure to toilet cleaner could cause severe gastrointestinal injury and permanent morbidity as reported in the present study. A study from Turkey also reported that corrosive ingestions led to high fatality[7]. Public education regarding the danger of toilet cleaner should be implemented. Although pesticide poisoning is not common in the present study, it caused severe morbidity. Two fatal cases in this study were due to pesticide.

Intentional exposure was the major cause

Table 11. Distribution of substances involved in intentional and unintentional exposure by age

Category of substances	No. of case less than 11 years old			No. of cases 11-40 years old			No. of cases more than 40 years old		
	Intentional	Unintentional	Other	Intentional	Unintentional	Other	Intentional	Unintentional	Other
Pharmaceutical products	0	16	0	377	6	10	22	5	2
Bites and Stings	0	49	0	0	207	0	0	97	0
Household Product	0	9	1	139	16	10	9	11	1
Pesticides	0	6	0	28	3	1	4	2	0
Illicit drugs	0	0	0	6	0	0	0	0	0
Occupational products	0	1	0	0	28	1	0	10	0
Hydrocarbon	0	6	0	1	16	0	0	5	0
other	0	2	0	0	3	1	0	1	0
Total	0	89	1	551	279	23	35	131	3

Table 12. Distribution of discharge profile from the emergency department

Discharge profile	No.	%
Discharge from ED	538	48.4
Discharge after hospital admission	471	42.3
Death during hospital admission	3	0.3
Refer to other hospital	69	6.2
Left without medical permission	31	2.8

Table 13. Distribution of length of hospital admission

Length of stay (day)	No.	%
0-3	402	84.8
4-7	60	12.7
8-21	9	1.9
More than 21	3	0.6
Total	474	100.0

of exposure in this study, which is similar to others[1,5,6,8-10,14]. Most cases of intentional exposure were in the age group of 11-40 years. This might be due to many factors such as far away from home, no family support, stress due to financial problems. Pharmaceutical products (especially acetaminophen) and household products, which were always available in house, were important agents involved in acute intentional poisoning of this age group. However, all of children aged less than 11 years old in the study exposed to toxic substances unintentionally. This resembles with other findings[1,2,12,15]. Poisonous animal bites and stings were the major cause of acute poisoning in children. Drugs and other potentially toxic substances available in their houses were at risk as well. Prevention of poison exposure in children should be considered.

Most acute poisonings in the study survived without sequelae. Acetaminophen, poisonous snake and Hymenoptera sting caused severe clinical symptoms during hospitalization, but there was no significant morbidity after successful treatment. In contrast, pesticide and toilet cleaner caused higher morbidity and mortality[2,7,10,15]. There were only three fatal cases (0.27%) during this two-year period, so we could not identify factors that could help to predict fatality. Although mortality rate was low in the study, this might not represent the real mortality. Some cases were referred to other hospitals, so we could not follow

Table 14. Summary of acute poisonings with severe clinical course (Poison Severity Score 3)

Substance	No. cases	Intentional exposure	Route of exposure	Organ involvement (No. of cases)	Sequelae (No. of cases)
Acetaminophen	18	18	ingestion	Severe hepatitis (18)	No
Toilet cleaner	17	17	ingestion	Wide spread second degree burn in GI tract (11) Third degree burn in GI tract (2) Circumferential lesion (2) Stricture (1) Perforation (1)	Esophagogastrectomy (2)
Poisonous snake bites	16	0	bites	Nervous system (12) Coagulopathy (2) Compartment syndrome (5)	No
Insecticide	3	3	ingestion	Respiratory insufficiency (3) Nervous system (3)	No
Hymenoptera stings	2	0	stings	Anaphylaxis (2)	No

Table 15. Summary of fatal exposure

No.	Sex	Age (y)	Substance	Route of exposure	Intention	Duration prior to ED arrival (hour)	Initial symptom	Organ involvement	Length of stay (day)	Cause of death
1.	F	42	organophosphate	ingestion	yes	1	Cardiac arrest	Heart Nervous system	1	Respiratory failure
2.	M	17	paraquat	ingestion	yes	8	Vomiting	Kidney Liver Respiratory	4	Multiple organ failure
3.	M	43	Toilet cleaner (corrosive)	ingestion	yes	1	Abdominal pain	Third degree burn from esophagus to proximal jejunum	27	Sepsis Multiple organ failure

the outcome of these cases

Conclusion

Acute poisoning is one of the common problems presenting to the Emergency Department. The pattern of acute poison exposure is different in each area. The information about the incidence and characteristic of poison exposure will be useful for planning of health care. The study found that acetaminophen and toilet cleaning agents, available in most houses, were commonly involved in acute poison exposure. Pesticide and Toilet cleaning agents caused severe morbidity and mortality. Education regarding the danger of these agents should be implemented. Unintentional exposure was the major cause of exposure in children. Prevention of poison exposure in children should be emphasized.

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การศึกษาผู้ป่วยได้รับสารพิษเฉียบพลันที่เข้ารับการรักษาในแผนกฉุกเฉินของโรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติในช่วง ระยะเวลา 2 ปี

จิตรลดา ลิ้มจินดาพร

***ภูมิหลัง**: อุบัติการณ์และลักษณะการได้รับสารพิษแตกต่างกันไปในแต่ละพื้นที่ ข้อมูลเกี่ยวกับการได้รับสารพิษ ในพื้นที่นั้น ๆ จะช่วยในการวางแผนป้องกันเพื่อลดจำนวนผู้ป่วยได้รับสารพิษในอนาคต*

***วัตถุประสงค์**: ศึกษาลักษณะการได้รับสารพิษ ความรุนแรงของอาการ ผลลัพธ์ และอัตราการเสียชีวิตของผู้ป่วยที่ได้รับสารพิษเฉียบพลัน ที่เข้ารับการรักษาในแผนกฉุกเฉิน โรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติ*

***วัสดุและวิธีการ**: ทบทวนย้อนหลังเวชระเบียนผู้ป่วยได้รับสารพิษเฉียบพลันทุกคน ที่เข้ารับการรักษาในแผนกฉุกเฉิน โรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติตั้งแต่วันที่ 1 ตุลาคม พ.ศ. 2549 ถึงวันที่ 30 กันยายน พ.ศ. 2551 โดยรวบรวมข้อมูลพื้นฐาน เวลาที่ได้รับสารพิษ ชนิดของสารพิษ วิธีการ และสาเหตุที่ได้รับสารพิษ การดำเนินโรค และผลลัพธ์ของการได้รับสารพิษ จากนั้นนำมาวิเคราะห์ทางสถิติเชิงพรรณนา*

***ผลการศึกษา**: ในช่วงเวลาดังกล่าวมีการตรวจรักษาในแผนกฉุกเฉินทั้งหมด 76,805 ราย ในจำนวนนี้มี 1,112 ราย ที่เข้ารับการรักษาเนื่องจากได้รับสารพิษเฉียบพลัน คิดเป็นร้อยละ 1.4 พบเพศหญิงมากกว่าเพศชาย ช่วงอายุที่พบมากที่สุดคือ 21-40 ปี สาเหตุส่วนใหญ่เกิดจากการได้รับสารพิษโดยเจตนาคิดเป็นร้อยละ 52.7 โดยพบว่าการได้รับสารพิษ โดยเจตนาเป็นสาเหตุสำคัญในกลุ่มอายุ 11-40 ปี ขณะที่การได้รับสารพิษโดยไม่เจตนาเป็นสาเหตุหลักในเด็กอายุน้อยกว่า 11 ปี กลุ่มประเภทสารพิษที่พบบ่อย คือ ยาที่ใช้ในการรักษา (ร้อยละ 38.1) สัตว์และแมลงกัดต่อย (ร้อยละ 31.7) และสารที่ใช้ในครัวเรือน (ร้อยละ 17.6) โดยชนิดของสารที่พบมากที่สุด คือ acetaminophen (ร้อยละ 17.7) และผลิตภัณฑ์ทำความสะอาดห้องน้ำ (ร้อยละ 12.3) ผู้ป่วย 56 ราย (ร้อยละ 5) มีการดำเนินโรครุนแรง ผู้ป่วย 3 ราย เสียชีวิตหลังจากกินสารกำจัดศัตรูพืชและผลิตภัณฑ์ทำความสะอาดห้องน้ำ คิดเป็นอัตราการเสียชีวิตร้อยละ 0.27*

***สรุป**: Acetaminophen และผลิตภัณฑ์ทำความสะอาดห้องน้ำเป็นสารที่พบบ่อยที่สุดในกลุ่มผู้ป่วยที่เข้ารับการรักษาในแผนกฉุกเฉินด้วยเรื่องได้รับสารพิษเฉียบพลัน โดยพบว่าสารกำจัดศัตรูพืชและผลิตภัณฑ์ทำความสะอาดห้องน้ำก่อให้เกิดภาวะทุพพลภาพและเสียชีวิตได้ ดังนั้นจึงสมควรเผยแพร่ให้ความรู้แก่ประชาชนเรื่องอันตรายของ สารเหล่านี้ ส่วนผู้ป่วยเด็กมักได้รับสารพิษโดยไม่เจตนาการให้ความรู้แก่ผู้ปกครองเรื่องการป้องกันการรับสารพิษในเด็กเล็กเป็นอีกมาตรการที่สมควรให้ความสำคัญ*