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An Epidemiological Study of Paediatric Poisoning in Hong Kong

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Abstract

Objectives: To examine the epidemiology of paediatric poisoning in Hong Kong. ***Design:*** Retrospective review. ***Setting:*** The cases of Hong Kong Poison Information Centre (HKPIC). ***Participants:*** All poisoning cases involving patients with age less than 18 years old during the period of July 2005 to June 2008. ***Main Outcome Measures:*** Demographic data, type of poison involved, reason of poisoning, management, disposal, and final outcome of patients. ***Results:*** Totally 1002 cases were included and analysed. Thirty-five percent and 31% of patients were in age group of 1-3 and 15-17 respectively. Sixty-four percent of toddlers were male, while 72% of adolescents were female. Younger patients usually had accidental exposure, while older patients often had intentional exposure. Pharmaceutical agents were involved in most patients, with use of analgesics being the commonest. Most patients experienced no adverse effects or presented with a benign course. Overall mortality of our study was 0.3%, with no permanent disability in survivors. ***Conclusion:*** Male toddlers tend to have accidental exposure, while female teenagers tend to have intentional ingestion. Medical practitioners should be aware of those with toxic exposure and provide prompt and appropriate care.

Key words Epidemiology; Hong Kong; Paediatric poisoning

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Introduction

Childhood poisoning is one of the major concerns of the public, as most of the morbidity and mortality should be preventable. According to the data from Department of Health of the Government of Hong Kong Special Administrative Region, there were altogether 11 mortalities due to poisoning under the age of 15 during the period 2001-2006.[1] There were only a few studies so far specifically looked into this issue in Hong Kong.[2,3] According to Chan & Critchley,[2] there were 238 enquiries concerning subjects aged 14 years or younger received by the Drug and Poisons Information Bureau during the years 1988-1992. Lau et al[4] found that in a regional hospital during the years 1985-1994, 2% and 22% of poisoning

patients were in the age group 1-10 and 11-20 (years) respectively. As these papers did not provide detailed data specifically on paediatric age group, we did not know about the type of toxin exposure, disposal as well as outcome of paediatric poisoning in Hong Kong. This study reviewed the poisoning cases of paediatric patients reported to Hong Kong Poison Information Centre (HKPIC) of the Hospital Authority during the period of July 2005 to June 2008.

Methods

Poisoning cases managed in Emergency Department of 6 regional hospitals in Hong Kong would be voluntarily reported to HKPIC since July 2005. In addition, the database of HKPIC also includes those consultation concerning poisoning cases from all health care professionals in Hong Kong, including both public and private sectors.

Data within the period July 2005 to June 2008 were reviewed. During this period, all poisoning cases involving paediatric patients with age less than 18 years old were recruited. In the database, the following parameters were recorded: age and gender; date, time and location of exposure; type of toxic substance and its route of exposure; clinical presentation, management, and outcome. Progress of patients being admitted would also be followed up. Cases of inert foreign body ingestion, food poisoning of infective origin, and adverse drug reactions were excluded from the cases analysis.

The data recruited was analysed with descriptive statistics. Proportion of cases and summary statistics would be reported, followed by discussion and conclusion on the issue of paediatric poisoning in Hong Kong.

Results

There were altogether 1002 cases of consultation and reports in the database during this 3-year period, with an average of about 28 cases per month.

Age and Sex Distribution

The age distribution of this population demonstrates a bimodal distribution (Figure 1). The first peak includes those with age of 1 to 3 years old. This group of children accounts for about 35% of total cases. The second peak includes those with age 15 to 17 years old, and this group accounts for about 31% of total cases.

It is interesting to note that there is different sex predominance in the two age groups. Among the toddler

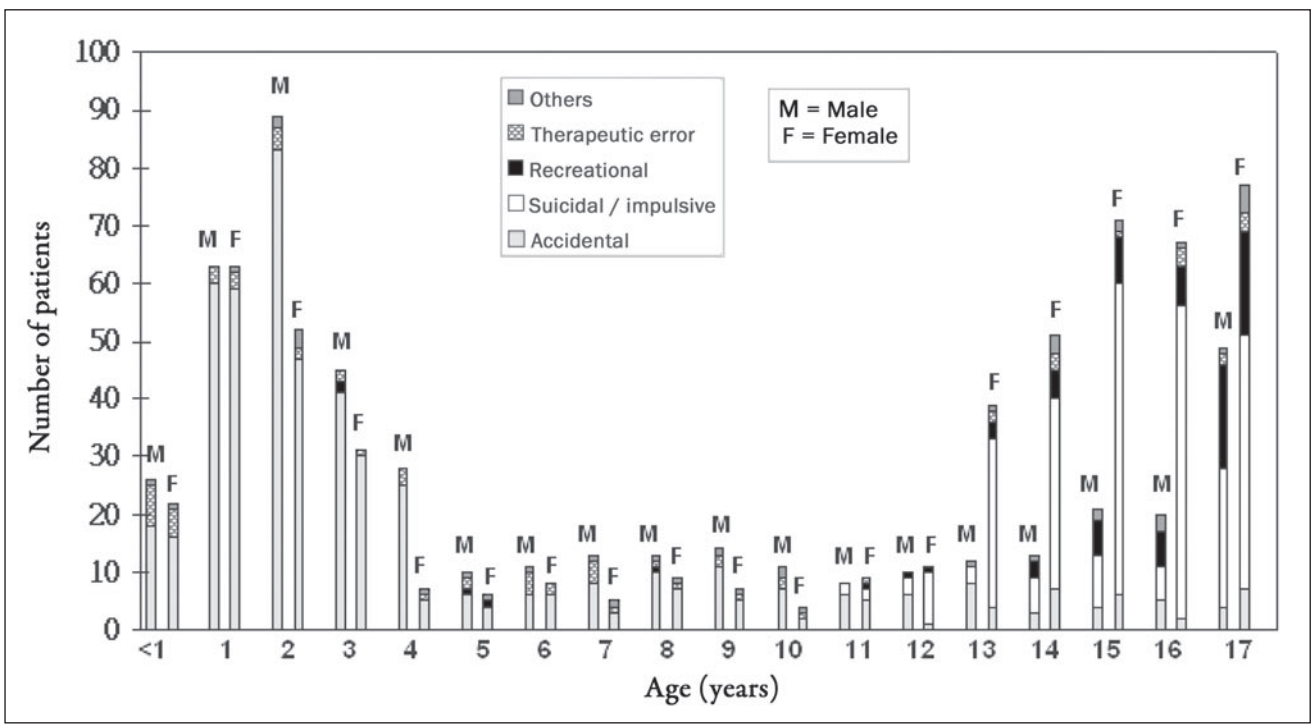

Figure 1 Age and sex distribution of paediatric poisoning cases in Hong Kong.

(age 2-10) group, 64% of patients were boys. In contrast, 72% of patients were female in the adolescent (age 13-17). Those younger than 12 years old usually had accidental exposure or therapeutic error (92%), while patients with age 12 or above usually had intentional exposure (79%).

Figures on reasons of poisoning are stated in Table 1.

Substance Involved

Pharmaceutical agents were involved in more than half of these patients (63%). Commonest culprit was analgesics, followed by stimulants, anticholinergic and antihistamines, and sedative or hypnotics. Non-pharmaceutical agents were involved in about one-third of patients and about 60% of them were related to various household products exposure (Table 2).

There were totally 597 cases of non-intentional exposure (including accidental exposure and therapeutic error). Two hundred and ninety-nine (50%) of them were due to pharmaceutical agents. The 3 commonest pharmaceutical agents involved in accidental drug exposure were analgesics, anticholinergic / antihistamines, and cardiovascular drugs. While 266 (45%) were due to non-pharmaceutical agents, more than half (159 cases) of them were related to household products exposures.

Concerning intentional exposure (including suicidal, criminal / homicidal, and recreational exposures), there were totally 367 cases. In contrast to accidental cases, pharmaceutical agents were involved in most situations (313 cases, 85%), with analgesics being the commonest drug involved (132 cases, 36%). A significant proportion had use of sedative or hypnotics (60 cases, 16%). On the other

Table 1 Reasons of paediatric poisoning in Hong Kong

Accidental	532	53%
Suicidal	278	28%
Recreational	82	8.2%
Therapeutic error	65	6.5%
Homicidal / criminal	7	0.7%
Others	38	3.8%
Total	**1002**	**100%**

Table 2 Substances involved (One patient may be exposed to more than 1 drug / substance) in paediatric poisoning in Hong Kong

Pharmaceutical	Analgesics	184	29%
632 patients (63%)	Stimulants	85	13%
	Anticholinergic / Antihistamine	84	13%
	Sedative / Hypnotics	72	11%
	Cardiovascular drugs	46	7.3%
	Antidepressants	31	4.9%
	Gastrointestinal drugs	29	4.6%
	Antimicrobials	26	4.1%
	Antipsychotic	23	3.6%
	Anticonvulsants	15	2.4%
	Opioids	12	1.9%
	Nutrient / Trace element supplement	32	5.1%
	Others	92	15%
	Total	**632**	**100%**
Non-pharmaceutical	Household products	207	58%
360 patients (36%)	Ethanol	35	9.7%
	Bites and stings	29	8.1%
	Carbon monoxide	13	3.6%
	Others	79	22%
	Total	**360**	**100%**
Chinese and alternative medicine	Patent Chinese medicine	30	50%
60 patients (6%)	Conventional Chinese medicine	10	17%
	Others	20	33%
	Total	**60**	**100%**

hand, ketamine (39 cases) and amphetamine (31 cases) were the commonest agents involved in abusive use (totally 82 cases).

Analysis on Clinical Presentation and Management

Most patients experienced no adverse effect from the exposure (68% of the cases). For those symptomatic patients, 52% experienced gastrointestinal symptoms, and most of them had vomiting or abdominal pain. Forty-four percent of patients had neurological symptoms, most commonly dizziness and drowsiness. Other more serious symptoms like confusion or seizure were relatively rare.

Gastrointestinal decontamination was not performed in most patients (88%). Activated charcoal was given in 116 patients (12%). Gastric lavage was only performed in 6 patients. Antidotes were rarely used. N-acetylcysteine for paracetamol poisoning was the commonest used antidote, but was given in only 29 (3%) patients.

Intensive resuscitation was rarely needed. Cardiorespiratory resuscitation with respiratory support was performed in a teenager with ecstasy and other psychotropic substance poisoning. Intubation and ventilation support were also required in a 6-month-old patient with herbal plant poisoning.

Disposal of Patients

Four hundred and forty-seven patients (45%) were admitted to Paediatric ward. Two hundred and seventy-seven (28%) patients were monitored in Observation ward before discharge. One hundred and eighty-four (18%) patients could be discharged directly from Emergency Department or clinic, and 16 (1.6%) patients were transferred to psychiatric ward for further management (Table 3).

Twenty-two (2%) patients required care in Paediatric Intensive Care Unit (Table 4). Nine of them were due to

Table 3 Disposal of patients

Paediatric ward (general)	447	45%
Observation ward	277	28%
Discharge	184	18%
Discharge against medical advice	36	3.6%
Intensive care unit (paediatric)	22	2.2%
Psychiatric ward	16	1.6%
Death*	3	0.3%
Unknown / Others	17	1.7%
Total	**1002**	**100%**

*1 patient died in Emergency Department after ecstasy poisoning. Other 2 patients died in ward due to causes other than poisoning.

Table 4 Clinical data of the 22 ICU admissions

Patient no.	Age	Sex	Poison	Cause of poisoning
14	1 month old	M	*Rhododendsan*	Accidental
22	8 months old	M	*Nitrate (in vegetables)*	Accidental
5	11 months old	M	*Tramadol*	Therapeutic Error
2	1 year old	F	*Haloperidol*	Accidental
19	1 year old	M	*Nifedipine Retard*	Accidental
20	1 year old	M	*Lycopodium*	Therapeutic Error
4	2 years old	F	*Caustic Soda Tablet*	Accidental
9	2 years old	F	*Haloperidol*	Accidental
10	2 years old	M	*Lisinopril*	Accidental
17	2 years old	M	*Nifedipine Retard*	Accidental
3	3 years old	M	*Nifedipine Retard*	Accidental
11	5 years old	M	*Ecstasy*	Accidental
6	14 years old	M	*Metal Polish*	Suicidal / Impulsive
1	15 years old	M	*Charcoal Burning*	Suicidal / Impulsive
16	15 years old	M	*Chlorpromazine*	Suicidal / Impulsive
8	16 years old	M	*Charcoal Burning*	Suicidal / Impulsive
21	16 years old	F	*Dothiepin*	Suicidal / Impulsive
7	17 years old	M	*Cough Mixture*	Abuse
13	17 years old	M	*Psychotropic Substance*	Abuse
15	17 years old	F	*Aspirin*	Suicidal / Impulsive
12	17 years old	M	*Charcoal Burning*	Suicidal / Impulsive
18	17 years old	M	*Charcoal Burning*	Suicidal / Impulsive

decreased consciousness or coma, including 4 cases of carbon monoxide and 2 cases of antipsychotics poisoning. Three patients were admitted to ICU due to severe agitation and confusion (1 cough mixture, 1 ecstasy, and 1 dothiepin ingestion). There were 4 cases of poisoning related to anti-hypertensive drug exposure. One toddler was admitted due to accidental ingestion of lisinopril. He developed transient hypotension with uneventful recovery. Three kids required closed monitoring after accidental ingestion of nifedipine retard, and stayed asymptomatic during observation.

Outcome of Exposures

Concerning outcome of poisoning for these patients, most of them (871 patients) only experienced mild or even no effects (87%). Twenty-one (2%) patients had major symptoms, and most of them required intensive care. However, no survivor suffered from permanent disability.

There were 3 mortalities recorded in the database yet only one of them is causally related to poisoning. The case is a teenage lady who developed cardiopulmonary arrest after taken ecstasy and other abusive drugs. She succumbed despite resuscitation en route to and in the Emergency Department.

In general, the outcome is more severe for those with intentional exposure than those with non-intentional exposure. Eighteen percent of those with intentional exposure suffered from moderate to severe outcome, while only 6% of those with non-intentional exposure suffered from such outcome. In addition, the percentages of patients with intentional and non-intentional exposure that could be discharged directly from Emergency Department or clinic were also very different; 3% and 28% respectively. This implied that those with non-intentional exposure usually had non-toxic exposure, and thus could be discharged soon without long period of observation.

Discussion

Our database includes poisoning cases reported from most regional public hospitals in Hong Kong, and consultation from doctors and other health care workers (in public and private sectors). Although it was not the full picture, the pattern observed from our database helps to have a clearer understanding of paediatric poisoning in our locality.

The finding of bimodal pattern of age distribution is similar to those previously reported in other countries.[5-7] The first peak contains toddlers with accidental ingestion, with male dominance. These children are curious of the environment, and prone to put whatever they noticed to be novel into their mouths. Some older children could mistakenly recognise these poisons as candies and thus resulted in accidental ingestion. The second peak consists of older teenagers with suicidal attempt or impulsive act, and drug overdose. Female is more dominant in this group. The pattern is similar to that of adult poisoning.[7]

In a local study on children hospitalised for poisoning, Hon et al[8] also reported similar findings that young boys were more at risk of unintentional ingestion whereas adolescent girls were more likely to ingest medications as a gesture of suicide. They suggested that adolescent girls were prone to emotional and situational crises leading to attention-seeking displays of self-harm.

Pharmaceutical and household products are common culprits, as they are easily accessible in home environment.[6,7,9] Analgesics is commonly prescribed by medical practitioners or easily purchased from pharmacy. Its popularity makes it the commonest drug of exposure. Some substance or the packing are colourful, and some pills even have good taste. For example, some vitamin or nutrient tablets sold in the market are packaged resembling candies. Such attractive stuff thus makes young children vulnerable to accidental poisoning.

Gastrointestinal decontamination was not indicated in most of these patients, as most exposures were non-toxic and the amount ingested was not significant. Activated charcoal was administered in about 12% patients who had taken potentially toxic amount of substance. Activated charcoal becomes the treatment option of choice if gastrointestinal decontamination is considered to be needed.[10,11] No case of induced emesis by ipecac was noted in our review. There is no evidence from clinical studies that ipecac improves the outcome of poisoned patients and its routine administration in the Emergency Department should be abandoned.[12]

Gastric lavage was rarely administered in paediatric poisoning. Its risk often outweighed benefit. Gastric lavage should not be considered unless a patient has ingested a potentially life-threatening amount of a poison and the procedure can be undertaken within 60 minutes of ingestion.[10,11] In our review, patients undergoing gastric lavage were usually teenagers with suicidal attempt and potentially fatal ingestion.

Most patients were asymptomatic on arrival. More than half of patients with potentially toxic ingestion or unknown amount need to be observed before they were medically cleared. These patients should be observed either in the

observation ward of Emergency Department or in Paediatric ward as indicated before discharge. Appropriate supportive management would be offered when indicated. About one-sixth could be discharged directly if their ingestion or exposure was known to be non-toxic. Most patients had benign outcome. Psychiatric consultation was usually offered to those patients with suicidal or impulsive acts before discharge, with a small proportion needed to be transferred to psychiatric ward for further management when they were physically stabilised.

Severe poisoning was rare. Twenty-two patients (2%) of them were admitted to paediatric intensive care unit. About half of them were due to accidental ingestion by toddlers, while about one-third of them were due to suicidal attempt by teenagers. Most of them experienced severe neurological symptoms, while a number of them required close monitoring due to accidental ingestion of potentially toxic substance. They all had uneventful outcome.

The reports of mortality rates in recent studies were low,[6-7,13] generally less than 1%. There was only 1 case of poisoning related death (ecstasy poisoning) in our study, and the other fatal cases were judged to be not related to poisoning. There was no permanent disability in the survivors. The overall mortality rate from our study is 0.3%.

Chan et al[14] conducted a prospective study on acute poisoning in Hong Kong during the period from January 2001 to June 2001, with data recruited from 6 Emergency Departments in Hong Kong. In their study, 195 cases of exposure with patients younger than 18 years old were recruited. Analysis of the data found that the pattern of exposure, in terms of age, sex, reasons of exposure, and culprits were similar to our current study. However, there are some changes that are noteworthy.

In their study, there were 19 (10%) cases of drug abuse, with most of them (14, 74%) involving use of amphetamine group of drugs. However, in the current study, it is found that ketamine abuse has become more common nowadays. In our 82 drug abusers, 39 (48%) of them used ketamine, while 31 (38%) used amphetamines. This is compatible to the findings of the Central Registry of Drug Abuse of the Hong Kong Government.[15]

Teen suicide is an important issue to our society, as it is associated with more years per life loss (YPLL). In a study conducted by Yip et al[16] in 2001, it was found that around 20% of Form 3 to Form 7 students displayed some forms of suicidal ideation or behaviour. According to the data from the Centre for Suicide Research and Prevention of the University of Hong Kong,[17] there were totally 47 suicidal cases with age under 15 reported in 2003 in Hong Kong. Four of them resulted in death, mainly due to jumping from height (3 out of 4), with no poisoning death. However, poisoning was the commonest method adopted in attempted suicide (26 out of 43). Indeed, our study also found that there were totally 87 suicidal cases due to poisoning under the age of 15 during the 3-year period, with the youngest one being 11 years old. Although there was no mortality, some of them did have potentially toxic or fatal exposure, or suffer from moderate to severe outcome.

Toddlers usually present with accidental small dose exposure. On the other hand, teenagers tend to have large dose intentional ingestion. Although most non-intentional exposures are non-toxic, physicians should bear in mind that some drugs or substance may be potentially toxic even with small amount ingestion in young children.[18-20] There are a few one pill kill in kid pharmaceutical: narcotic, oral hypoglycemic agent, calcium blockers, chloroquine / quinine, tricyclic anti-depressant, theophylline and thioridazine / chlorpromazine.

Nifedipine retard is a relatively common culprit, due to its colorful appearance and attractiveness to children. These patients should be kept under a period of close monitoring before considering safe for discharge. Parents and caretakers should be educated on issues of home safety and primary prevention to avoid unnecessary exposure and tragedy.

On the other hand, for those with intentional exposure, prompt recognition of the toxicity and resuscitation should be performed.[21] With adequate knowledge and modern facilities, mortality and permanent morbidity should be rare nowadays.

Nowadays, with the use of warning labels, safety packaging, change in formulations and public education campaigns, the trend of accidental poisoning among toddler is decreasing. With the improvement of supportive and intensive care, early GI decontamination and use of antidote and specific treatment, the prognosis of suicidal poisoned patient is also getting better. Poisoning is an avoidable illness, and paediatric group is the most valuable or precious possessions of our community. Every effort should be done to prevent or reduce the morbidity and mortality in this avoidable condition.

Conclusion

Our study specifically looks into the issue and demonstrates the epidemiology of paediatric poisoning in Hong Kong. The data cover a large patient population and a significant proportion of paediatric case poisoning

exposure, including those attending Emergency Departments. We found that male toddlers tend to have accidental exposure (with peak at 1-2 years old), while female teenagers tend to have intentional or deliberate exposure (more common from 13 years old onwards).

Hopefully, our review could help medical practitioners to aware of patients with significantly toxic or potentially lethal exposure and provides prompt supportive and specific care accordingly.

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