Original Article

Pharmaceuticals Poisoning: Reported by the National Poison Centre in Malaysia between 2010 and 2015

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ABSTRACT

Background and Purpose: The wide availability of medications has led to an increased exposure of humans to the possibility of poisoning. An unavoidable effect due to the availability of these medications has also led to a rising increment in the number of poisoning cases. All drugs, especially when administered in large doses or overextended periods, can initiate a toxic condition. Therefore, the objective of this study was to examine nationwide, the patterns attributed to poisoning, and to describe the sociodemographic, and geographic distribution of poisoning, by identifying the category of substances implicated in these cases.

Data Sources and Methods: A retrospective study based on telephone calls reported on poisoning caused by pharmaceutical products undertaken by the National Poisoning Centre (NPC) in Penang (Malaysia) was used as the basis of this study covering the period between 2010 and 2015. The study included the mode and type of poisoning, exposure routes as well as the incidence locations.

Results: A total of 10,998 cases were examined, finding that females represented 5,899 cases (53.6%) being intoxicated more frequently compared to the number of males, 3,839 (34.9%). The age group of poisoning cases ranged between 20 and 29 years representing 2,579 (23.4%) of reported cases. The common mode of poisoning was attributed to suicide 5,203 (47.3%) from among the 10,998 cases and the highest poisoning agents reported were from the psychiatric group of pharmaceutical products of 2,287 (21%).

Conclusion and Implications: These findings indicate a rising trend of suicidal poisoning attempts between 2013 and 2015, which emphasizes the need for more stringent and effective enforcement protocols to limit the rising incidence of poisoning. As such, analyzing the trends in poisoning in a particular zone periodically could help health policy-makers to develop management policies and prevention strategies.

KEYWORDS: Malaysia NPC, overdose, pharmaceuticals poisoning, suicide

INTRODUCTION

Pharmaceutical products in the form of medicines are substantial components of both modern and traditional medicine which are prescribed and used rationally.1 Medicines can contribute to poisoning in several ways, for example, as a result of an overdose of the prescribed medication, over-the-counter drug abuse, or via drug interactions.2 Accidental or intentional exposure to pharmaceuticals has drawn worldwide attention to this issue. According to the world drug report, it is estimated that up to 190,000 deaths each year are related

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How to cite this article: Alwan IA, Awadh AI, Tangiisuran B, Khan HR, Yahaya N, Majid MI. Pharmaceuticals poisoning: Reported by the National Poison Centre in Malaysia between 2010 and 2015. J Pharm Bioall Sci 2020;12:475-81.
to pharmaceutical products.\cite{3} The United States (US) accounts for approximately one-quarter of the estimated number of drug-related deaths globally including drug overdose deaths which continue to grow in the US, having more than tripled between 1999 and 2015, from 16,849 to 52,404 annually.\cite{3} Nowadays, poisoning is the leading cause of death from injuries in the US, with drugs causing 9 of 10 deaths through poisoning.\cite{4} Death as a result of drug poisoning in Asia, however, is unclear given the lack of data and poor coverage in reporting the number of mortalities. However, it has been estimated that in 2013, there were between 13,600 and 100,700 deaths.\cite{5} 

Given the continual updating of information in parallel with poisons and poisonings, several problems remain which need to be resolved. First, there is insufficient awareness of the potential dangers of poisons. In most developing countries, trained personnel for poisoning care as well as diagnostic and treatment facilities are limited. Second, it is essential to provide more detailed national information on pharmaceutical poisonings which may contribute to the planning and development of national poison policies. In Malaysia, pharmaceutical products are responsible for much of the recent increments in poisoning incidences.

The National Poison Centre (NPC) of Malaysia was initially established in 1995 through the Drug and Poison Information Service (DPIS) and remains the only poison information center in Malaysia. The DPIS receives calls from all states of Malaysia including East Malaysia (Sabah and Sarawak).\cite{6}

DPIS is considered one of the important, if not primary reference points for healthcare professionals and members of the public in managing poisoning incidences. Accordingly, the objective of this study is to evaluate the drug and pharmaceuticals poisoning trends recorded by the NPC over 6 years between January 1, 2010 and December 31, 2015.

**Materials and Methods**

This study is a retrospective review of pharmaceutical poisoning cases, representing inquiries to the NPC in Malaysia. As a multiracial country, the total population in Malaysia in 2010 was 28.3 million consisting of Bumiputera (67.4%), Chinese (24.6%), Indians (7.3%), and others (0.7%).\cite{7} Accordingly, this motivated the researcher of this study to evaluate the differences in poisoning patterns between the three ethnic groups. The telephone inquiries received were actioned by a team of nine experts including pharmacists and health scientists, being experts in toxicology, along with expert consultants for managing complex cases.

The telephone calls were entered into a standardized Poison Case Report Form (PCRF), adapted from the WHO IPCS INTOX system and then entered into a retrievable database.\cite{8} The details of each call included the enquirer’s name, address, product/poison information (name of the drug/medicine), patient’s age, sex, route, and duration of exposure, mode and symptoms of poisoning, treatment provided already, and other necessary queries regarding the patient. All information relating to the call was documented. The records were extracted where the substance code was “Pharmaceutical,” and each PCRF was manually reviewed for inclusion.

Regarding the ethical issues, all personal information belonging to the patient was removed before conducting the descriptive analysis to ensure the patient’s privacy was protected. Descriptive analysis was performed in this study using the Statistical Package for Social Sciences (SPSS) version 22.0. In describing the results, descriptive statistics, such as frequency and percentage, were used.

**Results**

During the period of this study (2010–2015), the total number of poisoning cases [incidences] reported to the NPC was 29,675 and the number of pharmaceutical poisoning cases was 10,998, representing 37.06% of all reported poisoning cases. In 2010, the total number of cases having pharmaceutical poisoning was 1976 cases, which increased in 2011 to 2349 cases. In 2012, the number of reported cases, however, decreased with only 1276 cases reported. However, this number quickly rose in 2013, reaching 1533 cases, and constantly increased to 1867 cases in 2014 and 1997 cases reported in 2015 [Figure 1].

The demographic characteristics of the subjects involved in pharmaceutical poisoning are displayed in Table 1. The age group of the subject that topped
the list was between 20-29 years (23.4%) followed by the infants and toddlers aged between 0-4 years (23.0%) and then by those aged between 30-39 years (13.9%). The number of intoxicated females was higher compared to males (F: 53.6% and M: 34.9%). Among the three main races in Malaysia, Malays constituted the highest percentage with 33.9%, followed by Indians (22.2%) and Chinese (19.1%) [Table 1].

The distribution of causative agent groups that led to poisoning revealed that psychiatric drugs had the highest incidence; 21% of the total data over the 6 years, followed by topical agents 18%, and analgesics 15% [Table 2]. However, the highest group of poisoning cases were recorded by the group representing psychiatric agents where the most common product causing poisoning was paracetamol (an analgesic) with a total of 802 reported poisoning cases for the 6 years. This number is considered the highest among other pharmaceutical products and alone accounts for approximately 50% of total analgesic poisoning, and approximately 7.3% from pharmaceutical poisoning in total.

Less common was calamine lotion, which was listed under the group of topical agents, with 323 reported cases, representing approximately 16.6% of topical agent’s cases, followed by 245 acriflavine-related cases representing 12.6% of all topical agents. From among the cough and cold group, chlorpheniramine displayed the highest recorded product with 253 cases or 27.7% of all group cases. Regarding the psychiatric group, the majority of cases were distributed across a variety of psychiatric related products, the highest being for alprazolam, with 168 cases or 7.3%, followed by clonazepam with 142 cases (6.2%) and others consisted of amitriptyline with 86 cases (3.8%), risperidone with 107 cases (4.7%), valproic acid and zolpidem each with 94 cases (4.1%), and lastly haloperidol with 79 cases (3.5%) [Figure 2].

Regarding the distribution of incidences by state, the majority of incidences were reported in the Selangor state area (22.9%) having 2520 cases reported to the NPC followed by 1722 cases (15.7%) in Perak. The less reported number of cases was in Negeri Sembilan and Johor (9.5%), (9.4%), respectively, and (8.5%) in Kuala Lumpur [Table 3].

Concerning the mode of poisoning, the most common (incident category) was related to intentional poisoning (60%), with unintentional poisoning representing 36.75%. From among the 10,998 pharmaceutical poisoning incidents that were reported, suicidal poisoning was the highest (47.3%), followed by

| Table 1: Demographic characteristics of pharmaceutical poisoning cases |
|-----------------------------|----------|--------|
| Characteristics           | Number   | Percent (%) |
| Gender                     |          |          |
| Male                       | 3839     | 34.9    |
| Female                     | 5899     | 53.6    |
| Others                     | 1260     | 11.5    |
| Age group (years)          |          |          |
| 0–4                        | 2527     | 23.0    |
| 5–9                        | 411      | 3.7     |
| 10–14                      | 302      | 2.7     |
| 15–19                      | 1270     | 11.5    |
| 20–29                      | 2579     | 23.4    |
| 30–39                      | 1532     | 13.9    |
| 40–49                      | 838      | 7.6     |
| 50–59                      | 485      | 4.4     |
| Above 60                   | 467      | 4.2     |
| Unrecorded                 | 77       | 0.7     |
| Unclassified adult         | 510      | 4.6     |
| Race                       |          |          |
| Malay                      | 3723     | 33.9    |
| Chinese                    | 2098     | 19.1    |
| Indian                     | 2444     | 22.2    |
| Unrecorded/unknown         | 2020     | 18.4    |
| Others                     | 596      | 5.4     |
| Non-Malaysian              | 117      | 1.1     |

| Table 2: Poisoning cases according to the groups of pharmaceutical agents (total 10,998 cases from 2010 to 2015) |
|---------------------------------------------------------------|
| Pharmaceutical agent       | Number of cases | Percentage (%) |
|-----------------------------|-----------------|----------------|
| Analgesic                    | 1616            | 14.7           |
| Antidiabetic                 | 223             | 2.0            |
| Antiepileptic                | 315             | 2.9            |
| Anti-infective               | 281             | 2.6            |
| Cardiovascular               | 520             | 4.7            |
| Cough and cold               | 911             | 8.3            |
| Cytotoxic                    | 10              | 0.1            |
| Gastrointestinal             | 283             | 2.6            |
| Hematologic                  | 27              | 0.2            |
| Herbal remedies              | 249             | 2.3            |
| Hormones                     | 263             | 2.4            |
| Psychiatric                   | 2287            | 20.8           |
| Respiratory                  | 321             | 2.9            |
| Topical agent                | 1946            | 17.7           |
| Veterinary                    | 22              | 0.2            |
| Vitamins/minerals/food       | 250             | 2.3            |
| supplements                  |                 |                |
| Mixed pharmaceuticals       | 906             | 8.2            |
| Other pharmaceutical         | 530             | 4.8            |
| Unknown pharmaceutical       | 38              | 0.3            |

*The term (other pharmaceutical) refers to a drug or medication which is not listed under any of the above mentioned groups (mixed pharmaceuticals), can be combination drugs, or exposed to more than one medication.
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accidental poisoning (30.5%), and the misuse of pharmaceuticals (5.1%). Interestingly, the number of suicidal poisoning incidences reportedly increased between 2010 and 2011 from (50.9%) to (52.9%), respectively, which then decreased between 2012 and 2013 from 45.9% to 40.3%. However, the incidence of suicidal poisoning subsequently rose after that between 2014 and 2015 to reach 44.8%, as shown in Table 4.

According to the exposure type, most cases were due to acute exposure to the pharmaceutical product itself (90.2%) with chronic (long term) exposure of 0.8%. Acute and chronic exposure combined was 8.5%, meaning that the patient had been using a particular medicine for an extended period with a large dose of the same product consumed by the patient resulting in an acute/chronic type of exposure. According to the route of exposure, the most common route was via ingestion (98.7%), with fewer exposure routes through injection (0.8%), and cutaneous (0.2%), whereas ocular

Table 3: Incidence of reported cases with pharmaceutical poisoning distributed by the states in the whole 6-year period

| State                | Number | Percent (%) |
|----------------------|--------|-------------|
| Perlis               | 9      | 0.1         |
| Kedah               | 523    | 4.8         |
| Pulau Pinang        | 761    | 6.9         |
| Perak               | 1722   | 15.7        |
| Selangor            | 2520   | 22.9        |
| WP Kuala Lumpur     | 935    | 8.5         |
| WP Putrajaya        | 186    | 1.7         |
| Negeri Sembilan     | 1040   | 9.5         |
| Melaka              | 371    | 3.4         |
| Johor               | 1038   | 9.4         |
| Pahang              | 726    | 6.6         |
| Terengganu          | 80     | 0.7         |
| Kelantan            | 197    | 1.8         |
| Sarawak             | 257    | 2.3         |
| Sabah               | 492    | 4.5         |
| WP Labuan           | 16     | 0.1         |
| Unknown             | 125    | 1.1         |
| Total               | 10,998 |             |

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Figure 2: Data of the most common pharmaceutical products that resulted in poisoning over six years, according to the number of reported cases, and regardless of their group product classification

| Product               | Number | Percent (%) |
|-----------------------|--------|-------------|
| Fluvoxamine           | 79     |             |
| Theophylline          | 79     |             |
| Haloperidol           | 79     |             |
| Amlodipine            | 86     |             |
| Potassium permanganate| 91     |             |
| Massage oil           | 93     |              |
| Zolpidem              | 94     |              |
| Methadone             | 106    |             |
| Risperidone           | 107    |             |
| Salbutamol            | 122    |             |
| Tramadol              | 118    |             |
| Methyl salicylate     | 125    |             |
| Carbamazepine         | 133    |             |
| Diphenhydramine       | 136    |             |
| Clonazepam            | 142    |             |
| Alprazolam            | 168    |             |
| Eucalyptus oil        | 182    |             |
| Mefenamic acid        | 203    |             |
| Acriflavine           | 245    |             |
| Chlorpheniramine      | 253    |             |
| Calamine lotion       | 323    |             |
| Paracetamol           | 802    |             |
and inhalation were each 0.1%, and 0.1% for other routes [Table 5].

**DISCUSSION**

The most significant or highest rate of poisoning in Malaysia was due to pharmaceutical agents, among other chemical products. The results of this study revealed that an increase in pharmaceutical poisoning incidences occurred between 2010 and 2011. However, after 2012 the number of reported cases, based on the data, halved because the center had decreased their operating hours to between 9.00 AM and 5.00 PM; before the center was operated 24 h a day. This issue obviously influenced the number of cases that were recorded in 2012 onward. Nevertheless, the percentage of intentional poisonings constantly grew over 6 years. In other countries, the rates of poisoning incidences tend to vary widely, which may be attributed to the country’s culture. For instance, in some countries, patients tend to use folk or traditional medicine for treatment rather than to seek medical advice.[9]

Of the 10,998 recorded cases reported over 6 years resulting from pharmaceutical poisoning in Malaysia, the annual rate of recorded incidents ranged between 4.42 and 8.14 per 100,000 population. Interestingly, women outnumbered men, which is similar to many studies conducted in Middle East countries such as Iran and Turkey, in addition to countries such as the US and Norway.[10-13] Also, sociopsychological problems such as marital disharmony, family conflicts, and loss of family members are more intolerable for women compared to men. For example, Zhang et al.[14] found that suicide attempts, including suicidal poisonings, were more common in women in China.

As mentioned earlier in this study, the incidence of poisoning was often found to be highest among the 20–29 years age group of which a similar finding was found Indian and Iranian studies.[4,10,15] Unfortunately, however, mental stress was often seen to be the cause in the 12–30 years age group with the main reasons being unemployment, starting employment, and settlement in life,[16] and possibly due to failure in relationships, educational matters, and the inability to cope with the high expectation of parents.[17,18] Sadly, this group of people appears to be emotionally unstable or not mature enough to tolerate extreme mental pressure.[19,20]
Notwithstanding, the psychiatric drug group also shows the highest incidence of poisoning among other groups of pharmaceutical agents, of which similar findings have been reported in Turkey.[23] In this study, it was found that paracetamol was responsible for the majority of poisoning incidences associated with drugs, which is similar to those reported in the US and Scotland.[22,23] For instance, in the case of Malaysia, in 2012 the data revealed that 56.7% of reported poisoning incidences were due to intentional poisoning, and 32.4% were a result of accidental poisoning. In contrast, in the US, accidental poisonings were most commonly reported representing approximately 80% of cases in 2012.[24]

In summary, it is anticipated that the poisoning patterns and characteristics associated with the incidence of poisoning in this study will serve as the basis for future study.

**CONCLUSION**

In this study, data related to poisoning and pharmaceutical products in Malaysia were examined by describing in detail the number of reported attempted suicidal cases which were significantly high. Accordingly, this finding warrants adequate safety measures for the storage and application of these substances to be introduced. In addition, parental supervision and educational programs are necessary to curb the high incidence of poisoning among young adults. As such, community psychiatry programs and psychological consults are required to identify high-risk young adults who may be more likely to commit suicide.

**Acknowledgement**

The authors thank staff at the National Poison Centre Malaysia for their contribution to this report, with special thanks to statistician from the National Poison Centre, Noor Afiza Abdul Rani for her contribution in statistical analysis.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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