

## Trends of acute poisoning: 22 years' experience from a tertiary care hospital in Karachi, Pakistan

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### Abstract

**Objective:** To determine the trends of acute poisoning in terms of frequency, nature of poisoning agent, clinical presentation and its outcome.

**Methods:** The retrospective study was conducted at the Aga Khan University Hospital, Karachi, and comprised data of patients who presented with poisoning between January 1989 and December 2010. The patients were randomly selected, and demographic, chemical information, clinical feature, treatment and outcome were analysed using SPSS 16.

**Results:** Of the total hospital admissions during the period, 3,189 (0.3%) were cases of poisoning. Of them, medical records of 705 (22%) cases were reviewed; 462 (65.5%) adult and 243 (34.5%) paediatric cases below 16 years of age. The overall median age was 21 years (interquartile range: 4-32 years). Moreover, 544 (87%) were critical at the time of presentation. In 647 (92%) cases, the poisoning occurred at home. Psychiatric drugs were found involved in 205 (29%) cases, followed by prescription drugs 172 (24.4%), pesticides 108 (15.3%), hydrocarbons 71 (10%), analgesics 59 (8.7%), household toxins 59 (8.7%), alcohol and drug abuse 21 (2.97%) and others 47 (6.67%).

**Conclusion:** Poisoning was a serious cause of morbidity in children and young adults. Medications were the leading cause and home was the most common place of incident.

**Keywords:** Poisoning, Trend, Pakistan, Acute, Poisoning agent. (JPMA 66: 1237; 2016)

### Introduction

Poisoning is a serious public health problem worldwide.<sup>1,2</sup> According to Global Burden of Disease (GBD) study 2010, unintentional poisoning was responsible for an estimated 180.4 thousand deaths. Mortality rate due to this cause was 4 per 100,000 inhabitants, constituting the 47th specific cause of death.<sup>3</sup> According to WHO data 2012, poisoning is a significant global public health problem accounted 84% deaths in low- and middle-income countries and in same year, unintentional poisoning caused the loss of over 10.7 million years of healthy life (disability adjusted life years, DALYs).<sup>4</sup> Acute exposure to a poison, deliberately or accidentally, is also one of the most common reasons for visiting emergency department in many countries.<sup>5-8</sup>

Spectrum of poisoning differs significantly in LMICs as compared to high-income countries (HICs).<sup>9-11</sup> Hydrocarbons and pesticides account for majority of poisoning-related morbidity and mortality in LMICs.<sup>9-11</sup> An epidemiological study from Sri Lanka found the incidence of poisoning to be 75 per 100,000 people with a death rate of 22 per 100,000. In that study, 59% of

poisonings were due to agrochemicals.<sup>10</sup> In India, the case fatality rate (CFR) due to poisoning in children ranged between 0.6% and 11.6%.<sup>9</sup> A Singapore study found poisoning to be one of the most common reasons for hospitalisation along with other injuries and violence.<sup>12</sup>

The magnitude of poisoning is also getting new dimensions. The reasons for these changing trends are socioeconomic patterns, new development of drugs and chemicals, agricultural modernisation, green revolution in various regions and easy access to over-the-counter (OTC) drugs.<sup>13,14</sup> Studies from India had demonstrated this trend shift from arsenic to opium, barbiturates and then to organophosphates over two decades.<sup>15,16</sup> The same study also established that the proportion of urban deaths due to poisoning increased from 45% in the period from 1972 to 1977 to 72% in the period from 1992 to 1997. Suicidal deaths due to poisoning increased from 34% in the period from 1972 to 1977 to 77% in the period from 1992 to 1997, whereas accidental or unintentional deaths due to poisoning decreased from 63% to 17%.<sup>16</sup>

The epidemiological data on poisoning is very limited in Pakistan. In a national health survey of Pakistan, poisoning was the second commonest cause of unintentional injuries after fall in persons aged five years and above.<sup>17</sup>

Other studies done in Pakistan are generally case series

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with a limited time frame.<sup>11,13,14,18</sup> Studies have also focused either on intentional or unintentional poisoning or restricted to adult or paediatric age group.<sup>11,18-21</sup> Knowledge of the temporal changes is a way forward for effective preventive and educational measure. To the best of our knowledge, no study till present has focused on the trends of poisoning over the past 2 decades. It is essential for better policymaking to observe the data for a longer time period and identify specific areas adding to the poisoning cases. Target interventions can then be devised for the communities in general.

The current study was planned to determine the trends of poisoning in terms of frequency, nature of poisoning agent, clinical presentation and outcome.

### Materials and Methods

The retrospective study was conducted at the Aga Khan University Hospital (AKUH), a 450-bed private, urban, tertiary care teaching hospital in Karachi, and comprised patient data from January 1989 to December 2010. The incidence of poisoning was calculated by using the numerator of the total number of poisoning cases admitted (adult and paediatric) and the denominator of the total number of overall admissions with all diagnosis. A representative sample was drawn by using simple random sampling technique for detailed chart review. This sampling was used due to time and resource constraints as population size was big.

For calculating the sample size, an alpha ( $\alpha$ ) level of 5% was used with incidence of poison taken at 5 per 1,000 patients per year in the emergency department. The bound on the error (per 1,000 patients) was taken at 5.5 patients per year. After inflating the sample size to 10% for non-response, a minimum sample of 695 patients was required to fulfil the study objectives. A standardised questionnaire was developed to collect data from patient files. A medical graduate collected the data on data collection tool. Data collection sheet included patient's demographic information, substance information, clinical presentation, management, length of stay and disposition.

SPSS 16 was used for data analysis. Descriptive statistics were obtained and reported as mean with standard deviation and proportion for quantitative and qualitative data, respectively. We also reported skewed continuous data in terms of median with interquartile range (IQR). Univariate association was used for comparison of two groups by using chi-square test for categorical data and continuous variables were compared using t-test. Trend of poisoning was also observed in terms of frequency and the causative substance involved in poisoning. Approval was obtained from the institutional ethical review committee.

### Results

Of the total hospital admissions, poisoning contributed to 3,189 (0.3%) cases. Of them, medical records of 705(22%) cases were reviewed; 462(65.5%) adult and 243(34.5%) paediatric cases aged below 16 years. The peak age group for poisoning was found to be 15- 29 years followed by 0-4 years (Figure-1). The overall median age was 21 years (IQR: 4-32 years). The median age of men was 21 years (IQR:3-35 years) and of women was 22 years (IQR:12-31 years). Psychiatric drugs were found involved in 205(29%) cases, followed by prescription drugs 172(24.4%), pesticides 108(15.3%), hydrocarbons 71(10%), analgesics 59(8.7%), household toxins 59(8.7%), alcohol and drug abuse 21(2.97%) and others 47(6.67%), including occupational and environmental toxin/ metals. More than one substance was taken by 36(5.1%) patients. The most common form of substance was tablet which was used by 397(56.3%), followed by liquid 269(38.2%), fumes 41(5.8%),

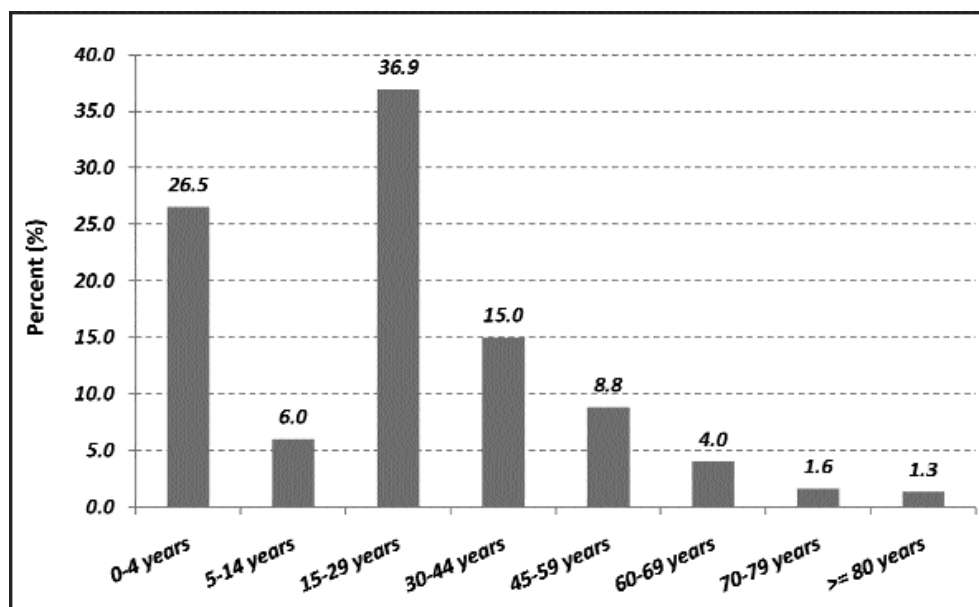


Figure-1: Distribution of poisoning cases by age group (1989-2010).

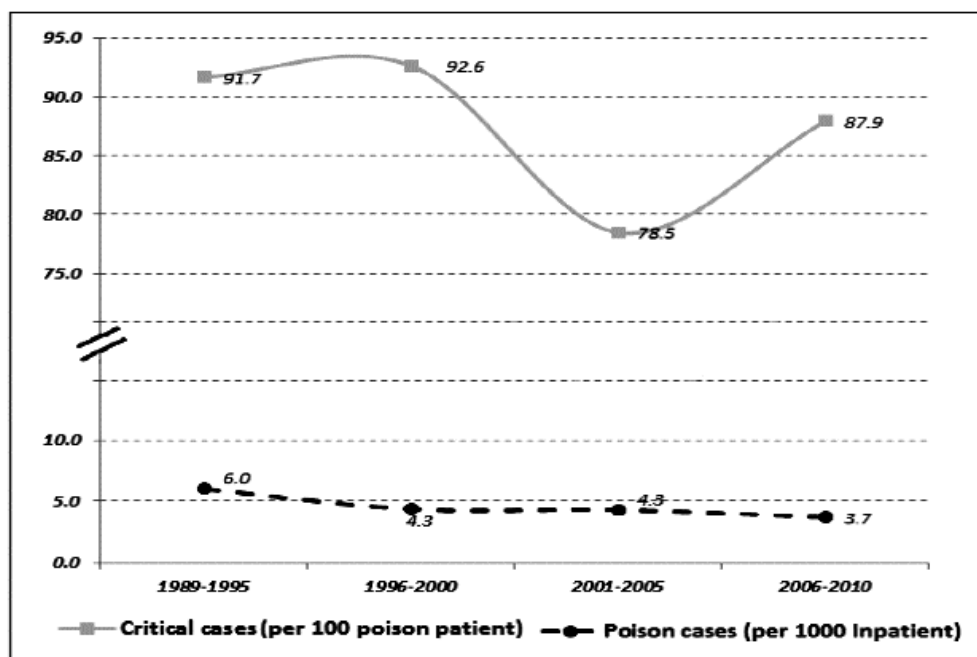


Figure-2: Trend of Incidence of Poisoning and Patient with critical Presentation (according to triage category) from 1989-2010.

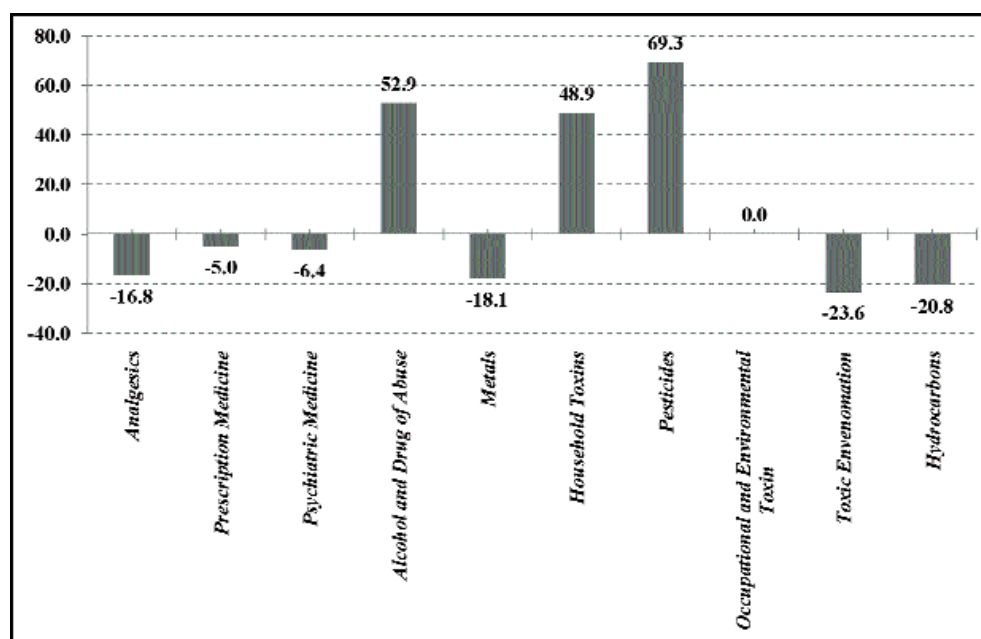


Figure-3: Percent change in substance used in poisoning between 2001-05 and 2006-10.

powder/granular 9(1.3%) and unknown (0.7%). The most common place where the incident of poisoning occurred was home, i.e. in 647(92%). Besides, 487(69%) patients were taken to the hospital after one hour of the incident. Moreover, 322(46%) cases were unintentional, followed by suicidal 233(33%), mental illness 54(8%), homicidal 14(2%)

and 80(11%) with no information. Around 544(87%) were categorised as critical patients on presentation at the triage i.e. Priority 1 and Priority 2.

Although the trends of critical patients showed a dip in 2000-2005, the proportion of critical patients was significantly high over the whole two decades. The incidence of poisoning came down from 6 per 1,000 inpatients in 1989-1995 to 3.7 per 1,000 inpatients in 2006-2010. The incidence remained 4.3 per 1,000 during the periods 1996-2000 and 2001-2005 (Figure-2).

The involvement of toxic envenomation fell by 23.6% between 2001-05 and 2006-10, followed by 20.8%, 18.1%, 16.8%, 6.4% and 5% decline in the use of hydrocarbons, metals and analgesics, psychiatric medicines and prescription medicines, respectively. By comparison, the use of pesticides, alcohol/drug of abuse and household toxins rose 69.3%, 52.9% and 48.9%, respectively (Figure-3).

Antidote(s) were given to 114(16.2%) patients, activated charcoal to 372(52.8%) and gastric lavage to 376(53.3%). The median length of stay in hospital was 2 days (IQR: 1-4 days). There were 61(8.7%) patients with previous poisoning attempts.

In addition, 606(86%) drug/poison containers were properly labelled, 78(11%) were unlabelled and 21(3%) were wrongly labelled.

There were 136(56%) boys in the paediatric group compared to 241(52.2%) women in the adult group

**Table-1:** Comparison of paediatric and adult poisoning patients (n= 705).

| Indicators                                      | Pediatric patients<br>(N= 243)<br>n (%) | Adult patients<br>(N= 462)<br>n (%) |
|-------------------------------------------------|-----------------------------------------|-------------------------------------|
| <b>Gender</b>                                   |                                         |                                     |
| Male                                            | 136 (56.0)                              | 221 (47.8)                          |
| Female                                          | 107 (44.0)                              | 241 (52.2)                          |
| <b>Time from incidence to presentation</b>      |                                         |                                     |
| < one hour                                      | 73(30)                                  | 145(31.4)                           |
| >more than one hour                             | 170(70)                                 | 317(68.6)                           |
| <b>Type of Substance Involved</b>               |                                         |                                     |
| Analgesics                                      | 18 (7.4)                                | 41 (8.9)                            |
| Prescription Medicine                           | 64 (26.3)                               | 108 (23.4)                          |
| Psychiatric Medicine                            | 32 (13.2)                               | 173 (37.4)                          |
| Alcohol and Drug of Abuse                       | 3 (1.2)                                 | 18 (3.9)                            |
| Household Toxins                                | 27 (11.1)                               | 32 (6.9)                            |
| Pesticides                                      | 33 (13.6)                               | 75 (16.2)                           |
| Hydrocarbons                                    | 56 (23.0)                               | 15 (3.2)                            |
| Others                                          | 15 (6.2)                                | 32 (6.9)                            |
| More than One substance involved                | 5 (2.1)                                 | 31(6.1%)                            |
| <b>Form of substance used</b>                   |                                         |                                     |
| Liquid                                          | 127 (52.3)                              | 142 (30.7)                          |
| Tablet                                          | 96 (39.5)                               | 301 (65.2)                          |
| Powder                                          | 2 (0.8)                                 | 7 (1.5)                             |
| Fumes                                           | 17 (7)                                  | 24 (5.2)                            |
| Unknown                                         | 2 (0.8)                                 | 3 (0.6)                             |
| Critical patients categorized on triage (n=627) | 190 (88.4)                              | 354 (85.9)                          |
| <b>Intent of poisoning</b>                      |                                         |                                     |
| Unintentional                                   | 205 (84.4)                              | 119 (25.8)                          |
| Suicidal                                        | 20 (8.2)                                | 213 (46.1)                          |
| Homicidal                                       | 1 (0.4)                                 | 13 (2.8)                            |
| Mental illness                                  | 2 (0.8)                                 | 52 (11.3)                           |
| Others                                          | 15 (6.2)                                | 65 (14.1)                           |
| Length of stay in days; Median (IQR)            | 1 (1,2)                                 | 2 (1,5)                             |

IQR: Inter-quartile range.

( $p=0.04$ ). Prescription drugs were used in 64(26.3%) paediatric cases compared to 108(23.4%) adult cases. In contrast, the use of psychiatric medicine was found in 173(37.4%) adult cases compared to 32(13.2%) paediatric cases ( $p<0.001$ ). Hydrocarbons were involved in 56(23%) paediatric and 15(3.2) adult cases ( $p<0.001$ ). Household toxins were the cause of poisoning in 27(11.1%) child and 32(6.9%) adult cases while alcohol/drug abuse was behind 3(1.2%) child and 18(3.9%) adult cases. More than one substances were used in 31(6.1%) adult cases compared to 5(2.1%) paediatric patients ( $p=0.008$ ). Liquid form of poison was involved in 127(52.3%) paediatric cases while tablet form in 301(65.2%) adult cases. There were 205(84.4%) incidents of unintentional poisoning among children. Other markers were found to be relatively higher in adult population. Median length of hospital stay was greater in adults compared to children (Table-1).

**Table-2** Comparison of Male and Female poisoning patients n= 705).

| Indicators                                      | Male<br>n=357<br>(%) | Female<br>n=348<br>(%) | Male vs<br>Female<br>P-value |
|-------------------------------------------------|----------------------|------------------------|------------------------------|
| <b>Age Group</b>                                |                      |                        |                              |
| 0-4 years (n=187)                               | 115 (32.2)           | 72 (20.7)              | 0.001                        |
| 5-14 years (n=42)                               | 19 (5.3)             | 23 (6.6)               |                              |
| 15-29 years (n=260)                             | 108 (30.3)           | 152 (43.7)             |                              |
| 30-44 years (n=106)                             | 54 (15.1)            | 52 (14.9)              |                              |
| 45-59 years (n=62)                              | 35 (9.8)             | 27 (7.8)               |                              |
| 60-69 years (n=28)                              | 13 (3.6)             | 15 (4.3)               |                              |
| 70-79 years (n=11)                              | 5 (1.4)              | 6 (1.7)                |                              |
| >= 80 years (n=9)                               | 8 (2.2)              | 1 (0.3)                |                              |
| <b>Time from incidence to presentation</b>      |                      |                        |                              |
| < one hour                                      | 111(31.1)            | 107(30.7)              | 0.409                        |
| >more than one hour                             | 246(68.9)            | 241(69.3)              |                              |
| <b>Type of Substance Involved</b>               |                      |                        |                              |
| Analgesics                                      | 30 (8.4)             | 29 (8.3)               | 0.973                        |
| Prescription Medicine                           | 84 (23.5)            | 88 (25.3)              | 0.587                        |
| Psychiatric Medicine                            | 96 (26.9)            | 109 (31.3)             | 0.195                        |
| Alcohol and Drug of Abuse                       | 15 (4.2)             | 6 (1.7)                | 0.053                        |
| Household Toxins                                | 25 (7.0)             | 34 (9.8)               | 0.185                        |
| Pesticides                                      | 53 (14.8)            | 55 (15.8)              | 0.724                        |
| Hydrocarbons                                    | 47 (13.2)            | 24 (6.9)               | 0.006                        |
| Others                                          | 28 (7.8)             | 19 (5.5)               | 0.205                        |
| More than One substance involved                | 20 (5.6)             | 16(4.6%)               | 0.545                        |
| <b>Form of substance used</b>                   |                      |                        |                              |
| Fluid                                           | 144 (40.3)           | 125 (35.9)             |                              |
| Tablet                                          | 194 (54.3)           | 203 (58.3)             |                              |
| Fumes                                           | 4 (1.1)              | 5 (1.4)                | 0.789                        |
| Powder                                          | 21 (5.9)             | 20 (5.7)               |                              |
| Unknown                                         | 2 (0.6)              | 3 (0.9)                |                              |
| Critical patients categorized on triage (n=627) | 277(86.8)            | 267(86.7)              | 0.957                        |
| <b>Intent of poisoning</b>                      |                      |                        |                              |
| Unintentional                                   | 178 (49.9)           | 146 (42.0)             |                              |
| Suicidal                                        | 94 (26.3)            | 139 (39.9)             |                              |
| Homicidal                                       | 11 (3.1)             | 3 (0.9)                | 0.001                        |
| Mental illness                                  | 28 (7.8)             | 26 (7.5)               |                              |
| Others                                          | 46 (12.9)            | 34 (9.8)               |                              |
| Length of stay in days; Median (IQR)            | 2 (1,5)              | 1 (1,3.5)              | <0.01                        |

Gender comparison showed that 115(32.2%) males were aged between 0-4 years and 108(30.3%) between 15-29 years, while 152(43.7%) females were aged between 15-29 years and 72(20.7%) between 0-4 years (Table-2).

Hydrocarbons were used in 47(13.2%) male cases compared to 24(6.9%) females case ( $p=0.006$ ). The use of alcohol and drugs was found involved in 15(4.2%) male and 6(1.7%) female cases ( $p=0.053$ ).

The length of stay was significantly more in males compared to females ( $p<0.01$ ).

## Discussion

Our study highlighted that the incidence of poisoning has

been decreasing over the two decades. According to GBD study 2010, the overall burden of poisoning has gone down, which is consistent with the findings of our study.<sup>3</sup> It is alarming that patients with critical presentation constituted a significantly higher proportion throughout the study period, highlighting the need for both regulatory control and education and awareness at public level and specialised training at the medical facility level. Toxicology is still an unrecognised specialty in our country as there is no specialised training available in clinical toxicology. Also, Pakistan has two poison information centres listed in the World Directory of Poison Centre established by the International Programme on Chemical Safety (IPCS).<sup>22</sup> These centres do not have a clinical toxicologist to care for poisoned patients. The telephonic advice service, poisoning prevention and toxicovigilance activities also need capacity building.<sup>23</sup> These are some similar challenges faced by poison control centres in developing countries.<sup>24</sup>

Overall, the most common agent involved in our setting was medication with a downtrend over the last decade and an increasing trend was noted for pesticides, alcohol and drugs of abuse and household toxins. This was in contrast to published data from developing countries including Pakistan which showed that pesticides and hydrocarbons were the two most common agents involved.<sup>13,14</sup> On the other hand, our data of poisoning agent was similar to studies in developed countries where medications were the most common agent involved.<sup>12</sup> The reason behind this difference was that the AKUH is a private; fee-for-service (FFS) tertiary care referral hospital, getting patient referral from all over Karachi and rural population, but may not be afforded by the poor. People use poisoning agent for which they have easy access, and pesticides are more accessible to poor and rural population compared to medication.

The two peak age groups involved in poisoning were 0-4 years and young adults. This was in conformity with World Health Organisation's (WHO) data.<sup>9</sup> The death at young age and then rising incident of poisoning and high medical acuity of patient in this study require immediate steps to prevent and control poisoning. Our study highlighted that most of the incidents occurred at home and most were unintentional, therefore, steps towards home safety will help in this regard. Manzar et al. have reported several factors for accidental poisoning at home including accessibility of chemicals to children.<sup>25</sup> Further interventional studies are needed to reduce the risk of unintentional poisoning at home.<sup>26</sup>

Majority (69%) of the cases in this study were presented to

the hospital after an hour. This is an important finding as, according to recent guidelines, decontamination procedure including gastric lavage and charcoal are effective if performed within one hour of poisoning incident.<sup>27</sup> This is one of the reasons that only 53% of patient underwent gastric lavage and only 52% received charcoal. Various factors accounted for delayed presentation including public awareness, accessibility to care and pre-hospital care.<sup>28</sup> Poison control centre could take a lead in timely intervention in these cases through telephonic advice service.

We could not find wrong labelling as a cause of poisoning in our study. Studies have reported that mislabelling and wrong container, like soft drink bottles as storage for pesticide, cleaning product and kerosene, as a factor in accidental poisoning.<sup>29</sup> The reason behind this discrepant finding is that the majority of cases were related to prescription medications, which are generally labelled.

Our study, however, was not without its limitations, including a retrospective design, being single-centred and private tertiary care hospital setting. Data only included admitted patients while patients discharged from emergency department were missed, leading to underestimation of true incidence. Since intentional poisoning is a medico-legal case in Pakistan and requires police reporting, there is a possibility that families feeling reluctant to go to hospital further underestimated the problem. Despite these limitations, this study contributed to already existing epidemiological data of poisoning.

## Conclusion

Poisoning was a serious and increasing threat to young lives. Home was found to be the most common place of incident. Late presentation was one of the barriers in timely interventions. Psychiatric medicines were the most common agent in poisoning, followed by other prescription medications, pesticides and hydrocarbons.

## Acknowledgment

We are grateful to Johns Hopkins-Pakistan International Collaborative Trauma and Injury Research Training programme for partially supporting two of the authors through the Fogarty International Centre of the USA National Institute of Health (NIH). The content, however, is solely the responsibility of the authors and do not represent the views of Fogarty or NIH.

**Disclosure:** No.

**Conflict of Interest:** No.

**Funding Sources:** No.

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