

ORIGINAL ARTICLE

POISONS IMPLICATED IN HOMICIDAL, SUICIDAL AND ACCIDENTAL CASES IN NORTH-WEST PAKISTAN

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Background: Pakistan has one of the highest prevalence of poisoning in the world. However, limited data exist on the frequency of poisons implicated in homicidal, suicidal, and accidental cases in North-West Pakistan (Khyber Pakhtunkhwa). **Methods:** This retrospective study of 353 cases and biological specimens of poisoning received at the department of Forensic medicine and toxicology, Khyber Medical College Peshawar from 13 districts of Khyber Pakhtunkhwa. Frequency of poisoning was assessed by testing each specimen for 17 different poisons. **Results:** Of all the specimens, 250 (70.8%) specimens tested positive and the rest didn't show any indication of poisoning (n=103, 29.2%). The most frequent poisons detected were benzodiazepines (total n=75), organophosphates (total n=58), phencyclidine (total n=30) and morphine (total n=23). Gender had a significant association with benzodiazepines ($p=0.011$), tricyclic antidepressants ($p=0.001$), and organophosphates ($p<0.001$). Organophosphates were the most common cause of poisoning in females while benzodiazepines were the most common cause of poisoning in males. **Conclusion:** Poisoning by benzodiazepines, organophosphates and phencyclidine are the most common causes of intoxication in population of Khyber Pakhtunkhwa. Source of poisoning varies with gender for organophosphates, benzodiazepines and tricyclic antidepressants.

Keyword: Poisoning, Organophosphates, Benzodiazepines, phencyclidine, Morphine

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INTRODUCTION

In different manner of self-annihilation, poisoning is common since old times. The choice of intoxicants depends on availability, cost and harmful effects of poison and territorial circumstances. Accidental and suicidal poisoning is a substantial contributor to ill health and increased fatality rate in the humankind.¹ There are approximately 3 million cases of poison intoxication, around 2,20,000 death occur annually worldwide, 90% amongst these occur in developing countries particularly among agrarian workers.² Pakistan being an agricultural country, agrochemicals are predominant cause of death due to poisoning. The mortality rate of poisoning in developing countries like Pakistan is quite high (15–30%).¹

Poisoning is predominant in percentages of population throughout Pakistan^{1,3} but tendency of poisoning varies from region to region. In some countries the common cause of death due to poisoning is by and large due to detergents and cosmetics, other household poisons include carbon monoxide (CO) and acetaminophen which are frequently used as elements for poisoning. The most common ingested substances worldwide were petroleum products. Alkaline cleaners, Opiates, Tricyclic Antidepressants and Benzodiazepines. A small percentage of cases are multi-drug related poisoning. Opiates are the most common agents which accounts for poisoning in below 6 months old.

Decreased level of consciousness and vomiting are the most common signs and symptoms.

Organophosphate poisoning is normally used in agribusiness and is common self-destructive agent in Pakistan and other Asian countries. It causes ill health and kills hundreds of people each year in Pakistan and its neighbouring countries. The exact prevalence of organophosphate poisoning is not known in Pakistan as many cases are not reported, due to religious, social or cultural reasons. Benzodiazepines and organophosphate compounds are commonly used for intentional poisoning.

Although studies have reported cases of poisoning by organophosphates⁴⁻⁸, benzodiazepines, morphine and other poisons in Pakistan, none of these studies have considered a group of poisons together and from a geographically wide area. The aim of this study was to investigate the prevalence of 17 different poisons in cases of male and female poisoning received for forensic and toxicological examination from 13 districts of Khyber Pakhtunkhwa.

MATERIAL AND METHODS

This was a longitudinal study conducted at the Forensic medicine and toxicology department of Khyber Medical College Peshawar, Khyber Pakhtunkhwa. The study included all cases (n=353) of poisoning (patients or their biological material)

referred to the laboratory for toxicological analysis between January 2012 and March 2013. The regions included 13 districts of Khyber Pakhtunkhwa including district Peshawar, Mardan, Kohat, Charsadda, Swabi, Dera Ismail Khan, Tank, Swat, Abbottabad, Haripur, Dir, Buner, and Malakand agency. Two cases were referred from Azad Jammu and Kashmir and district Attock in Punjab. Ethical approval was obtained from the Khyber Medical College ethics committee.

We included total of 353 cases including 103 (29.18%) females and 250 (70.82%) males of all ages in this study. Stomach washings, blood, urine, body organs, tissues, milk, nail, hair, skin, vomitus, and non-biological materials (such as Pepsi cola and juices) were screened for toxicology. Each specimen was tested for methamphetamine, tricyclic antidepressants, organophosphates, morphine, benzodiazepines, methadone, phencyclidine, THC, barbiturates, chertanine oxide, alcohol, carbon monoxide, cocaine, canabinol, chloroform, barium phosphide, and phallogdin.

Data on participants' gender and positive or negative report on toxicology screening was organized on Microsoft excel sheets and then analysed using Minitab® version 17 (Minitab corporation, Illinois, USA). Frequencies of toxicological reports were calculated as counts and percentages. The association of poisoning with male or female gender were calculated using Chi square test. P value of less than 0.05 was considered as significant.

RESULTS

Taken together, the most abundant specimen collected from the patients was either blood or urine (n=137; females, n=33 and males, n=104. The most frequent specimen from female patients was that of stomach wash [n (%); 36 (34.95)] and blood/urine for males [n (%); 104 (41.6)].

Specimens for all patients were tested for 17 poisons (Table-1) of which 250 (70.8%) specimens tested positive and the rest didn't show any indication of poisoning (n=103, 29.2%). The most frequent poisons detected were benzodiazepines (total n=75), organophosphates (total n=58), phencyclidine (total n=30) and morphine (total n=23) (Table-1). Of particular note, frequency of specimens from male cases compared to females was higher for benzodiazepines [n (%), males; 62 (17.56), females; 13 (3.68)], morphine [n (%), males; 19 (5.38), females; 4 (1.13)], phencyclidine [n (%), males; 23 (6.52), females; 7 (1.98)] and methamphetamine [n (%), males; 17 (4.82), females; 4 (1.13)]. On the other hand, frequency of

positively tested specimens was higher in females compared to males for organophosphates [n (%); females; 32 (9.07), males; 26 (7.37)] and tricyclic antidepressants [n (%); females; 9 (2.55), males; 4 (1.13)] (Figure-1). Chi-square associations were calculated to assess possible associations of gender with the type of poisons reported. Gender had a significant association with benzodiazepines (p=0.011), tricyclic antidepressants (p=0.001), and organophosphates (p<0.001) (Table-2).

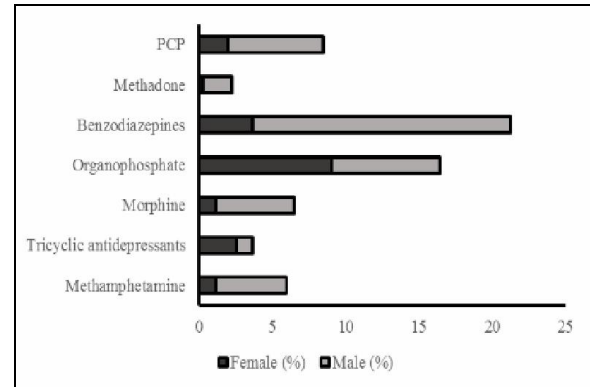


Figure-1: Percentage frequency of specimens and positive cases of most common poisoning for male and female cases

Table-1: Frequency of specimens and positive cases of poisoning for male and female cases

Variable	Female n (%)	Male n (%)
Total (n=353)	n=103 (29.18%)	n=250 (70.82%)
Specimen		
Blood/Urine only	33 (32.04)	104 (41.6)
Non-Biological Material	2 (0.97)	8 (3.2)
Organs/Body Tissues	20 (19.42)	73 (29.2)
Stomach wash only	36 (34.95)	39 (15.6)
Stomach wash plus Blood/Urine	12 (11.65)	26 (10.4)
Poison		
Methamphetamine	4 (1.13)	17 (4.82)
Tricyclic antidepressants	9 (2.55)	4 (1.13)
Morphine	4 (1.13)	19 (5.38)
Organophosphate	32 (9.07)	26 (7.37)
Benzodiazepines	13 (3.68)	62 (17.56)
Methadone	1 (0.28)	7 (1.98)
phencyclidine	7 (1.98)	23 (6.52)
THC	0 (0.00)	5 (1.42)
Barbiturates	1 (0.28)	4 (1.13)
Chertanine Oxide	0 (0.00)	1 (0.28)
Alcohol	0 (0.00)	4 (1.13)
Carbon monoxide	0 (0.00)	1 (0.28)
Cocaine	0 (0.00)	1 (0.28)
Canabinol	0 (0.00)	2 (0.57)
Chloroform	1 (0.28)	1 (0.28)
Barium phosphate	1 (0.28)	1 (0.28)
Phallogdin	0 (0.00)	1 (0.28)

Values are expressed as n (%), THC

Table-2: Chi-square associations depicting association of gender with particular poisoning substance

Poison	Female (n=103)		Male (n=250)		p-value
	Count	Expected count	Count	Expected count	
Methamphetamine	4	6.13	17	14.87	0.292
TCA	9	3.79	4	9.21	0.001
Benzodiazepines	13	21.88	62	53.12	0.011
Organophosphates	32	16.92	26	41.08	<0.001
Morphine	4	6.71	19	16.29	0.198
Methadone	1	2.33	7	5.67	0.294
phencyclidine	7	8.75	23	21.25	0.462
THC	0	1.46	5	3.54	0.148
Barbiturates	1	1.46	4	3.54	0.649
Chertanine Oxide	0	0.292	1	0.708	NC
Alcohol	0	1.17	4	2.83	0.197
Carbon-monoxide	0	0.292	1	0.708	NC
Cocaine	0	0.292	1	0.708	NC
Canabinol	0	0.58	2	1.42	NC
Chloroform	1	0.58	1	1.42	NC
Barium phosphide	1	0.58	1	1.42	NC
Phalloidin	0	0.292	1	0.708	NC

TCA; tricyclic antidepressants, PCP, THC, NC; p-value not computable due to low numbers Tranquilizers, arsenic and ciprofloxacin are not included in the table as they were not detected in any of the case

DISCUSSION

This is the first study in Pakistan investigating the frequency of 17 different poisons in a single study and a wide range of population from 13 districts of Khyber Pakhtunkhwa. Over a period of one year, our study showed that most common cause of poisoning detected in patients referred to forensic department were those of benzodiazepines, organophosphates, phencyclidine and morphine in a decreasing order of frequency. Furthermore, organophosphates were the most common source of poisoning in females while benzodiazepines were the most commonly reported poisoning in males.

Poisoning with benzodiazepine was the most common cause of poisoning reported in our study. Self-poisoning with benzodiazepines especially bromazepam, lorazepam and diazepam is very common due to its pharmaceutical indication, easy availability over the counter.^{9,10} Several other studies have reported higher incidence of benzodiazepine poisoning⁹⁻¹³ as high as 60% of the reported poisoning^{3,10,13} both in males¹¹ and females¹². Despite its frequent use, deaths reported due to the overdose of benzodiazepines are lower (<2%).

Higher prevalence of organophosphorus poisoning in females have also been reported in previous Pakistani studies reporting females to male ratio of 3:2⁴, 5:1⁵, 3:2⁶, and accidental poisoning in 1-3 years female children compared

to male children in a ratio of 5:2⁸. Others have reported almost equal incidence of poisoning both in males and females (1:1). In contrast, Shaikh et al studied 100 cases of organophosphorus poisoning received in accident and emergency over one year period of which only 22% were females and the rest (78%) were males.⁷ Organophosphates are commonly used in agriculture and are therefore easily accessible for suicidal, homicidal, and incidental cases in homes.¹⁰ The prevalence is reported high in unmarried women of low income families⁶ or house wives. However studies showing lower female to male ratio of organophosphorus poisoning suggest that abundant and easy accessibility of these compounds make them an easy source of accidental as well as intentional poisoning. Among other poisons, morphine and phencyclidine were commonly reported poisons from the specimens received. Only few studies have reported poisoning by opiates such as morphine (3%).³

Our study was limited by lack of data on other variables such as age, marital status, socioeconomic conditions, intent of poisoning, whether self-administered or by someone else etc. These could give us an insight into the causes of poisoning. Furthermore, we have no data on the circumstances of sample collection and the quality of sample collected from the patient. Different types of biological samples were investigated. The results may therefore have been affected because of different rates of absorption and metabolism in the body. Despite these limitations, this is still the largest study reporting poisoning cases from a wide geographical region of Khyber Pakhtunkhwa.

CONCLUSION

Poisoning by benzodiazepines, organophosphates and phencyclidine are the most common causes of intoxication in population of Khyber Pakhtunkhwa. Source of poisoning significantly vary between males and females especially with organophosphates, benzodiazepines and tricyclic antidepressants. Further studies are suggested to investigate the causes of poisoning by these agents to help government develop policy for the prevention of such incidents.

AUTHOR'S CONTRIBUTION

AJ, MJK: contributed to concept development and designed study; AJ, MJK, MTHK collected data, performed the tests; MJK, analysed other data, performed the statistical analysis; MJK, SF drafted the manuscript; SF, MTHK, and MTMK revised manuscript. None of the authors had a personal or financial conflict of interest to disclose.

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