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Research Article

**COMPARATIVE ANALYSIS OF INDIVIDUAL MORTALITY RATES
AMONG FEMALE PATIENTS PRESENTING WITH PARAPHENYLENE
DI-AMINE AND ORGANOPHOSPHATE POISONING AT NAWABSHAH****Ejaz Ahmed Awan¹, Shahla Imran², Nadia Aslam³, Afzal Memon⁴ and
Muhammad Muneeb⁵**¹ Dept. of Forensic Medicine & Toxicology,

(Peoples University of Medical & Health Sciences for Women, Nawabshah).

^{2,3} Dept. of Forensic Medicine & Toxicology - Bilawal Medical College, Liaquat University,
Jamshoro.^{4,5} Dept. of Forensic Medicine & Toxicology - Indus Medical College, Tando Muhammad Khan.**Abstract:****Objective:** To compare the individual mortality rates exclusively among female patients presenting with paraphenylene di-amine and organophosphate poisoning at Nawabshah during 2013-2015.**Methodology:** This comparative analysis comprised of a sample of 380 patients female patients presenting to the Surgical Intensive Care Unit Peoples University of Medical & Health Sciences for Women, Nawabshah with Paraphenylene di-amine or organophosphate poisoning from January 2013 to December 2015. The information that constituted the variables of the study, apart from the individual mortality rates, was about basic socio-demographics. The data was analyzed on SPSS version-20 and presented as frequencies and percentages whereas age was presented as mean±SD. Chi square test was used for comparison between types of poisons and their outcomes, and frequency tables and cross tabulation was used to present the study findings.**Results:** Out of the total 380 cases of poisoning, there was 235 (61.8%) paraphenylene diamine and 145 (38.2%) organophosphate poisoning cases. Most of the population (76.8%) belonged to the age group 16-30 years. Majority of the cases 162 were reported in 2014 and most of the patients (108 cases) expired during 2014. There was a significant difference (p value = 0.001) when comparison between the types of poisons and their outcomes was done.**Conclusions:** In female population of our region, paraphenylene diamine poisoning was the main source of poisoning compared to the rates of organophosphate poisoning with a higher mortality rates, especially in youth.**Keywords:** Organophosphate, Poisoning, Paraphenylene Diamine and Suicide**Corresponding author:****Dr. Ejaz Ahmed Awan,**

Assistant Professor,

Department of Forensic Medicine & Toxicology,

Peoples University of Medical & Health Sciences for Women,

Nawabshah (SBA), Sindh, Pakistan.

Telephone # 0335-9900369, Email: dr.ejazawan@gmail.com

QR code



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INTRODUCTION:

According to the World Health Organization (WHO) estimates, there were 873,000 suicides globally in 2002, contributing to the increasing rates of premature mortality. [1] Poisoning is the most common method of committing suicide in Asian countries with enormous disparity in sociocultural, religious, and economic backgrounds in this region. [2, 3] Recent data from Asian countries suggests that there may be 300,000 per year suicidal cases due to the deliberate ingestion of pesticides. [4, 5] Moreover, recent reports suggest that pesticides are now the most common method of suicide worldwide. [6] However, unlike the developed countries where other substances are used for self-harm, agricultural pesticides are the most commonly used substances for self-poisoning in developing countries. [4] Noticeably, the overall case fatality resulting from the pesticide poisoning ranges from 10% to 20%. [7] Therefore, pesticide poisoning –related deaths have a major contribution to increasing rates of suicide in developing countries, especially in rural areas. [8]

Organophosphate (OP) compounds significantly cause mortality and contribute to the increasing rates of mortality, specific to the South Asian context. [9] Previous literature reports 65-79.2%, 40-60%, and 10-36.2% cases of organophosphate poisoning in developing, African and developed countries respectively. [10] Additionally, youth (aged 21-30 years) has the major contribution to the pesticide-related deaths. [9] Likewise, Paraphenylene diamine (PPD) or black stone, a common hair-dye ingredient in South Asia, has recently emerged as a new means of suicidal attempts in developing countries especially in Asia and Africa. [11, 12] Furthermore, PPD poisoning cases have been dominated by females and young people (15-35 years). [4] Several factors may be held responsible for increased rates of poisoning in developing countries and young females including family and marital conflicts, low socioeconomic status, unemployment, social and emotional issues, and ease of access to the poisons. [13]

The rates of self-harm rates peak in the population of 15-24 year olds and are generally highest among women due to the tendency of young people, particularly females, to engage in impulsive acts of self-harm. [4] It has been reported that pesticides are a common method of self-poisoning and suicide in our country where suicide rates due to pesticide poisoning range from 15% to 39%. [14] However, recent reviews suggest that the data from Pakistan on the topic of self-poisoning is limited. [6] There are

several studies conducted in Pakistan regarding the cases of organophosphate poisoning but there is scarcity of literature on this topic from small, rural areas of the country. [14] In the same way, a few studies have been conducted in Pakistan on paraphenylene diamine poisoning but the existing knowledge is limited and does not particularly address female youngsters. [15] Considering the limited amount of data especially from rural areas, this study was conducted to determine the poisoning rates and outcomes exclusively among females in Nawabshah during 2013-2015.

METHODOLOGY:

After due approval from the institutional ethical committee of Peoples University of Medical & Health Sciences for Women, Nawabshah, this casual comparative analysis was conducted upon a sample of 380 patients female patients presenting to the study setting (Surgical Intensive Care Unit, P.U.M.H.S, Nawabshah) with Paraphenylene diamine or organophosphate poisoning from January 2013 to December 2015.

These patients were initially admitted to the Emergency Department and Department of Medicine and were then, shifted to the Surgical Intensive Care Unit for management. The data for organophosphate and paraphenylene diamine poisoning cases was extracted for this study. Moreover, the data was included irrespective of the modes of poisoning i.e. accidental or intentional. Information on female patients only was obtained and children, male patients and other causes of poisoning was excluded from the study.

The information that constituted the variables of the study, apart from the individual mortality rates, was about basic socio-demographics. The data was analyzed on SPSS version-20 and presented as frequencies and percentages whereas age was presented as mean±SD. Chi square test was used for comparison between types of poisons and their outcomes, and frequency tables and cross tabulation was used to present the study findings.

RESULTS:

Out of the total 380 cases of poisoning, there was 235 (61.8%) paraphenylene diamine and 145 (38.2%) organophosphate poisoning cases. The outcomes of poisoning demonstrated that 234(61.6%) cases were cured, 128(33.7%) expired and 18(4.7%) were referred to other hospitals for management. [Table 1]

Table 1 Total poisoning cases by type and the outcomes of poisoning

Type of poison	Frequency	Percentage
OPP	145	38.2
PPD	235	61.8
Outcome	Frequency	Percentage
Cured	234	61.6
Expired	128	33.7
Referred	18	4.7

The mean age of the patients was 24.26(9.5) years. Most of the population (76.8%) belonged to the age group 16-30 years. The age of the patients ranged between 1 and 70 years. [Table 2]

Table 2 Age distribution of the participants

Age Group	Frequency	Percentage
1-15	28	7.4
16-30	292	76.8
31-45	47	12.4
46-60	12	3.2
61-75	1	0.3

There were 80, 162 and 138 cases during 2013, 2014 and 2015 respectively. Most of the patients (108 cases) expired during 2014. Poisoning cases by year for each type of poison and their outcomes are shown in Table 3.

Table 3 Poisoning cases by year and their outcomes

Year	Poison		Total
	OPP	PPD	
2013	32	48	80
2014	57	105	162
2015	56	82	138
Year	Outcome		
	Cured	Expired	Referred
2013	45	32	3
2014	108	45	9
2015	81	51	6

Majority of the patients (90 cases) expired due to the PPD poisoning. There was a significant difference (p value = 0.001) when comparison between the types of poisons and their outcomes was done. [Table 4]

Table 4 Comparison between types of poisons and their outcomes

Poison	Outcome				P value*
	Cured	Expired	Referred	Total	
OPP	105 (72.4%)	38 (26.2%)	2 (1.4%)	145	0.001**
PPD	129 (54.9%)	90 (38.3%)	6 (6.8%)	235	
Total	234 (61.6%)	128 (33.7%)	18 (4.7%)	380	

*Chi square test was used; **significant at p <0.05

DISCUSSION:

The developing world, due to the lack of health facilities and control, and increasing gender and health disparities, is facing a continuous rise the rate of suicides by means of pesticide, particularly organophosphate, and paraphenylene diamine poisoning. [4, 15] The current study extended the previous knowledge base and determined the poisoning rates and outcomes exclusively among females in Nawabshah during 2013-2015. Paraphenylene poisoning was more prevalent and

devastating than organophosphate poisoning in our population with the majority of the poisoning victims being young adults.

Several previous studies have found female predominance in cases of paraphenylene diamine and organophosphate poisoning in the range of 56% to 85% specifically in young population. [15-19] This forms the strength of the study and the main reason to conduct this study. The mean age of the study population in this study was 24.25 years. These

findings were consistent with the previous reports where young females (in the range of 24.7 to 27.7 years) were more likely involved in the use of pesticides (e.g. organophosphate compounds) and paraphenylene diamine as a source of self-harm. [4, 15, 16, 19-21] Studies have reported that PPD poisoning was observed in young people aged 15 to 24 years. [4, 15] This preponderance of young females inclined to self-poisoning warrants an immediate public health attention for the stakeholders and policy makers.

It is well-established that pesticide poisoning-related deaths have a major contribution to increasing rates of suicide in developing countries, especially in rural areas. [8] In this study, 38.3% patients died due to paraphenylene diamine poisoning and 26.2% patients died due to organophosphate poisoning ($p=0.001$). Several retrospective and cross-sectional studies have reported mortality rates in poisoning cases in the range of 14.7% to 42%. [4, 15, 22] This variation may likely be due to the difference in the study duration, time of the study, sample size and methodological variation, geographical difference, amount and time elapsed for the consumption of poison, and availability of the management facilities. Similarly, mortality rates due to organophosphate poisoning range between 3-25%. [23] A study reported that there are on average 500-1000 patients admitted to the hospital annually due to the organophosphate poisoning with 18% mortality rate. [24] Several studies from Pakistan have reported high mortality rates in organophosphate poisoning cases accompanied by a huge public health burden. [24-26]

Strengths and limitations: Although the present study extends the previous work on poisoning cases in Pakistan, there are some limitation that should be addressed. Firstly, due to the observational nature of the study where patients' charts were reviewed, limited information from the patient records was extracted. Second, the data was limited to one setting only. Third, the underlying causes of the poisoning and the mode of poisoning could not be investigated, due to the nature of the study, to have a better understanding of the issue. It is recommended that future studies should be prospective and longitudinal in nature involving biochemical analysis, duration of hospital stay, management protocol followed, time and amount of consumption of the poison, clinical characteristics, and possible consequences of poisoning, and should be multi-institutional to provide better findings of this problem.

CONCLUSION:

Poisoning, especially with pesticides has recently emerged as a main source of suicide globally. In female population of our region, paraphenylene diamine poisoning was the main source of poisoning compared to the rates of organophosphate poisoning with a higher mortality rates, especially in youth. We recommend that stakeholders and policymakers should pay an immediate attention to this issue and should control the sales of organophosphate and paraphenylene diamine poisoning in this region.

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