

Paraphenylene Diamine Poisoning in Nawabshah, Pakistan From 2011 to 2014: Trend & Outcomes

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ABSTRACT

Objective: To analyze the trend and outcomes of PPD poisoning over a period of four years.

Study Design: Retrospective trend analysis.

Setting: Surgical Intensive Care Unit (SICU), Peoples University of Medical and Health Sciences for Women, Nawabshah, Pakistan.

Material and Methods: Data from 2011 to 2014 on paraphenylene diamine poisoning were extracted from the medical records and reviewed. The data extracted included yearly and monthly cases received at SICU and their outcomes after the management of PPD poisoning.

Results: From 2011 to 2014, there were 594 cases received in SICU for PPD poisoning and 69% of them were cured whereas 28% died during the course of management. The maximum number of cases were reported in June (15%) and maximum cases were received during May to August (49.8%) each year during 2011 to 2014.

Conclusions: PPD poisoning as a source of suicide is increasing over time in this region. The cases peak during the mid of the year particularly from May to August and subsequently affect the outcomes. Despite the efforts taken for managing these cases, almost one third of the patients die.

Keywords: Paraphenylene diamine, PPD, poisoning, outcome, suicide

INTRODUCTION:

Paraphenylene diamine (PPD) is a common constituent of hair dye preparations in Middle Eastern, South Asian and African countries while its use is rare in the west.¹ It is used to enhance the rapid darkening effect of the hair dye and for other cosmetic and industrial purposes.² Hair dyes have been used since centuries but in 1856, the first artificial dye was synthesized.^{3,4} PPD was being used in hair dying since 1883.⁴

PPD has been reported as a source of intentional or accidental cause of poisoning in developing countries from Asia and Africa.⁵ The first case of PPD poisoning was documented in 1924 in a hair salon owner.^{2,3,6} PPD is highly toxic and has been reported to damage muscular, respiratory, integumentary and renal systems culminating into death of an individual in most of the cases.^{2,7} The systemic side effects of PPD poisoning are dose-dependent and with the individuals' effect, based on their potential susceptibility.^{7,8}

Numerous studies have been conducted in Khartoum, Sudan, Casablanca, Morocco and India on reports of PPD poisoning.^{5,9} More recently, Abdul Rahim *et al.* reported 178 cases of PPD poisoning in their study in Nawabshah and concluded that PPD poisoning is a newer trend of committing suicide in their area.¹⁰ Radhika *et al.* in their study discuss some of the retrospective studies conducted in Africa which points to the scarcity of such studies in South Asia.⁴

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None of the studies have discussed trend analysis related to PPD poisoning cases. Particularly to the context of Pakistan, literature is scarce on this topic. This study aims to analyze the trend and outcomes of PPD poisoning over a period of four years.

MATERIAL & METHODS:

After obtaining the ethical approval the data on parapahenylene diamine poisoning were extracted from the medical records of Surgical Intensive Care Unit (SICU), Peoples University of Medical and Health Sciences for Women Nawabshah. We reviewed all the cases concerning PPD poisoning from 2011 to 2014. The data extracted included yearly and monthly cases received at SICU and their outcomes after the management of PPD poisoning.

Nawabshah is located in the center of the Sindh Province surrounded by District Sanghar and Khairpur on East, river Indus on West, District Naushahro Feroze on North and District Matiari on South.¹¹ [Fig 1]

The major proportion of population resides in rural areas. According to 1998 census the population was 189244 people which was worked out to be 235041 people in 2004.¹²

We used SPSS version-20 and MS Excel 2007 for data entry and analysis. The variables were presented in tables and graphs. The data was represented in frequencies and percentages.

RESULTS:

The retrospective review of the PPD poisoning yielded 594 cases during the period of four years. The most recorded cases 32.2% and 24.4% of the total were reported during 2014 and 2013 respectively. Survival rate of the patients ranged between 65 to 76% and the mortality rate was as low as 22% and as high as 36%. From 2011 to 2014, there were 594 cases received in SICU for PPD poisoning and 69% of them were cured whereas 28% died during the course of management. [Table 1]

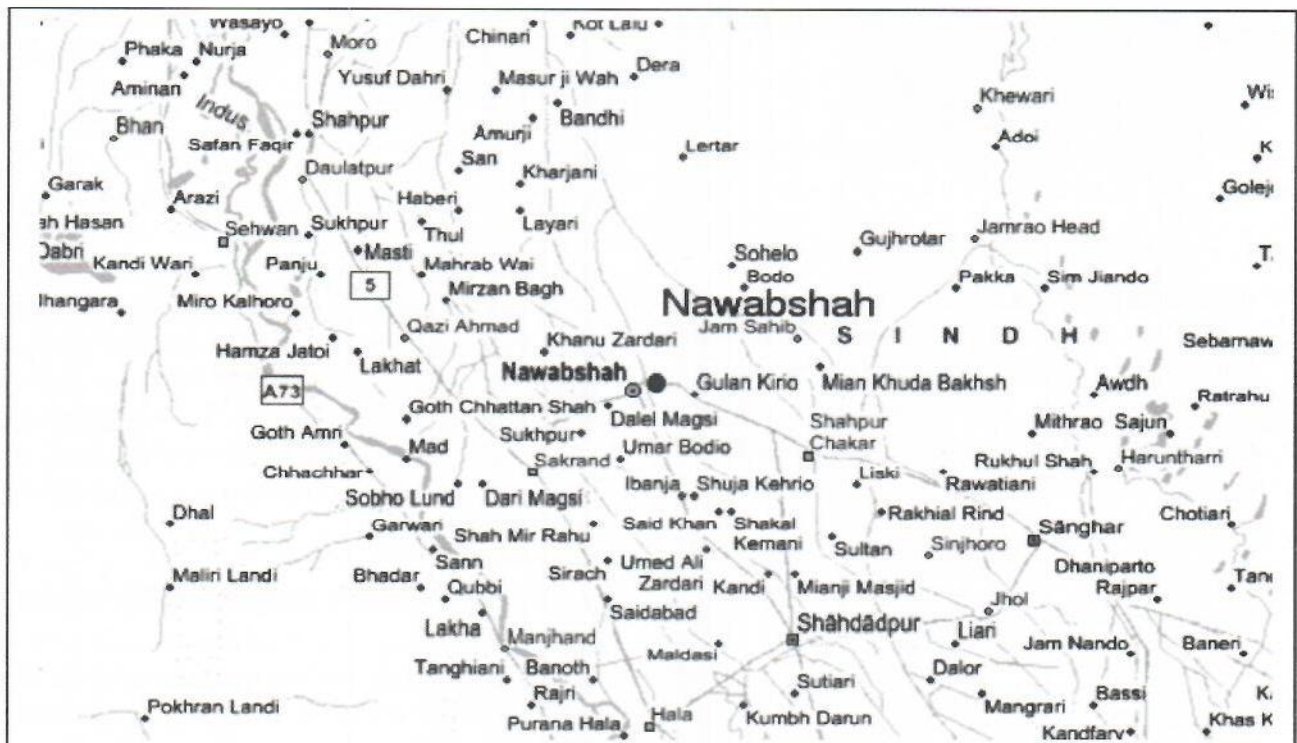
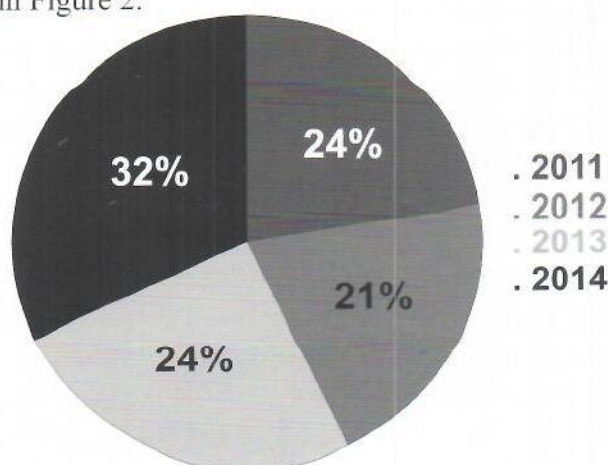


Fig-1: Adopted from: SEDA. Assessment Report of the Losses, Damages and Needs Caused By Heavy Rainfall in 2011 District Shaheed Benazirabad (Nawabshah) Sindh Pakistan October 26, 2011. URL: www.sedapk.org/documents/assessment-benazirabad.pdf

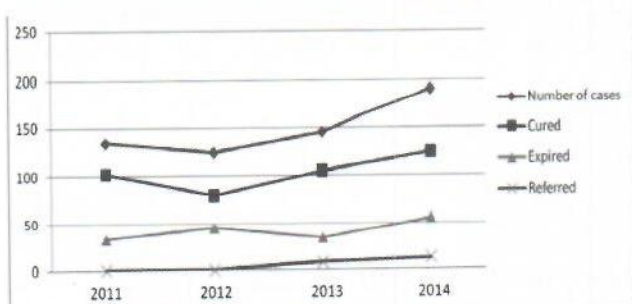
Table-1: PPD Poisoning Cases Reported from 2011 to 2014 & their Outcomes

Year	Number of Cases	Outcomes		
		Cured	Expired	Referred
2011	134	102 (76.1%)	32 (23.9%)	0 (0%)
2012	124	79 (63.7%)	45 (36.3%)	0 (0%)
2013	145	105 (72.4%)	33 (22.8%)	7 (4.8%)
2014	191	124 (65%)	56 (29.3%)	11 (5.7%)
Total	594	410 (69%)	166 (28%)	18 (3%)

The Total Distribution of Cases by Year is Shown in Figure 2.

**Fig-2:** Total Cases of PPD Poisoning by Year

The trend analysis shows that the number of cases for PPD poisoning declined in 2012 but the deaths reported during that year were significantly higher. However, during the preceding years, the number of cases had increased but with least deaths recorded in 2013. [Fig 3]

**Fig-3:** Trend of PPD Poisoning during 2011-2014

The maximum number of cases were reported in June (15%) and peak cases were received during May to August (49.8%) during the year. Similar were the statistics for the outcomes of the cases. [Table 2]

Table-2: PPD Poisoning Cases Reported Monthly & their Outcomes from 2011-2014

Year	Number of Cases	Outcomes		
		Cured	Expired	Referred
January	51	35	15	1
February	58	37	21	0
March	45	29	15	4
April	39	26	13	0
May	72	50	20	2
June	89	63	24	2
July	72	54	12	6
August	63	43	20	0
September	28	23	5	0
October	30	21	8	1
November	24	15	7	2
December	23	17	6	0

Monthly distributions of the cases and their outcomes is shown in Fig 4

DISCUSSION:

For attempting suicide, self-poisoning is one of the ancient way with various reports from different parts of the world.¹³ Analysis of the last five decades show that the mortality from suicide has shifted from Europe to Asia.¹⁴ Suicide methods greatly vary among Asian and Western populations. Within Asia, these methods are different due to variation in religious, socio-economical and cultural backgrounds.¹⁵ In Pakistan, national statistics on suicide are scarce. With large contribution of rural population in Asian countries, the most common method for committing suicide is ingestion of poison.¹⁶ The reports from literature show that the most common mode of poisoning was intentional which is a major problem world wide.¹⁷

In this study, number of PPD poisoning cases increased to 32.2% from just 20.9% in 4 years.

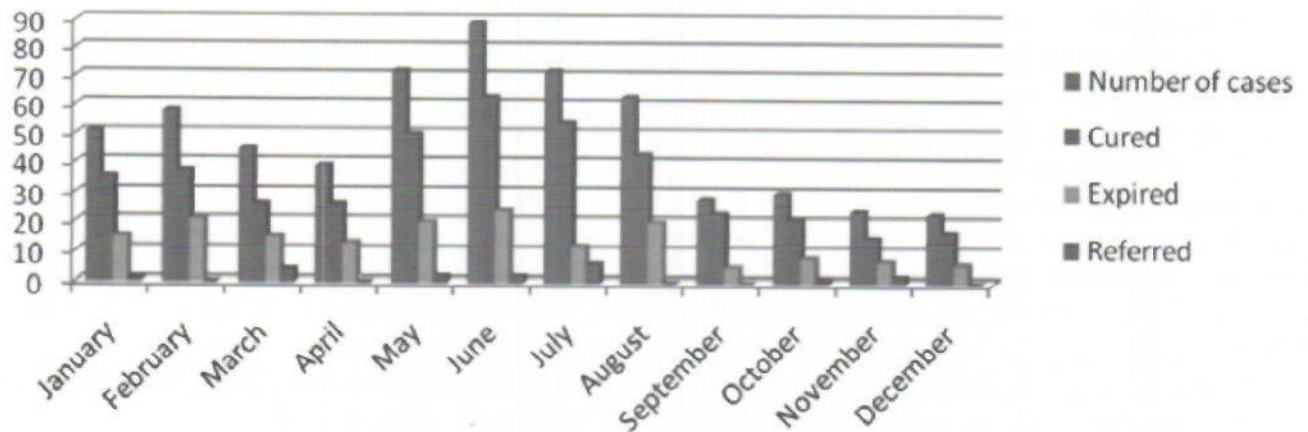


Fig-4: Monthly Distribution of PPD Poisoning Cases During 2011-2014

Noticeably, the referral has increased during the four years for the cases of PPD poisoning possibly because of several reasons. Firstly, after the awareness that PPD can be used as a source of self-poisoning, the number of cases has increased and also has the access of patients to the hospital. Secondly, and possible large dose of poison consumed by the patients which is quite problematic as it can not be measured so to be managed efficiently. Thirdly, there is still no antidote for PPD. These reasons cumulatively might have contributed to increased reports of PPD poisoning mortality and referral during the preceding years. In such situations, the patients are referred to specific poisoning centers for management of their condition however; their outcome is not known and is not reported in this study. Sharda Shah Peshin et al. in their 13 years retrospective trend analysis conclude that there is increase in overall number of poisoning cases.¹⁷ Ayoub Filali et al. show that cases of PPD poisoning increased over time from 1.9% in 1992 to around 16% in 2002.¹⁸ We had a major proportion of patients (49.8%) during the mid year particularly during May to August. Udaykiran Gella et al in a prospective study on poisoning cases found most of the cases reported in May.¹⁹ This is possibly due to the increased availability of PPD during these months as hinna is considered soothing during the hot days of summer and people prefer applying it on their hair, feet and hands. This increasing

availability of PPD, the main ingredient of hinna, may have been the cause of maximum number of cases reported during these months.

There are very diverse findings on the mortality rate of PPD poisoning cases. Mohamed Abdelraheem et al.² in his study, demonstrated the range from 12-42% while it was between 0.03%-60% reported in another study.²⁰ Ayoub Filali et al. in their 11 years retrospective study reported 21.1% mortality rate in PPD poisoning patients.¹⁸ Abdul Rahim et al. in their study from Nawabshah reported mortality rate as 7.9% but the duration of the study was only 2 years.¹⁰ H Rebgui et al in Morocco during 1996-2007 found that 14.7 % patients had lost their lives due to PPD poisoning out of 102 cases.²¹ In a 7 years retrospective study, Sawsan A Shalaby et al found the mortality rate of 16%.²² These variations may be due to difference in the sample size, study duration, geographic variation, dose-ingestion and management.

The likely contributing factors for intentional attempts for suicide include easy access, family issues, emotional conflicts, unemployment, conflict related to marriage and low socioeconomic status.^{16,17} Specifically in our situation, this increasing trend has also been linked not only to the personal problems but also to other emerging factors like distance from the religion, influence of electronic media and inspiration from the virtual world of movies particularly in young generation.

CONCLUSION:

Nawabshah is one of the major regions in Sindh, Pakistan with major proportion of population in rural areas. PPD poisoning as a source of suicide is increasing over time in this region. The cases peak during the mid of the year particularly from May to August and subsequently affect the outcomes. However, despite the steps taken for managing these cases, one third of the patients die. There, is need to control and monitor the distribution of PPD or its use should be banned except for authorized people able to use it for industrial purposes.

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