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### Demographic and Toxicological trend of Prayagraj District

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#### ABSTRACT

Poisoning is a global public health problem which leads to nearly cause a million of deaths per year. Incidence of poisoning is high in India. Acute poisoning is a common phenomenon to commit intentional suicide. There are many ways which humans use to end their life. This study was carried out on poisoning cases reported to the autopsy department of Prayagraj district hospital from 2017-2021. Four years of study were done. The main objectives of the study were to analyze the toxicological trend and demographic variables of poisoning data that were collected and analyzed statistically. The collected data were bifurcated year-wise. Total 1612 cases of poisoning were reported in the year 2020, which were the highest. Consumed poisoning in the year 2017 (21.712%) followed by 2020 (24.813%). Area of incidence (rural area has major cases: 816, then urban which is 796). Occupational distribution shows labourers commit more suicides (33.74%) followed by farmers (33.43%). Gender paradox bifurcation shows total 1612 (male 835 is the prime consumer, female 777) and pattern of poisoning. Celphos is the most common poison seen in 22.7%, followed by organophosphorus 18.3%. The following demographic variables were evaluated and the variation that has occurred during these years were studied and analyzed.

**Keywords:** Lethal dose, Toxicology, interpretation, Celphos, insecticide and pesticides, zinc phosphide, aluminum phosphide

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## INTRODUCTION

Forensic toxicology is one of the branch of sciences that uses the ethics and facts of toxicology to resolve issues and problems in the field of law, For achieving this the tools and techniques of analytical chemistry are collectively combined with toxicology to raise issues related to the toxicological effects of substances on human being that are germane to judicial proceedings. This discipline continues to flourish as human fascination with the poisons, their effects on living body and detection in the human remains. The toxicological investigations starts with the fundamental and critical requirement of acquisition of an appropriate specimen., above this a suitable scientific technique and methods are applied to analyze the specimen. An cited definition of a poison is given by the alchemist, "All substances are poisons; there is nothing which is not a poison only the right dose differentiates a poison from the remedy." stated by Hayes et, al <sup>7</sup>. The phos poisoning is the most lethal to cause damage to the children if the lag interval time to the hospital admission is not reduced then the severity of the sign and symptoms can cause death. Reported in the study of the Sharma et al <sup>1</sup>. AAIPP poisoning causes hemodynamic failure correlated with shock and altered consciousness and the unavailability of a specific antidote studied by the Chuget., al <sup>2</sup>. Poisoning can be said as epidemic nowadays which is counted as a natural death majorly from the previous era to this coming era the death ratio is increasing. According to WHO 3 million people are committing suicide every year and the patent poison found among them are insecticides and pesticides Chopra et al <sup>11</sup>. The analysis of poison mainly done to identify what role did the detected substance have played inside the viscera that caused impairment or death to the patient and this correlation and identification is known by a term called interpretation stated by josh et al <sup>9</sup>. The study of organophosphorus was, done and 923 poisoning cases admitted to Government hospital Gulbarga. 65.65% of total cases. Maximum number between the ages of 21-30 years of lower socioeconomic status. Males were more affected than female. 66.63% of the cases were from rural area reported by Gunnar et al <sup>5</sup>. Any substance can be considered medicine or poison it all depends on the dose if it consumer intake any medicine under its therapeutic dose then it produces an effective result and if it exceeds the minimum dose then it becomes fatal to their life and can be called as a poison. The study was carried out on 288 cases of Organophosphorus compound poisoning 3 years study were done and majority of the cases were in age group of 21-30 yrs includes (44.44%). Higher proportion of cases from lower class of society (48.95%) and from the rural area (82.29%) reported by Yogesh G, Ravikumar R. <sup>3</sup>

### Objective

- 1) To analyze the demographic data of poisoning cases statistically for forensic consideration.

### Methodology

The present study entitled were conducted in prayagraj district medical college from 2017-2021 five-years annual data taken for further studies. The statistical approach used is percentage for forensic consideration and further analysis. There were 1612 autopsy that were done in cumulative four years of the suspected poisoning cases. Their depth study of the autopsy report of the patient case history were done in order to understand and analyze the collected data statistically of the particular chosen district. The relevant data which includes yearly record of the number of poisoning cases, area of incidences where majority of the cases received, occupational group which, is the prime consumer of poison, gender of the patient and the pattern of the poisoning in order to analyze the trend of the suspected poisoning cases as well as focusing on the variation that is occurring yearly in the above chosen criteria for evaluation of the statistical data which also effects the demography of the particular district.

**Table.1.Showsyearlydistributionofpoisoningcasesfrom2017-2021in PrayagrajDistricts.**

Year	Numberofcases	Percentage
2017	350	21.712%
2018	250	15.509%
2019	295	18.300%
2020	400	24.813%
2021	317	19.665%
<b>Total</b>	<b>1612</b>	<b>100%</b>

Shows the year-wise distribution of poisoning cases of Prayagraj district from the year 2017 to 2021. There are total 1612 poisoning cases. In the year 2017, there found 350 cases percentage attributed to hit (21.712%), whereas in the year 2018, there is 250 poisoning cases percentage to be calculated as (15.509%), wherein 2019 the poisoning cases found to be 295 percentage valued as (18.300%), during the year 2020 the percentage of poisoning cases recorded as 400 percentage valued as (24.813%), During the year 2021 there found a poisoning data which is recorded as 317 cases (19.665%) respectively.

**Table.2.Showsareawisedistributionofpoisoningcases from 2017-2021ofprayagraj district**

Year	Urbanarea	Urbanpercentage	Ruralarea	Ruralpercent
2017	180	22.613%	170	20.833%
2018	115	14.447%	135	16.544%
2019	145	18.216%	150	18.382%
2020	225	28.266%	175	21.446%
2021	131	16.457%	186	22.794%
<b>G Total</b>	<b>796</b>	<b>100%</b>	<b>816</b>	<b>100%</b>

Table 2 Shows the area of incidence of poisoning cases in urban and rural area of Prayagraj district from 2017-2021. There are 1612 total poisoning cases among them 796 were from urban areas and 816 were from the rural area. The year 2017 poisoning cases in urban areas is 180 (22.613%) whereas in the rural area 170 (20.833%) poisoning cases. The year 2018 has 115 (14.447%) poisoning cases in urban areas and rural area has 135 (16.544%) cases. In the year 2019 urban area has 145 (18.216%) cases and rural has 150 (18.32%) cases. The year 2020 which the maximum number of cases in urban area has 225 (28.266%) and rural has 175 cases (21.446%). The year 2021 rural area has 186 (22.794%) and the urban area has 131 cases (16.457%).

Year	Female cases	Female Percent	Male cases	Male Percent
2017	149	19.17%	201	24.07%
2018	152	19.56%	98	11.736%
2019	129	16.60%	166	19.88%
2020	229	29.47%	171	20.47%
2021	118	15.18%	199	23.8%

**Table.3. Gender wise distribution of poisoning cases from 2017-2021 of prayagraj**

<b>Total</b>	<b>777</b>	<b>100%</b>	<b>835</b>	<b>100%</b>
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Table. Shows the sex wise distribution of poisoning cases of prayagraj districts from 2017 to 2021. The four years data shows 777 female poisoning cases and 835 male poisoning cases. The year 2017 female shows 149 (19.17%) and male have 201 (24.07%) poisoning cases. The 2018 female has 152 (19.56%) poisoning case and male have 98 (11.736%).

The year 2019 female 129 (16.60%) whereas male 166 (19.88%). The year 2020 female has 229 (29.47%) and male has 171 (20.47%). Whereas the year 2021 female has 118 (15.18%) and male have 199 (23.8%). The concluded result from this table can be withdrawn that male has highest consumption of poisoning when compared with female.

**Table 4. Shows occupational distribution of poisoning cases from 2017-2021 of prayagraj.**

<b>Occupation</b>	<b>2017</b>	<b>2017 %</b>	<b>2018</b>	<b>2018 %</b>	<b>2019</b>	<b>2019 %</b>	<b>2020</b>	<b>2020 %</b>	<b>2021</b>	<b>2021 %</b>	<b>Total</b>	<b>Total %</b>
Farmer	155	44.28 %	90	36%	95	32.20 %	120	30%	79	24.92 %	539	33.43 %
Labour	115	32.85 %	75	30%	99	33.55 %	130	32.5%	125	39.43 %	544	33.74 %
Student	22	6.28%	27	10.8 %	49	16.61 %	25	6.25%	25	7.86%	148	9.18%
Housewife	38	10.85 %	40	7.2%	27	9.15%	62	15.5%	33	10.41 %	200	12.4%
Unemployed	20	5.71%	18	16%	25	8.47%	63	15.75 %	55	17.35 %	181	11.22 %
<b>TOTAL</b>	<b>350</b>	<b>100%</b>	<b>250</b>	<b>100%</b>	<b>295</b>	<b>100%</b>	<b>400</b>	<b>100%</b>	<b>317</b>	<b>100%</b>	<b>1612</b>	<b>100%</b>

Table shows the occupational distribution of poisoning cases from 2017- 2021 of prayagraj district. The year 2017 shows farmer has 155 (44.28%) have highest consumption of poisoning cases, labor has 115 (32.85%) cases, student has 22 cases (6.28%), housewife has 38 (10.85%) case and unemployed has 20 (5.71%) which is least to be achieved poisoning cases. The year 2018 farmer has 90 (36%) highest attributed poisoning case, labour has 75 (30%) case, student has 27 (10.8%) case, housewife has 40 (7.2%) case and unemployed has

18(16%)leastreceivedpoisoningcases.Theyear2019whichfarmerhas95(32.20%)case, labor has 99 (33.55%) case ,student has 49 (16.61%) case , unemployed has 25 (8.47%)minimum cases among all and housewife has 27 (9.15%) poisoning cases. The year 2020farmer has 120 (30%) case , labor has 130 (32.5%)case highest to be recorded , student has25(6.25%) case least to be recorded among all occupation , unemployed has 63(15.75%) caseand housewife has 62(15.5%) poisoning cases. The year 2021 farmer has 79(24.92%) case,labour has 125 (39.43%)case to gain the highest, student has 25(7.86%) case , housewife has33(10.41%)caseandunemployedhas55(17.35%)casetoberecorded.Thefiveyearsdataof farmer shows 539 cases (33.43%) which is highest among all the occupation. Labour has544(33.74%) which shows second highest in terms of consumption. The housewife has 200(12.4%) which is third highest among all occupation. Student has total case 148 (9.18%) andthe unemployed has total 181 case (11.2%) which is emerging and there found increase in thecases day by day minimum cases among all. Therefore, labour has highest consumption ofpoisoning rate followed by the farmer and the lowest found in terms of consumption of poisonisthestudent person followed by the unemployed.

**Table5.Showsthedistributionbasedon consumptionofpoison from 2017-2021ofprayagraj**

Nameof poison	2017	%	2018	%	2019	%	2020	%	2021	%	Total case	Total %
Organophosphate	44	12.5%	61	24.4%	58	19.6%	72	18%	60	18.9%	295	18.3%
Celphos	69	19.7%	77	30%	71	24%	99	24.7%	50	15.7%	366	22.7%
Ratkiller	29	8.2%	27	10%	33	11.1%	31	7.75%	23	7.2%	143	8.8%
Phenyl	33	9.4%	44	17.6%	29	9.8%	25	6.2%	28	8.8%	159	9.8%
Insecticide & pesctide	58	16.5%	49	19.6%	65	22%	79	19.7%	61	19.2%	312	19.3%
Snakebites	15	4.28%	20	8%	25	8.47%	33	8.25%	18	5.67%	111	6.8%
Sedativedrugs	59	16.8%	25	10%	41	13.8%	56	14%	31	9.7%	212	13%
Arsenic	0	0	0	0	0	0	5	1.42	3	1.27%	8	0.49%
Plantpoison	4	1.14%	2	0.8%	0	0	0	0	0	0	6	0.37%

Shows the consumption of type of poison the four year comparative study show the highest intake and lowest intake of poison the organophosphorus has total 295 (18.3%) in which distributive year show that 2017 has 44(12.5%) lowest number of poisoning case recorded., 2018 have 61 (24.4%), 2019 have 58 (19.6%) cases , 2020 show highest cases of 72 (18%) and 2021 have 60 (18.9%).The Celphos has total poisoning case 366(22.7%) where 2017 has 69 (19.7%) case , 2018 has 77 (30%) , 2019 has 71 (24%) year , 2020 has chief cases of 99 (24.7%) highest year of poisoning and 2021 has 50 (15.7%) lowest recorded poisoning case. The rat killer which is zinc phosphide has total poisoning case 143 (11.5%) the year bifurcation show that in 2017 29 (8.2%) observed case, 2018 has 27 (10%) case , 2019 has 33 (11.1%) more cases received in this year , 2020 has 31 (7.75%), & 2021 has 23 (7.2%) very lowest case received in this year . The phenyl poison has total case of 159 (9.8%) the year 2017 has 33 (9.4%) case , 2018 has 44 (17.6%) highest poisoning year reorded , 2019 has 29 (9.8%) case , 2020 has 25 (6.2%) least recorded poisoning case and 2021 has 28 (8.8%) poisoning case. The insecticide & pesticides have total poisoning case 312 (19.3%) where bifurcated year show that in 2017 has 58 (16.5%), 2018 has 49 (19.6%) least average case , 2019 has 65 (22%), 2020 has 79 (19.7%) highest poisoning case and 2021 has 61 (19.2%). The snake bite has total poisoning case 111 (6.8%) the year 2017 has 15 (4.28%) lowest recorded year, 2018 has 20 (8%) highest poisoning case, 2019 has 25 (8.47%), 2020 has 33 (8.25%) highest case of snake venom and 2021 has 18 (5.67%). The sedative drug has total poisoning case 212 (13%) the year 2017 has 59 (16.8%) highest observed case, 2018 has 25 (10%), 2019 has 41 (13.8%), 2020 has 56 (14%) & 2021 has 31 (9.7%) lowest achieved poisoning cases. The arsenic poisoning which is known to be fatal nowadays leading to effect the population has total case 8 in which 2017 , 2018 , 2019 has 0 case least observed poisoning case , 2020 has 5 (1.42%) most of the cases received in this year & 2021 has 3 (1.2%). The plant poison has total case 6 (0.37%) very few the year 2017 has 4 (1.14%), 2018 has 2 (0.8%) from 2019 to 2021 no case has been received of plant poison in this area.

## Results and discussions

The poisoning data of Prayagraj, from 2017-2021 five years study is done to understand the demographic toxicological trend of poisoning. The various criteria has opted to find out the comparative analysis is done and the tabulation is mentioned above. The result is represented in tables 1 to 5. The retrospective study was conducted of one year and the data was Organophosphorus 135 cases, aluminum and zinc phosphide 50 cases, phenobarbitone 18 cases, benzodiazepines 7 case studied by Jaiprakash et al.<sup>10</sup>. The total recorded poisoning case of Prayagraj district is 1612. The comparative study of poisoning cases in the zonal area Prayagraj is done based on different demographic class features. The yearly distribution shows that the highest case is achieved in the year of 2020 and least in the year 2019 the highest case in 2020 shows increment of 32% growth when compared with other years and the lowest to be attained in the year 2018 of maximum decrement 26.4% compared from retro & pros years. When the area of incidence is taken into consideration then the rural area has major cases and urban has minor cases the year 2020 shows higher cases in urban areas and the year 2021 leads to rural areas concerning the occurrence of poison cases lower to be found in the year 2018 in both urban & rural. The gender paradox shows that male is more likely to take poison as compared to female. The year 2017 shows the highest number of poisoning cases in males & the year 2018 shows the lowest whereas females in the year 2020 has the highest poisoning case and 2021 is the lowest to be found. The classification based on the occupation majority of cases were of labors followed by farmers which is second

highest in terms of poisoning least to be recorded in students. The trend of poisoning that can be illustrated from the segmented table given in the result section highest cases were of Celphos (aluminum phosphide) followed by insecticides & pesticides & least recorded cases were of plant poison that is found in the Prayagraj region of the four-year comparative study. Additionally in the study based on the consumption of poison intake by genders concluded that Females also commit suicide but two or three times lesser than males stated by the Emerson et al.<sup>4, 11</sup> The study was done at Jamnagar hospital found that victims were married, Hindu, and males from rural area and low socioeconomic group. Majority of victims died within 1–6 hours of consumption of poison reported by Gupta and Vaghela<sup>6</sup>.

## Conclusion

The basic significance of this study is to understand the demographic and toxicological trend that is prevailing in the society from different years that shows variation when, comparative chosen criteria were statistically calculated and analyzed the demographic data shows variation yearly. Intentional poisoning were found highest among farmers followed by labourers. Specifically male genders were found to be high consumers of poison there were numerous reasons among them the common was indebtedness, natural calamities & family responsibility towards male gender is one of the key that provoke them to commit suicide, although study also concluded that majority of the cases were received from rural areas and the pattern of poisoning or trend found from the collection and analysis were insecticides & Pesticides followed by Celphos that is most common type of toxicological substance used for intentional manner of poisoning. The reason behind using these listed toxic substances that is trending from many years is the low cost availability, lack of awareness among people and the high lethal effect it causes when administered. This study also suggests that Counselling & awareness about the consequences of the specific nature of poisonings should be given to the people and also acknowledging them regarding the specific antidote can be given to the patient so that the lag interval time period can be utilized during delay in the hospitalization.

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