Original Research Article

Para-suicide by Self-Poisoning: Profile of Toxic Agents Used in Aligarh District of India

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Abstract

Background: Para-suicide by self-poisoning is a major public health concern throughout the world, especially in developing countries. It is a cause of considerable morbidity and mortality as well as consuming scarce medical resources which would have been used otherwise. The survival of such patients to a considerable extent depends on the competence of the attending doctors, nature of toxic agent consumed and the availability of specific antidote.

Objective: The sole purpose of this study is to provide proper knowledge and awareness of health professionals on the common toxic agents used for self-poisoning.

Material and methods: This prospective study was conducted by identifying and reviewing all self- poisoning cases that were presented at the emergency department of JNMCH, A.M.U Aligarh, over a span of 2 years. A total of 375 cases of self-poisoning were entered into the emergency department register, but only 315 files were considered for this study.

Results: In this study majority patients belong to 15-24 years' age group i.e. 153(48.57%) with male dominance. The most ingested substance for non-fatal self-poisoning was a pharmaceutical drug 71(22.54%) followed by agrochemicals like rat poison 60 (19.05%), Aluminium phosphide 46(14.60%) and organophosphate 33(10.48%). There were significant ($p<0.01$) gender differences noted in type of substance used.

Conclusion: Accessibility has been noted as a factor affecting the choice of drug used. Implementing the pesticide act strictly will allow the government to have control over the production, sale, distribution, storage, and use of pesticides.

Keywords: Para-suicide, Self-poisoning, Aluminum phosphide, Organophosphorus, Self-harm

Introduction

An act with non-fatal outcome, in which an individual deliberately initiates a non-habitual behavior that, without intervention from others, will cause self-harm, or deliberately ingests a substance more than the prescribed or recognized therapeutic dosage to gain sympathy or manipulate the

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environment, calledpara-suicide.[1]The choice of toxic agent used for self-poisoning varies between countries and seems to depend more on substance availability than its lethality. The toxic substance commonly used in self-poisoning include Agrochemicals, household chemicals, prescription and over the counter medicine like paracetamol, benzodiazepines, NSAIDS, anti-depressant etc., drugs of abuse and plants poisons.[2] In agriculture based developing country like India situation is quite different. The agent used mostly for self-poisoning is agrochemical pesticide, it was taken orally, at home and during daytime.[3,4] The use of pesticide in these countries is very extensive and unregulated, so it is easily available for use as a suicide agent. For this reason, pesticide self-poisoning becomes a major contributor of suicidal death in developing country, particularly from rural areas. At least half of the patients making suicidal gestures by using prescribed drugs are psychotropic medications, which are frequently used in case of deliberate self-poisoning and parasuicide.[5] The main objective of this study is to provide proper knowledge and awareness of health professionals on the common toxic agents used for self-poisoning.

Material and Methods

This prospective study was conducted by identifying and reviewing all self- poisoning cases that were presented at the emergency department of JNMCH, A.M.U, Aligarh over a span of 2 years from March 2015 to February 2017. A total of 375 cases of self-poisoning were entered into the emergency department register, but only 315 files were considered for this study. Data analysis was undertaken by using R studio version 3.3.1. A value of $p<0.01$ was statistically significant and other simple descriptive tests were also used during the study.

Results

A total of 315 patients met eligibility criteria to be included in the study, of whom 186 (59.05%) were males and 129 (40.95%) were females with male female ratio 1.44:1.Most of the patients belong to 15-24 years of age accounting to 153(48.57%), followed by 25-34 years 85(26.98%). Of these males, constitute 87(46.77%) from age group of 15-24years, 50 (26.88%) from age group of 25-34 years and female constitute 66(51.16%) from age group 15-24 years, 35(27.13%) from age group 25-34 years as depicted in table number 1.

Table 1: Distribution of self-poisoning patients according to age and sex

Age (in years)	Males N (%)	Females N (%)	Total N (%)
<15	04(02.15%)	07(05.43%)	11(3.49%)
15-24	87(46.77%)	66(51.16%)	153(48.57%)
25-34	50(26.88%)	35(27.13%)	85(26.98%)
35-44	28(15.05%)	15(11.63%)	43(13.65%)
45-54	10(05.38%)	04(03.10%)	14(4.45%)
55-64	05(02.69%)	01(0.78%)	06(1.91%)
≥65	02(01.08%)	01(0.78%)	03(0.95%)
Total	186	129	315

The most common substance taken for self-poisoning was a pharmaceutical drug 71 (22.54%) of these 39 (20.97%) were ingested by males and 32 (24.81%) were by females. Among the Agrochemicals, rat poison 60 (19.05%) rank top in the list, followed by aluminum phosphide 46 (14.60%), organophosphate 33 (10.48%), organochlorine 23 (7.30%), Pyrethroids 12 (3.81%) and 9 (2.86%) were carbamates. Males were more likely than females to ingest aluminum phosphide 36 (19.35%), organophosphate 22 (11.83%), organochlorine 14 (7.53%) and corrosive 13 (06.99%), whereas females were most likely than male to ingest rat poison 29 (22.48%), Pyrethroids 9 (06.98%), kerosene 7 (05.43%). Others 21 (6.67%) includes common household chemicals like hair dyes, Dettol, etc.as shown in table number 2.

Table 2: Distribution of substance used for self-poisoning

Poisonous substance		Male N (%)	Female N (%)	Total N (%)	p-value
Agrochemicals	Organophosphate	22(11.83%)	11(08.53%)	33(10.48%)	0.013
	Aluminium phosphide	36(19.35%)	10(07.75%)	46(14.60%)	< 0.01
	Organochlorine	14(07.53%)	09(06.98%)	23(07.30%)	0.238
	Rat poison	31(16.67%)	29(22.48%)	60(19.05%)	0.855
	Carbamates	06(03.23%)	03(02.33%)	09(02.86%)	0.345
	Pyrethroid	03(01.61%)	09(06.98%)	12(03.81%)	0.041
Drugs		39(20.97%)	32(24.81%)	71(22.54%)	0.313
Corrosive		13(06.99%)	05(03.88%)	18(05.71%)	0.019
Plant poison		02(01.08%)	02(01.55%)	04(01.27%)	1
Kerosene		01(0.54%)	07(05.43%)	08(02.54%)	0.012
Phenol		04(02.15%)	04(03.10%)	08(02.54%)	1
Others		13(06.99%)	08(06.20%)	21(06.67%)	0.217
Unknown		02(01.08%)	00(00%)	02(0.63%)	0.317
Total		186(59.05%)	129(40.95%)	315(100%)	

The most reported class of drug involved in self-poisoning was the benzodiazepine 18 (25.35%) followed by acetaminophen/NSAID 16 (22.54%), antibiotic 6(8.45%), antidepressant 5(7.04%), antiepileptic 4(5.63%), antipsychotic 3(4.23%) and antihypertensive 2 (2.82%). Interestingly, males were more likely to take benzodiazepines 13 (33.33%) than females, whereas females were more likely to take acetaminophen / NSAID 12 (37.50%). 7 (9.86%) patients take another class of drug like multivitamins, antihistamines, cough syrup, etc. Among 10 (14.08%) patients' class of drug were not known as shown in table number 3.

Table 3: Distribution of drugs used for self-poisoning

Drugs class	Male N (%)	Female N (%)	Total N (%)	p-value
Acetaminophen/NSAID	04(10.26%)	12(37.50%)	16(22.54%)	0.013
Antibiotic	04(10.26%)	02(06.25%)	06(08.45%)	0.563
Benzodiazepines	13(33.33%)	05(15.63%)	18(25.35%)	0.019
Anti-epileptic	01(02.56%)	03(09.38%)	04(05.63%)	0.479
Antihypertensive	01(02.56%)	01(03.13%)	02(02.82%)	01
Anti-depressant	03(07.69%)	02(06.25%)	05(07.04%)	01
Anti-psychotic	02(05.13%)	01(03.13%)	03(04.23%)	01
Other	04(10.26%	03(09.38%)	07(09.86%)	01
Unknown	07(17.95%)	03(09.38%)	10(14.08%)	0.179
Total	39(20.97%)	32(24.81%)	71(22.54%)	

Table 4 shows that out of 53 repeaters majority were ingested drug 23 (43.39%) were ingested as a toxic substance followed by rat poison 11 (20.75%), Aluminium phosphide 6 (11.32%), organochlorine 3 (5.66%) and corrosive 3 (5.66%).

Table 04: Type of substance used by repeaters

Poisonous substance	No of patients	Percentage
Organophosphate	01	1.89%
Aluminium phosphide	06	11.32%
Organochlorine	03	5.66%
Rat poison	11	20.75%
Carbamates	01	1.89%
Pyrethroid	01	1.89%
Drugs	23	43.39%
Corrosive	03	5.66%
Plant poison	00	0%
Kerosene	01	1.89%
Phenol	00	0%
Others	03	5.66%
Unknown	00	0%
Total	53	16.83%

Table 5 shows that the females were more likely than males to ingest a substance that was already available in the home 115(89.15%), while males were more likely than females to ingest a substance kept in the field or garden 09(04.84%), or to purchase 42(22.58%) the substance with the intention of self-poisoning.

Out of all cases of para-suicidal self-poisoning, the majority takes place inside the house 300 (95.23%) followed by workplace 11 (03.49%). Females 126(97.67%) were more likely than male to attempt inside the house. There was a clear variation in the number of para-suicidal self-poisoning with the time of day. Of the total, 183(58.10%) cases were reported in the evening hours, of these 105(56.45%) were males and 78(60.47%) were females. 75(23.81%) cases reported in the morning hours, of these 48(25.81%) were male and 27(20.93%) were females, followed by 57(19.09%) cases at nighttime of these 24(18.60%) were female and 33(17.74%) were males. Most of the patients 289(91.75%) ingested single substance for self-poisoning of these 166(89.25%) were males and 123(95.35%) were females. The multiple agent / drugs were used for self-poisoning in 26 (08.25%) cases. But 20 (10.75%) cases of self-poisoning were associated with alcohol at the time of the attempt.

Table 05: Sex wise distribution of characteristic of poison

Variable		Male N (%)	Female N (%)	Total N (%)
How poison was obtained	Kept at home	135(72.58%)	115(89.15%)	250(79.37%)
	Kept in field/garden	09(04.84%)	04(03.10%)	13(04.12%)
	Bought for ingestion	42(22.58%)	10(07.75%)	52(16.51%)
Place of Incidence	Workplace	08(04.30%)	03(02.33%)	11(03.49%)
	Home	174(93.55%)	126(97.67%)	300(95.23%)
	Others	04(02.15%)	00(00%)	04(01.27%)
Time of attempt	Morning	48(25.81%)	27(20.93%)	75(23.81%)
	Evening	105(56.45%)	78(60.47%)	183(58.10%)
	Night	33(17.74%)	24(18.60%)	57(19.09%)
Number of Chemical Agents	Single	166(89.25%)	123(95.35%)	289(91.75%)
	Double	20(10.75%)	06(04.65%)	26(08.25%)
Association with alcohol		20(10.75%)	00(00%)	20(06.35%)

Discussion

Out of 315 cases of Para-suicidal self-poisoning presented at the emergency section, 186(59.05%) were males dominating over females 129 (40.95%) with male to female ratio 1.44:1.

The high incidence of Para suicide amongst males as shown in this study, is like the previous study done internationally[6,7] and nationally.[8,9] Male dominance is easily understandable by the fact that males are more often exposed to the stress of day-to-day life, occupational hazards, monsoon dependent cultivation practices, crop failures, financial difficulties, loss of job, discord at home and workplace etc.

In the present study, it was observed that the majority of Para- suicidal self-poisoning cases belonged to age group 15-24years 153 (48.57%) followed by 25-34years 85 (26.98%). Our survey is similar to study conducted by Dash et al.[10] Female preponderance was more differentiated in the younger age groups, whereas there was a male preponderance amongst those aged 35 years and older. This is reproducible with the study of Hawton K et al.[11]This can be interpreted by the fact that this age group is the determining factor of life in terms of studies, marriage, lack of employment, breakup in the family support system and the failure of love affair. Therefore, they are subjected to a substantial amount of mental stress during this period.

The most ingested substance for non-fatal self-poisoning was a pharmaceutical drug 71(22.54%). There were significant ($p<0.01$) gender differences in type of substance used. Females were more likely to have ingested a pharmaceutical drug (24.81% vs20.97%), Rat poison (22.48% vs16.67%), House hold chemicals like kerosene (5.43% vs 0.54%) and phenol (3.10% vs2.15%).

The most frequent used agent for self-poisoning was drug overdose, in contrast to older studies of Eddleston et al[6] which report pesticide ingestion as the most common substances used, but similar to findings of Hanwella et al[12] and Gouda et al.[13]This is likely to be a reflection of reduced availability of pesticides, perhaps secondarily to the gradual urbanization of the country and easy availability of over the counter drugs both in urban as well as in rural areas. Indeed, both males and females reported that their reason for choice of substance was accessibility. Reasons for the higher rate of pesticide ingestion among males could be that in agricultural areas, pesticides are more easily accessible to males who work in the fields, compared to females.

In present study among the Agrochemicals, rat poison ranks top in the list, followed by aluminium phosphide, organophosphate and organochlorine. The high overall incidence of rat poison particularly among females could be due to reason that there is a rapid urbanization of Aligarh district and their adjoining area. Rat poisons were commonly used in both rural as well as urban areas but other agrochemicals like aluminiumphosphide and organophosphate were used only in agricultural areas.

In our study, like other north Indian study of Sharma et al[14], aluminium phosphide were the commonly used agrochemical for self-poisoning particularly by males. Kanchanet al[15] reported in his study that organophosphate was the most used agrochemical for self-poisoning.

This regional variation can be explained by the facts that aluminium phosphide is the most common agrochemical used for pest control in wheat farming which is the predominant staple food in north India, and it is easily available in the market and small shops. Whereas organophosphate compound are the predominant agro-chemicals of pest control in rice fields of south India where people depend on rice more than wheat.

A large variety of medicinal drugs was used to attempt Para- suicidal self-poisoning. Most commonly, patients had ingested benzodiazepines andacetaminophen/NSAID. Interestingly, males (33.33%) were more likely to take benzodiazepines than females (15.63%), whereas females (37.50%) were more likely to take Acetaminophen/NSAID than males (10.26%). This gender difference was statistically not significant ($p>0.01$).Our study agrees with the findings of Kumar et al[16]and Jesslin et al[17]who reported that benzodiazepine was the most used class of drug for Para-suicidal self- poisoning.

In India, most drugs including benzodiazepines are available over the counter. They are particularly popular as sleeping, tension-relieving pills. It is very comfortable for somebody to walk into a drug store and acquire a package of drugs. The salesperson who is rarely a qualified chemist hardly ever asks any question and dispenses the drug quite readily. The preference for benzodiazepines over analgesics in our work is slightly confusing. Pain reliving pills like acetaminophen/NSAIDS are equally freely available in India. Analgesics being 'pain killers may not make the mental relief desired by so many patients as compared to benzodiazepines.

The highest incidence of medicinal drug as a choice of toxic substance used by repeaters is due to the reason that, the drugs commonly used for self-poisoning like Benzodiazepine, Paracetamol,

NSAID etc. have a low case fatality rate. Drug self-poisoning on acute ingestion produces very few symptoms, if survive- the patients will have few or no complications. In contrast, Agrochemicals like aluminium phosphide, organophosphate, organochlorine etc. on ingestion produce profoundly serious, life-threatening symptoms and need immediate ICU admission for their management. Survivors of acute agrochemical or corrosive poisoning often require extensive follow up for the management of their complication.

Females 115 (89.15%) were significantly ($p<0.01$) more likely than males135 (72.58%) to take a substance that was already available in the house, while males 42 (22.58%) were more likely than females 10 (07.75%) to purchase the substance with the intention of self-poisoning or ingest a substance kept in the field or garden. Bose et al[18] and Phillips et al[19]also reported the same pattern.

Our results indicate that most of the subjects attempted Para-suicide rather than suicide as the act was not premeditated. It was attempted at home so the chances of being found were better. When we analyzed the distribution of self-poisoning attempts regarding time cycles, we found that there was a truly clear variation by the time of the day for both sexes with peak incidences in the evening and a trough in the morning. Doganay Z et al[20], Doshi A et al[21], Valtonen H et al[22]also reported the same pattern in time cycle of self- poisoning.

The number of attempted suicide due to self-poisoning may exhibit circadian rhythm because various physiological phenomena, like hormone levels and mood, show circadian rhythms. Increased adrenergic activity and lowered serotoninergic activity in the afternoon might play a role in mood changes.[23]

People tend to go to work during the daytime and return home in the evening; many social problems and verbal arguments are likely to happen in families during the evening, when it is the time for family members to gather and discuss matters. These arguments might lead to impulsive acts and even to suicidal tendencies. This sequence of events is likely to favor attempted suicide because these people do not really want to die, but rather they want to demonstrate their anger.

In most patients, 289(91.75%) were using single agent while 26 (8.25%) were using combination of agents. Statistically no significant ($p<0.01$) gender difference was reported in number of agents used for self-poisoning. This finding is in line with the study of Jones et al.[24]

Conclusion

Ease of accessibility has been summoned as a factor influencing selection of substance ingested and it is possible that younger individuals particularly those dwelling in urban areas would find it easier to obtain medication overdoses rather than pesticides. The increasing occurrence of drug overdoses among young people in our study is a causal agent for grave worry. Rigorousimplementation of pesticide acts so that import, manufacture, sale, transfer, distribution, storage, and utilization of pesticides can be under the oversight of the government. Poison information centers should be set up in each district throughout the state as it will benefit the common man in timely diagnosis and treatment. All the hospitals should have separate toxicological units exclusively dealing with clinical poisoningcases. Primary health Centre should be promoted to provide immediate effective treatment forself-intoxication.

Conflict of Interest: None

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Ethical Clearance: Taken from Institutional Ethical Committee (Faculty of Medicine , AMU,Aligarh) dated 23/02/2015.

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