

## ORIGINAL ARTICLE

# Patterns of Suicidal Poisoning Cases in Three Tertiary Care Government Hospitals in Karachi, Pakistan

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## ABSTRACT

**Background:** Suicidal attempts are a global problem and their rate of incidence is increasing day by day. This study aimed to elucidate the patterns of suicidal poisoning cases presenting in three tertiary care government hospitals of Karachi, Pakistan.

**Methods:** In this retrospective observational study, past data records of 627 suicidal (poisoning) cases of the three tertiary care hospitals of Karachi from a period of January 2016 to December 2016 were evaluated to see patterns of suicidal cases. Data was analyzed using SPSS version 25.0 via Chi-squared test.

**Results:** Majority of the cases (36.4%) belonged to the 9-25 years' age group. Mean age of the cases was  $25.31 \pm 9.92$ . Females (57.3%) considerably outnumbered males (42.7%). The greatest number of cases reported was from Southern district of Karachi (23%) followed by West (21.5%), central (20.9%) and East (11%) reported mainly at Jinnah Postgraduate Medical Centre. The most common poisoning agent used for suicidal attempts was insecticide (40.2%), followed by rodenticide (19.9%). Majority of patients were examined on the same day of attempting suicide (95.5%), majority were in conscious state (76.2%). Admission record for most cases was unmentioned. (66.3%)

**Conclusion:** Majority of the cases presented at three tertiary care government hospitals who attempted suicide were young female adults mainly from South district of Karachi followed by West, Central and East Karachi. Pesticides, specifically, insecticides and rodenticides, were the most commonly used poisoning agents used for suicide. Majority of cases were brought at Jinnah Post Graduate Medical Centre in the conscious state.

**Keywords:** Suicide; Insecticides; Pesticides; Tertiary Care Hospital.

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## INTRODUCTION

Suicide is the act of intentionally causing one's own death voluntarily and intentionally, this is also referred to as completed suicide<sup>1</sup>. Whereas, attempted suicide is deliberate self-damage that harms, but does not kill said individual<sup>1</sup>. According to the World Health Organization (WHO), 788,000 people all over the world committed suicide in

2015;<sup>2</sup> it accounted for close to 1.4% of all deaths worldwide for that year<sup>2</sup>. Suicide is the second leading cause of death among 15–29 year olds worldwide<sup>2</sup>. In developing countries, especially those belonging to South East Asia, e.g., India, Sri Lanka and China, pesticide poisoning was found to be the predominant method. However, in developed countries, medicinal or therapeutic poisons (such as benzodiazepines) are the poisons

of choice<sup>3</sup>.

In Pakistan, men commit suicide more often than women do and a majority of the subjects tends to be under the age of 30<sup>4</sup>. The most commonly used method in Pakistan aligns with that seen in other developing countries i.e., the use of pesticides, namely organophosphate insecticides<sup>4</sup>. At the same time, now in Karachi, poisoning via drug overdose for suicidal purposes is on the rise.<sup>5</sup> The most commonly used therapeutic poisons here are benzodiazepines followed by morphine, anti-epileptics, and warfarin<sup>5</sup>. It is interesting to note that despite the criminality of suicide in Pakistan, such that an attempt is punishable by imprisonment and fine, the systems in place to observe and prevent suicide in Pakistan are severely underdeveloped<sup>6</sup>.

There is a plethora of reasons and motives for attempting suicide; this most commonly includes severe mental illness<sup>7</sup>, immature cognitive processing<sup>8</sup>, sadness<sup>8</sup>, shame or anger associated with interrelationship disputes,<sup>7</sup> romantic failure, unemployment or financial issues, attention seeking or revenge, bullying and other traumatic experiences, social pressures or isolation, substance abuse, chronic pain, or terminal illness<sup>7,9</sup>. Recently, higher levels of inflammatory cytokines such as Tumor Necrosis Factor alpha and Interleukin-6 in the blood have been associated with increased suicidal ideation<sup>8</sup>. In one of a study conducted at emergency department of one Karachi tertiary care hospital, it was reported that the majority of subjects that commit suicide were young, unemployed, illiterate and single males who often suffer from mental illness<sup>9</sup>.

This study primarily aimed to describe the patterns of suicidal poisoning cases in 2016 that presented to three tertiary care government hospitals (namely, Dr. Ruth K. M. Pfau Civil Hospital Karachi, Jinnah Postgraduate Medical Centre, and Abbasi Shaheed Hospital) in Karachi. Especially in relation to age, gender, district, poisoning agent used, state of consciousness at admission, and assess if there is any change in these variables in comparison to past studies. It was also attempted to uncover any associations between the aforementioned variables.

## METHODS

This study was a retrospective, observational investigation that was carried out in three major tertiary care government hospitals in Karachi; Dr. Ruth K. M. Pfau Civil Hospital Karachi (CHK), Jinnah Postgraduate Medical Centre (JPMC) and Abbasi Shaheed Hospital. In order to describe the characteristic patterns of suicidal poisoning cases in Karachi after taking approval from all the additional police surgeons pertaining to Civil

Hospital, Jinnah Postgraduate Medical Centre and Abbasi Shaheed hospital for collecting medico-legal data (PSK #410 dated:20-2-18).

The sample size for a proportion or a descriptive study was calculated using the online epidemiological and statistical calculator OpenEpi Version 3 and this was based on probability calculated by a previous similar study. The sample size was shown to be  $n = 625$  for a confidence level of 95% with a confidence limit of 5% in reference to said study<sup>10</sup>. This sample is considered the representative of the total population of suicidal poisoning cases that presented to all three major government hospitals in 2016. Data from a total of 878 cases from all three hospitals were recorded to compensate for missing data and non-probability convenience sampling technique was employed. As per the exclusion criteria, cases with missing data were not considered, bringing the total number of valid cases to 627. A total of 335 cases, which accounted for all the suicidal poisoning cases from CHK for 2016 were retrieved, out of which 188 that had missing data were excluded from the study, 316 cases from JPMC were retrieved, out of which 89 cases had missing data were excluded from the study whereas, 44/227 were excluded from Abbasi Shaheed Hospital because of the missing data. Data was collected at random from different medicolegal registers of 2016 (which are organized based on serial number) to ensure an adequate spread for the year.

A recently formulated (2018) self-designed questionnaire according to the format of data fields commonly found in medicolegal registers was used as a data collection tool and filled manually by all of the authors concerned depending on whose turn it was to retrieve data. Questionnaire was pre-tested on 50 entries for checking its validity. Demographic data included name, age, gender, residential address, police station concerned, information about poisoning agent, date of incidence, date of examination, state of patient, and admitted ward. Original questionnaire consisted of follow-up outcomes, but due to incomplete data, it was unfeasible to complete this part of questionnaire. The questionnaire was condensed into a table format in order to record four cases per standard A4 page in an effort to make this study eco-friendly.

At the start of data collection procedure from Abbasi Shaheed Hospital and JPMC, an official permission letter signed by all the police surgeons pertaining to Civil Hospital, Jinnah Postgraduate Medical Centre and Abbasi Shaheed Hospital (PSK #410 dated:20-2-18) for collecting medicolegal data was obtained. All cases of poisoning for attempted suicide - whether living or dead - were included, whereas the remaining subjects that committed suicide by other means were excluded.

Regular trips to the medicolegal office associated with each hospital were made to fulfill the sample requirement. The Sindh Building Control Authority further classified the residential address into one of the six districts of Karachi in accordance with the allotment. The recorded data was transferred to Statistical Package for the Social Sciences (SPSS) v.25.0 developed by IBM, New York. The data was then analyzed for frequency, percentages and mean. Chi-squared tests of independence were applied to find the relationship between different variables. A p-value of less than 0.05 was considered significant.

## RESULTS

This study utilized a sample of 627 to represent the population of suicidal poisoning cases presenting to the three major tertiary care government hospitals of Karachi in 2016. The mean age of the participants in this study was  $25.31 \pm 9.92$  and a majority of them belonged to the 19-25 age group ( $n = 228$ , 36.4%) thus, majority (36.4%) of the study population were young adults (Table 1).

**Table 1: Characteristics of suicidal poisoning cases based on demographics.**

Variables	Frequency	Percentage (%)
<b>Age (years)</b>	$25.31 \pm 9.92$	NA
<b>Mean <math>\pm</math> SD</b>		
8 - 15	49	7.8
16 - 18	119	19.0
19 - 25	228	36.4
26 - 35	140	22.3
36 - 40	48	7.7
40 And Above	43	6.9
<b>Gender</b>		
Male	268	42.7
Female	<b>359</b>	57.3
<b>District</b>		
South	<b>144</b>	23.0
East	69	11.0
Central	131	20.9
West	135	21.5
Malir	62	9.9
<b>Poisoning Agent</b>		
Insecticide	<b>252</b>	40.2
Rodenticide	125	19.9
Therapeutic Poison	92	14.7

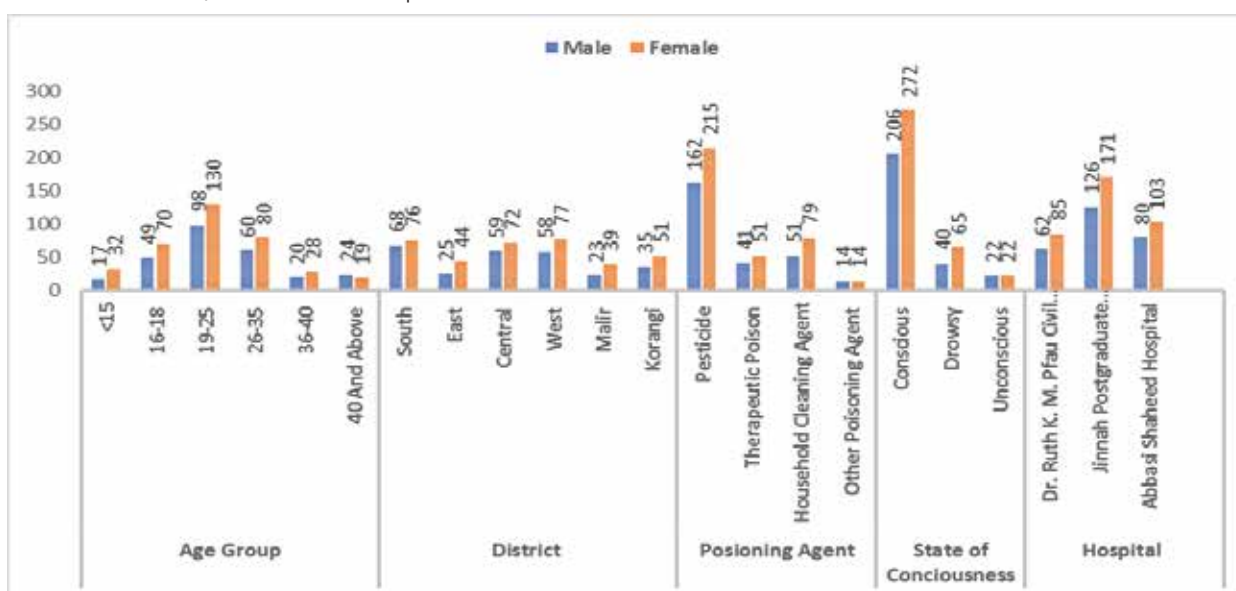
Bleach	85	13.6
Combustible Hydrocarbon	11	1.8
Paraphenyl lenediamine	5	0.8
Phenolic Acid	22	3.5
Acid	4	0.6
Other household cleaning agent	23	3.7
<b>State</b>		
Conscious	478	76.2
Drowsy	105	16.7
Unconscious	44	7.0

The number of females in this study was considerably higher with a difference of 14.6%. Concerning district wise distribution, the majority of cases were from the South district (23%) whereas Malir (9.9%) contributed the lowest number of participants (Table 1).

In this study, most commonly used poisoning agent for suicidal attempts was found to be insecticide followed by rodenticide, therapeutic poison and bleach. Almost 3/4th of the cases presented to the

hospital in a conscious state (76.2%), while the remaining 1/4th of cases presented in a drowsy (16.7%) or unconscious state (7%) (Table 1).

Chi-squared testing illustrated in graph 1 showed that there was no significant association between the gender of the participants and age group ( $p = 0.487$ ), district ( $p = 0.606$ ), poisoning agent ( $p = 0.708$ ), state of consciousness ( $p = 0.387$ ) or hospital ( $p = 0.950$ ) concerning suicidal poisoning attempts.



**Figure 1: Gender wise graphical Presentation of age group, district, poisoning agent, state of consciousness and hospital.**

Chi-squared testing also showed that there was a statistically significant association between poisoning agent used and the state of consciousness ( $p < 0.001$ ), with a majority of patients presenting in a conscious state for each type of poisoning agent

used. There was also a significant association between poisoning agent used and the hospital of admission ( $p = 0.003$ ) with the greatest number of cases of each poisoning agent presenting in JPMC. Abbasi Shaheed received the greatest number of

drowsy patients, and JPMC received the greatest number of unconscious patients, as shown in Table 2.

**Table 2: Relationship of state of consciousness of patient with the type of poisoning agent used.**

Variables of the study	Pesticide n (%)	Therapeutic Poison n (%)	Household Cleaning Agent n (%)	Other Poisoning Agent n (%)	Chi - squared Value	p - Value
<b>State of Consciousness</b>						
Conscious	291 (60.9)	53 (11.1)	110 (23.0)	24 (5.0)	26.908	<0.001
Drowsy	62 (59.0)	27 (25.7)	15 (14.3)	1 * (1.0)	NS	
Unconscious	24 (54.5)	12 (27.3)	5 (11.4)	3* (6.8)	NS	
<b>Hospital</b>						
Dr. Ruth K.M. PFau Hospital	105 (71.4)	15 (10.2)	22 (15.0)	5 (3.4)	NS	<0.001
Jinnah Postgraduate Medical Centre	171 (57.6)	47 (15.8)	59 (19.9)	20 (6.7)	19.581	
Abbasi Shaheed Hospital	101 (55.2)	30 (16.4)	49 (26.8)	3* (1.6)	NS	

## DISCUSSION

In present study, the mean age of suicidal cases presented to tertiary care government hospitals of Karachi was found to be 25. Similar results were observed for Pakistan and in other studies from Turkey, Iran, India and Sri Lanka<sup>1,7,11,13</sup>. This is a frequent finding in studies conducted on this topic especially in this geographical area<sup>14</sup>. It helps to consider the cultural and socioeconomic status of patients attempting suicide, generally encountered in a government hospital, the hierarchical family system of society, as well as the mental and emotional vulnerability of subjects within this age group<sup>15</sup>. Despite the socioeconomic disparity, even in the private hospitals<sup>16</sup>, the dominance of this age group persists, leading to consideration of highly pervasive and permeating factors responsible for suicidal attempts. The burdens of financial self-reliance and caring for dependents are also considerable stressful factors<sup>17</sup>.

Perhaps an increase in personal independence in this age group is associated with feelings of inferiority, loneliness, or hopelessness<sup>7</sup>. Older aged groups have

more stability in their lives and have maturity to deal with common stresses responsible for suicide attempts e.g., social conflicts including arguments within the family, bullying, romantic conflicts, educational stress, or financial stresses<sup>7</sup>. They are not at risk for the same peer or social pressure, exposure and contagion effect of suicidal behavior found in younger<sup>18,19</sup>. However, the prevalence of undiagnosed mental illnesses, such as anxiety, depression, post-traumatic stress disorder, personality disorders, or eating disorders, is most likely responsible for suicide throughout all age groups<sup>20</sup>.

In present study, incidence of suicidal cases was found more in female gender. Women are more prone to depression and anxiety as stated in a WHO report<sup>21,22</sup>. Worldwide, males are more frequently victims of suicide than females<sup>23,24</sup> however females dominate in terms of suicidal attempts and ideation<sup>21,25</sup> and perhaps this is what our study concisely highlights. Previous studies from Pakistan also support the finding of a greater incidence of suicidal attempts in females<sup>10, 16</sup>. Insecticides and rodenticides were the most commonly used poisoning agents in present

study. Hanging followed by chemical poisoning are most commonly preferred method for suicide in the female population worldwide, whereas hanging and firearms are the first and second most preferred methods in the male population respectively<sup>26,27</sup>.

This study included data of the newly allotted districts of Karachi, which were reinstated in 2011 and modified in 2015. The population percentage is at odds with the suicide frequency such that the district with the least population (South) has the highest percentage of suicide cases but this is perhaps explained by the location of two major government hospitals (Jinnah Postgraduate Medical Centre and Civil Hospital Karachi) near the district. However, Malir has the second lowest population and the lowest population density (762.5/km<sup>2</sup>) out of all six districts, and accordingly has the lowest percentage of suicide attempts. Factors relating to the effect of ethnic background on family life might be at play here<sup>28</sup>. Overall, perhaps district does not play as important role in suicide risk as gender and age. Other studies suggest that a rise in temperatures and heat waves is associated with an increase in suicidal ideation that is consistent with the rising temperature in Karachi<sup>29</sup>.

Pesticides seem to be the dominant chemical poison used in suicide attempts and this can be seen in previous studies from Pakistan<sup>10</sup> Latin America and most Asian countries<sup>3</sup> including China<sup>30</sup>. This can be due to the easy availability of these substances<sup>1</sup> and the perception that these chemicals are effective<sup>1</sup>. There are social and cultural reasons for this finding; the preference for methods that do not involve any overt physical changes seems to be one of them<sup>1</sup>. There is a considerable disparity in the use of therapeutic poisons between developing countries and developed countries and this study supports this finding, such that therapeutic poisons remain the chemicals of choice in the developed world where pesticide use is very low (4% in Europe)<sup>1</sup>. In contrast, another study conducted in Sargodha, Pakistan revealed that the commonest poisoning agent was Aluminum Phosphide ("Wheat pill", used as a rodenticide)<sup>31</sup>. This difference may be because Sargodha is located in Punjab, which is primarily an agricultural region, where access to this agent may be easier.

Another study conducted in Karachi highlighted that the most common agent used for intentional poisoning were pharmaceutical substances such as analgesics, while insecticides were the second most common agents<sup>32, 33</sup>. The main strength of our study was targeting and collecting data from three major tertiary care government centers, where majority of the medico-legal cases are reported and recorded. This allowed us to include data from a variety of socio-economic and cultural backgrounds, and compare it across different demographic characteristics.

One of the limitation of this study is it has utilized a population representative sample having the disadvantage of possibly not being an accurate enough representation of the entire population. Another limitation was a selection bias as we were often given registers at the discretion of the medico legal record room staff, missing data in the medicolegal registers as well as data that could be misclassified due to illegible handwriting in the registers. There is a critical need for the computerization of medico legal documents in order to establish national databases and a poison surveillance system. Mental health may be the most important factor implicated in suicidal attempts, for which we recommend following the WHO 2013-2020 Mental Health Action Plan. The sale of pesticides, especially insecticides needs to be closely monitored and access to them controlled. There is a need to train primary healthcare professionals to manage cases of pesticide poisoning effectively. Future large-scale qualitative studies should be conducted to further validate the findings.

## CONCLUSION

The pesticides, specifically, insecticides and rodenticides, were the most commonly used poisoning agents used for suicide. Majority of cases were brought at Jinnah Post Graduate Medical Centre in the conscious state irrespective of whatever the type of poisoning agent was used.

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## CONFLICT OF INTEREST

There was no conflict of interest among the authors.

## ETHICS APPROVAL

The study approval was sort from all additional police surgeons of JPMC, Abassi Shaheed Hospital and Civil Hospital, Karachi. Ethics Review Committee (RSK No: 410).

## PATIENTS CONSENT

Informed written/verbal consents were obtained.

## AUTHOR'S CONTRIBUTION

LR conceived the idea, designed the study proposal and collected data. RAS helped in data collection and analyzed the data. AMS helped in the manuscript write up and referencing. MUZ helped in data



collection and analysis procedure. ARS and AK helped in literature survey for article, and critical analysis. MRR and RR critically analyzed the manuscript and prepared bibliography. RM also contributed in the critical analysis.

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