Original Article

Socio-Demographic Profiling of Suicidal Cases and Preventive Strategies: An Autopsy-Based Study in Uttarakhand, India

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Abstract

Background: Suicide is a critical public health challenge in India, with 164,033 reported cases in 2021, reflecting a 7.2% increase from the previous year. Uttarakhand accounted for 717 suicides. This study analyzes demographic patterns, methods, and motivations among suicide cases examined at AIIMS Rishikesh to form preventive strategies. **Material and Methods:** A retrospective review of autopsy and inquest reports from Oct 2018 to July 2023. Data on age, sex, residence, occupation, suicide methods, and motives were collected. Statistical analysis, including chi-square tests, was used to compare group differences. **Results:** Of 2,166 autopsies, 255 (11.77%) were suicides. Males predominated (74.11%, n=189) over females (25.88%, n=66; male-to-female ratio 2.86:1, χ^2=34.7, p<0.001). Aged 21–30 years (37.25%). Urban residency with higher suicide rates (54.7% vs 35.3%; χ^2=7.41, p=0.0065). Employed comprised 41%, and unemployed (including homemakers) 50.6%. Depression (41.5%) and family disputes (26.7%) were the leading motives. Hanging (51.4%) was most common, followed by poisoning (42.4%). Poisoning was significantly more common among females (χ^2=7.22, p=0.0072). About 75% died before receiving medical attention. **Conclusion:** The The most affected group is young urban males, with depression and family conflict serving as primary drivers. High lethality and pre-hospital mortality point to the value of mental health outreach, means restriction, and improved emergency response.

Keywords: Suicidal cases, Socio-demographic profiling, Psychosocial factors, Suicide prevention, Public mental health.

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Introduction

Suicide is a pressing public health concern that demands both social and medical intervention. This not only leads to the unfortunate demise of an individual but also imposes deep emotional anguish on the family left behind by the departed. The worldwide prevalence of death by suicide is concerning, positioning it among the top 20 leading causes of mortality globally.[1] Approximately 800,000 individuals lose their lives to suicide annually, equating to one person succumbing to it every 40.[1] Suicide extends beyond high-income nations and presents a phenomenon that affects all corners of the world. In 2019, over 77% of suicides occurred in countries with lower- and middle-income levels.[1] In our society, mental health challenges frequently bear a heavy stigma, leading many individuals to suppress or deny their mental health issues.[1]

Legal complexities surround suicide, with many cases going unreported, contributing significantly to the under-reporting of suicide numbers. The increasing suicide rates in developing countries, as opposed to their more developed counterparts, can be linked to the higher occurrence of socioeconomic and behavioural risk factors associated with suicide.[2] Moreover, diverse demographic characteristics, such as age, sex, occupation, and methods of suicide, may vary across distinct regions and societies.[3]

In 2021, India witnessed 164,033 cases of suicide, marking a 7.2% increase in the suicide rate from 2020.[4] In 2021, most suicide incidents were concentrated in the states of Maharashtra (22,207), Tamil Nadu (18,925), Madhya Pradesh (14,965), West Bengal (13,500), and Karnataka (13,056).[4] Together, these five states comprise 50.4% of all suicide cases reported in the country. In 2021, Uttarakhand reported 717 cases.[4] Nineteen Indian states reported suicide rates more significant than the national average by 2021.[4] We observed a notable occurrence of suicide cases presented for autopsy at our centre, with victims exhibiting diverse profiles and employing various suicide methods. These observations call for further research in this area. Our primary objective was to scrutinize the patterns of suicide-related deaths

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subjected to autopsy at our facility, focusing on key factors such as age, gender, suicide methods, and the motives behind these incidents. Our goal was to decipher the demographic trends and their underlying causes.

Materials and Methods

A retrospective analysis conducted at the AIIMS Rishikesh Department of Forensic Medicine and Toxicology examined 2166 autopsies from October 2018 to July 2023, focusing on suicide cases within the jurisdiction of seven police stations across three districts in Uttarakhand. The study meticulously analysed various parameters, including age, gender, occupation, residence, location of death, method of suicide, type of poisoning, and connections to specific police stations. Data were organized in Excel and statistically analysed using SPSS Version 23. Descriptive statistics summarized findings. The chi-square test assessed associations between categorical variables; $p<0.05$ was considered significant.

This comprehensive exploration aimed to elucidate the complex factors surrounding suicides in the region, highlighting demographic and contextual details to identify potential patterns for better understanding and prevention. By investigating not just the cause of death but also the circumstances leading to it, the research aspires to enhance forensic methodologies and inform public health strategies aimed at suicide prevention, thereby significantly contributing to the fields of forensic medicine and toxicology.

Results

During the study period from 2018 to 2023, 2166 autopsies were performed. Among these, 255 cases, constituting 11.77% of the total, were attributed to suicide, which is slightly lower than the national suicide rate of 12%. Most cases were male, constituting 74.11% (n = 189), whereas 25.88% (n = 66) were female, leading to a male-to-female ratio of 2.8:1. [Figure 1 & Table 1].

1. Demographics

Table 1: Distribution by Sex and Residence

	Rural	Urban	Total
Female	22	44	66
Male	68	121	189
Total	90	165	255

Chi-square test: $\chi^2 = 7.41$, df = 1, p = 0.0065

Interpretation: Urban residency is significantly associated with higher suicide rates among both sexes.

2. Age Distribution

Table 2: Age Groups

Age Group (years)	Number of Cases
1–10	0
11–20	23
21–30	65
31–40	43
41–50	31
51–60	19
>60	8

Most affected: 21–30 years (37.25% of cases).

3. Employment Status

Table 3: Employment Status of Victims

Status	Number	Percentage
Employed	103	41.03%
Unemployed*	127	50.59%
Unknown	21	8.23%

*Unemployed includes homemakers and students.

4. Suicide Motive

Table 4: Motives for Suicide

Motive	Number	Percentage
Mental Health/Depress	92	41.50%
Family Disputes	69	26.66%
Unknown	43	23.98%
Other	11	7.86%

5. Method of Suicide among different Sexes

Table 5: Method of Suicide among different Sexes.

Method	Male	Female	Total
Hanging	110	21	131
Poisoning	73	35	108

Other	6	10	16
Total	189	66	255

Chi-square test: $\chi^2 = 7.22$, df = 2, p = 0.0072
Interpretation: Poisoning is significantly more common among females, hanging among males.

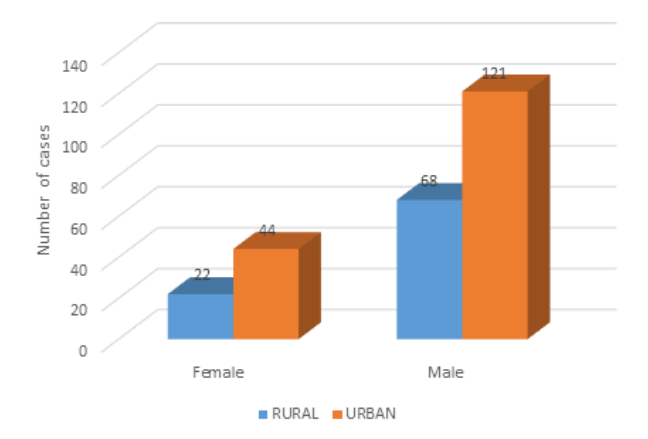

Figure 1: Shows the gender of deceased individuals in rural and urban areas, comparing male and female suicide cases.

The average age of the victims was 33.4 years, predominantly within the age range of 21-30 years [Figure 2].

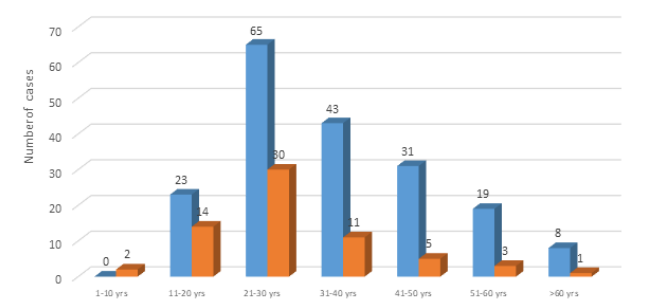

Figure 2: Shows age distribution of suicide cases among different age groups.

The suicide rates were higher in the urban population (54.7%, n = 165) than in the rural population (35.28%, n = 90) [Figure 1]. Among the victims, 41.03% (n = 103) were employed, 50.59% (n = 127) were unemployed (including homemakers), and 4.78% (n = 21) were unknown [Figure 3].

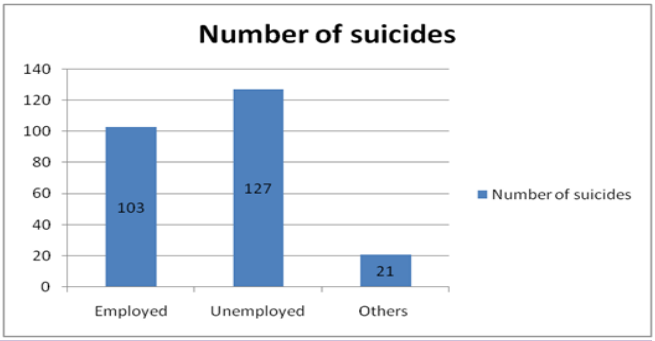

Figure 3: Graph shows the counts of employed, unemployed, and other categories among suicide victims (Employment status).

Regarding the reasons for suicide, mental health/depression was the most common factor (41.50%, n = 92), followed by family disputes (26.66%, n = 69). In 23.98% (n = 43) of the cases, the reason for suicide remained unknown. The reasons for suicide, mental health/depression, were the most common factor (41.50%, n = 92), followed by family disputes (26.66%, n = 69). In 23.98% (n = 43) of the cases, the reason for suicide remained unknown. Among poison-related suicides, rodenticides (celphos-aluminum phosphide, aluminum phosphide & zinc phosphide) were the most frequently ingested poison (55.8%, n = 22), followed by organophosphates (31.8%, n = 18). In comparison, the nature of the poison remained unknown in 78.34% (n = 199) of cases. All the demographic data is shown in [Figure 1-3 & Table 1-5].

AIIMS Rishikesh had jurisdiction over seven police stations for medico-legal autopsies, with the highest number conducted under its authority (72.94%, n = 186), including cases brought to hospitals. This was followed by Raiwala (8.62%, n = 22), Muni Ki Reti (8.23%, n = 21), and Laxman-Jhula (4.31%, n = 11). The place of suicide was also variable among the deceased; most of the 49.80% (n=127) of people committed suicide at home, followed by 23.13% (n=95) in which the place is unknown, and 7.05% (n=18) committed suicide at ashrams/hotels/hostels or rented accommodations.

Discussion

This study provides insights into the socio-demographic characteristics of individuals who underwent autopsies at our institution after succumbing to suicide. Suicidal tendencies pose a significant healthcare challenge, particularly in low- and middle-income nations.[5] The findings indicated that men exhibited higher susceptibility to suicide than women, with a distribution of 76.11% versus 25.88%, resulting in a male-to-female ratio of 2.86:1. This aligns with a study by Nunez et al., who reported that 86% of victims were men, maintaining a 6:1 ratio between men and women.[6] A similar retrospective study conducted in Kuwait from 2014 to 2018 encompassing 297 cases revealed that 81.1% of the patients were male; notably, 60.2% of all patients were of Indian origin, whereas only 7.4% were Kuwaiti nationals.[7] Remarkably, although suicide attempts were more frequent among females, the incidence of completed suicides was comparatively higher among males.[8] These findings contradict research that suggests suicidal behaviour is more prevalent in women, while suicide is more prevalent in men.[9]

The average age of individuals who ended their lives through any means was 33.4 years, with the age group between 21 and 30 years being the most susceptible. Various sources of evidence support the idea that young individuals in their second and third decades of life are the primary contributors to overall suicide rates.[5]

Nunez-Samudio et al. identified the 20-29-year age group as the most affected.[6] A systematic review confirmed a high prevalence of suicide rates within the 20-29-year-old age group,

with a notable difference in gender distribution. Among those under 30 years of age, females are more likely to commit suicide, whereas males are more likely in the 30 years or older age group.[10] Concerning the vulnerability of different population areas, urban regions reported more suicide deaths than rural areas did. Potential factors contributing to this disparity include workplace stress, busy lifestyles, and the higher cost of living.

India's global suicide rate has increased from 25.3% in 1990 to 36.6% in 2016 among women and from 18.7% to 24.3% among men.[11] In a study encompassing various states in India, suicide rates per one hundred thousand people rose from 14.9 in 2001 to 15.4 in 2016. It was also observed that more developed states reported higher suicide rates than less developed states.[12] Globally, India ranks 19th in terms of prevalence.[13] A distressing aspect of suicide in India relates to farmer suicides, primarily linked to meager returns from farmland, a lack of income diversification, mounting debts, crop failures due to factors such as rainfall, loss of social standing, and the inability to fulfill societal roles, all of which contribute to individuals taking their own lives.[11]

In the present study, the predominant causes of suicide were depression and family disputes. A similar investigation reported that 33.7% of individuals committed suicide for personal reasons, and 24.4% had unknown reasons for which a specific cause could not be determined.[12] There was a noteworthy correlation between suicide and the presence of comorbid physical or psychiatric conditions, with a particular emphasis on substance abuse, especially alcohol.[13] Another study underscored the robust connection between suicide and psychiatric issues, particularly depression. In states with lower socioeconomic status, significant challenges related to mental illness, alcohol abuse, and interpersonal difficulties have been identified as major contributors to suicide.[10]

In our study, the most prevalent suicide method for both sexes was hanging (51.37%), followed by poisoning (42.35%). Among the males, hanging emerged as the predominant method, followed by poisoning, whereas among the females, poisoning took precedence, followed by hanging. Numerous studies have reported similar findings, consistently identifying hanging as the most common method of suicide, followed by self-poisoning and firearm use.[5] The prevalence of firearm suicides is higher in the Western world, primarily because of the ease of obtaining licensed weapons, in contrast to our country, where obtaining a license is challenging. However, firearm-related suicides are not uncommon, particularly within the armed forces.

In contrast to our results, Dandona et al. reported poisoning as the primary method of suicide, followed by hanging.[12] Similarly, Rane et al. identified hanging as the leading method, followed by poisoning. Self-immolation, notably observed in dowry deaths among women, has also been reported.[10,14] Hanging, a technique that uses household materials as ligatures, is often performed when an individual is alone.

Celphos aluminum phosphide was the most frequently ingested poison, accounting for 18.51% of the autopsied cases. The type of poison remains unknown in 49.07% of the cases. Numerous studies have identified pesticides, particularly organophosphate compounds, as the predominant cause of poisoning.[5,10,12,13,15,16] The availability and accessibility of these substances at home contribute to suicide by poisoning. The advent of the green revolution, while preventing famine deaths, introduced pesticides such as parathion and endrin to impoverished rural populations who lacked the training and resources to use and store these substances safely.

In this study, most of the suicide victims were employed (31.76%), followed by those without jobs (19.60%), housewives (16.47%), and students (13.33%). A stressful work environment may serve as a potential risk factor for suicidal thoughts, as suggested by other studies.[17] In a survey conducted by Koreaby Lim et al., 39.5% of participants exhibited clinical levels of depression, and 15.3% reported suicidal ideation.[18] A cross-sectional study by Ahn et al. revealed that among female workers, suicidal ideation/attempts were significantly associated with physical environment, lack of rewards, and occupational climate. However, in male workers, experiences of suicidal ideation/attempts were more correlated with depression than job stress.[19] Medical residents commonly experience burnout due to excessive workload, with 64.05% of interns and 40% of junior residents expressing burnout thoughts. Surgical specialty residents are particularly prone to burnout, with no observed gender differences in burnout levels.[20]

Peer pressure is a notable contributing factor to suicide among younger generations. The Internet and social media serve as easily accessible platforms for expressing stress, yet various methods of suicide are readily available.[16,21] There was a clear association between Internet use and self-harm behaviour, mainly linked to Internet addiction, a prevalent issue in vulnerable age groups in our study. The suicide death rate in India surpasses expectations for its socio-demographic index level, especially among women, demonstrating significant variations in both magnitude and male-to-female ratio among different states. Considering these disparities, the government should formulate suicide prevention programs tailored to address specific issues leading to suicide in other states and strata of society.

Preventive Measures: Various preventive strategies have been developed to reduce suicide risk. These measures include limiting access to commonly used means of suicide, such as pesticides, firearms, or certain medications. It is crucial to collaborate with the media and relevant authorities to promote the responsible reporting of suicides. Additionally, imparting socio-emotional life skills to adolescents may be beneficial. Early identification, access, management, and follow-up of individuals affected by suicidal behaviours are essential. Some authors have identified common themes in suicide, such as a crisis leading to intense suffering with feelings of hopelessness and helplessness, a conflict between unbearable stress and survival, a desire to escape rather than move towards a solution, a narrowing of perceived options, and often a wish to self-punish or punish significant others, usually accompanied by guilt.[22]

Numerous red flag signs can be observed, and while a single warning sign by itself may not warrant immediate action, the presence of these signs in clusters indicates the need for intervention.[23,24] The concept of means restriction is employed in suicide prevention, which involves community or societal actions that do not ideally rely on individual intention or volition.

When applied to the population, it tends to impact individuals whose suicide risk may otherwise go undetected and who may not actively seek therapeutic assistance to avert a crisis or receive life-saving interventions when needed.[25] An example of this restriction is the removal of the pump handle in the United Kingdom by John Snow.[26] Alterations in the environment or access can affect or forestall suicide.

Conclusion

The occurrence of suicides in our region is on the rise at an alarming pace, with a considerable portion attributed to young males. While urbanization is pivotal for economic progress, it simultaneously poses a risk of suicide among young individuals, owing to the heightened stress of meeting basic survival needs.

Surprisingly, individuals employed in jobs are more susceptible to suicide than those who are unemployed, indirectly indicating the stressful work environment they face. It is crucial not to leave individuals with suicidal thoughts, taking psychiatric medication, or experiencing depression alone, as most victims take their lives when left unattended. Even minor psychiatric issues should not be disregarded, and seeking proper consultation is imperative to comply with government regulations regarding the sale of agricultural insecticides to mitigate access to these poisons. Promoting gender equality can contribute significantly to reducing the number of suicides among females.

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Conflicts of interest

There are no conflicts of interest.

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