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Methods of Choice in Completed Suicides: Gender Differences and Review of Literature

ABSTRACT: Suicide is an important public health hazard worldwide. A 4-year retrospective study from January 2000 to December 2003 was conducted to identify the favored methods in realized suicides among males and females in the west coastal region of India. During the study period, a total of 539 cases of suicidal deaths were autopsied. Males were predominantly affected (male: female—1.9:1). The age of the victims ranged from 13 to 90 years in males (mean = 40.1 years, median = 37.0 years) and 15 to 85 years in females (mean = 36.6 years, median = 32.0 years). Most favored method of suicide amongst males and females was hanging (36.9%, $n = 199$) followed by poisoning (34.7%, $n = 187$). Male dominance was apparent for each method of suicide except for self-immolation. Males were relatively more likely to use hanging and poisoning while females were more likely to prefer drowning and self-immolation as methods of suicide. Relatively younger females (mean = 33.0 years, median = 32.0 years) preferred hanging as a method of suicide when compared to males (mean = 42.4 years, median = 40.0 years). Among females, significantly younger females resorted to hanging when compared to older females who preferred drowning. On investigating the various theories proposed for choice of suicide methods in males and females in different regions we conclude that preference of method of suicide in men and women is complexly determined. In this region, availability, accessibility, popularity, and socioacceptability seem to be the major determinants in the choice of methods among males and females rather than violence associated and lethality of the method. Females were as likely to use lethal and violent methods as males in this region.

KEYWORDS: forensic science, suicide, methods of suicide, gender differences, hanging, self-immolation

Suicide is one of the most important public health problems worldwide. Pattern of suicidal deaths reflects the prevailing social and psychological mindset of the people of a region. Suicidal behavior, pattern, and rates differ in various populations and culture. Asia in total accounts for up to 60% of all suicides (1) and India alone contributes to more than 10% of suicides in the world (2). Suicide statistics in India are staggering. Primary cause of concern has been a steady rise (8.47 per 100,000 population in 1989 to 11.2 per 100,000 population in 1999) in suicide rate over the years (2). The problem may be even more serious as the data from developing countries in Asia in most instances are underestimated (1,3). It is well known that individuals of different races in different countries tend to use different methods of committing suicide (4). Cultural, religious, and social values appear to play a major role. Since suicide is a multi-causal phenomenon, its therapy and prevention should be complex and gender differences should be taken into consideration while building up preventive strategies (5,6). This is a comparative study of completed suicides done with an aim to describe the differences in methods used among males and females. This study also summarizes the differences in preferred methods of suicide in males and females, among various population groups and examines the extent to which the availability, attraction, and lethality of particular methods of suicide affects choice or preference of a method.

Materials and Methods

Medicolegal autopsy is imperative when death is sudden, unexpected, suspicious, or unnatural in manner. In India, all suicidal deaths are recorded as unnatural and a postmortem examination is performed. This retrospective research was carried out in the Department of Forensic Medicine and Toxicology, Kasturba Medical College, Mangalore in the west coastal region of India. All unnatural deaths autopsied at the Government District Wenlock Hospital mortuary between January 2000 and December 2003 where the manner of death was deemed to be suicidal as per police investigations and autopsy findings were included in the present study. Gender was taken as the main observed variable and the data registered in a database were analyzed for methods used in completed suicides in relation to gender using Microsoft Excel and Statistical Package for Social Sciences (SPSS) for Windows, version 11.5. Chi-square test was performed to compare the categorical variables (method by gender). The Wilcoxon–Mann–Whitney test was used to compare variables (ages by gender and ages by method). Statistical significance was defined at the standard 0.05 level. Gender-based differences in methods employed to commit suicide are discussed and compared to those used elsewhere in India and abroad.

Results

A total of 539 autopsies on suicidal deaths comprising 350 males and 189 females were conducted at the aforementioned center between January 2000 and December 2003. Males were predominantly affected (64.9%). Male–female ratio was 1.9:1. The age of the victims ranged from 13 to 90 years in males (mean = 40.1 years, median = 37.0 years) and 15 to 85 years in females

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(mean = 36.6 years, median = 32.0 years). Amongst all suicide victims, 97.6% (*n* = 526) resorted to hanging, poisoning, drowning, and self-immolation as preferred methods of suicide. Among other methods (*n* = 13, 2.4%), railway related suicides were most common (*n* = 5) followed by the use of firearms (*n* = 3), sharp weapons (*n* = 2), jumping from height (*n* = 2), and electrocution (*n* = 1). Most favored suicide method amongst males and females was hanging followed by self-poisoning with toxic substances. Hanging and poisoning together accounted for 77.1% suicides in males and 61.4% suicides in females. Males were proportionately more likely to use hanging and poisoning when compared to females, while females were more likely to use drowning and self-immolation as preferred methods of suicide than male victims. Significant male–female differences were observed for different methods of suicide ($\chi^2 = 33.833$, *df* = 4, *p* < 0.001). Male–female ratio varied for different methods of suicide. Reversal of male–female ratio was evident for self-immolation deaths. Victimologic distribution and male–female ratio for each method of suicide is shown in Table 1. Of the 13 victims who chose less common methods of suicide, most (four males and one female) resorted to railway related suicides. A female committed suicide by electrocution, whereas firearms, sharp weapons, and jumping from height were exclusively restricted to male victims. A significant male–female difference in mean age was observed only for hanging. Relatively younger females (mean = 33.0 years, median = 32.0 years) preferred hanging as a method of suicide when compared to males (mean = 42.4 years, median = 40.0 years). Age distribution for each method of suicide is shown in Table 2. Significantly younger females (*p* < 0.001) resorted to hanging when compared to older females who preferred drowning as a method of suicide. Otherwise no other significant differences were observed for individual methods of suicide in different ages among males and females. On genderwise analysis, most suicide victims (60.9% males and 60.8% females) were in the 20–44 years age group followed by 45–64 years age group (27.7% males and 19.6% females). Extremes of ages were least involved. It is apparent that adolescent females (≤ 19 year age group) and males in the 45–64 years age group were relatively more commonly the victims of suicide (Fig. 1). Choice of method of suicide varied in different age groups among males

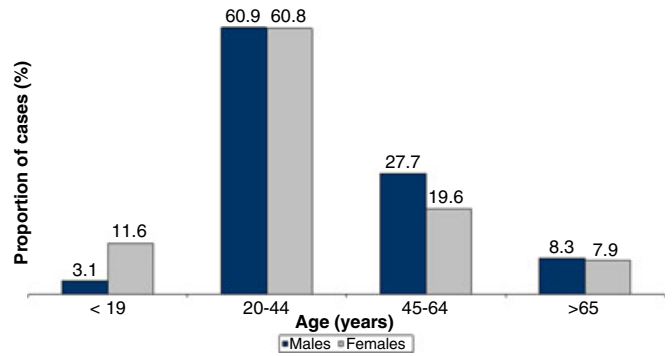


FIG.1—Genderwise distribution of suicide victims in different age groups.

and females (Table 3). Significant differences were, however, only observed for hanging as a method of suicide in different age groups among males and females.

Discussion

Male predominance in suicides in our study is similar to that reported in most countries with the exception of China (7). Order of male–female ratio however, reportedly varies in different countries (1). Higher suicides in men have been related to elevated economic difficulties and social responsibilities (8,9). Besides, a higher case fatality rate for different suicide methods is reported in males (10–13). The higher case fatality rate may indicate the intent and seriousness of the suicide attempt in males when compared to females (12), which may in turn also contribute to an increased male–female ratio. Poor data registration system is a consistent problem in developing countries (14). A limitation of the present retrospective research was our inability to test the theories relating case fatality with gender and method due to unavailability of the survival details. An analysis of risk factors and circumstances of suicide also could not be done. Overall higher suicide rate in men can be attributed to the fact that males are subjected more rigorously to the temptations, challenges, stresses, and strains of life than females (15–17).

The common methods of suicide prevalent among both genders in different population groups (18–32) are compared to our study in Table 4. Researchers have suggested that people use methods of suicide to which they have ready access. Firearms are readily available in many households and remain the most common method of suicide in the United States. Kaplan and Celeng reported that the percentage of American households with firearms ranges from 38.6% in New England to 70% in East South Central and concluded that firearm availability especially in the home is a strong predictor of suicide in the United States (33–35). Some observers argue that women are more concerned with appearance than men and therefore, they are less apt to use firearms in committing suicide and in situations where women do use firearms, they are less inclined to shoot themselves in the head for fear of disfigurement (36). Conwel et al. (37) found that men were more likely than women to use firearms, but since a considerable number of women also used firearms doubt remains on these arguments. The findings of our study support the theory of availability and accessibility of suicide method among both males and females, and not the one concerned with appearance and disfigurement. All four commonly used methods of suicide by males and females were easily available and accessible to the victims of realized suicides. Strict implementation of firearm legislation in India and high cost of

TABLE 1—Victimologic distribution of the preferred methods of suicide.

| Age (years) | Male (n, %) | Female (n, %) | Total (n, %) | M:F |
|-----------------|-------------|---------------|--------------|-------|
| Hanging | 138, 39.4 | 61, 32.3 | 199, 36.9 | 2.3:1 |
| Poisoning | 132, 37.7 | 55, 29.1 | 187, 34.7 | 2.4:1 |
| Drowning | 52, 14.9 | 34, 17.9 | 86, 16.0 | 1.5:1 |
| Self-immolation | 17, 4.9 | 37, 19.6 | 54, 10.0 | 1:2.2 |
| Others | 11, 3.1 | 02, 1.1 | 13, 2.4 | 5.5:1 |
| Total | 350, 100 | 189, 100 | 539, 100 | 1.9:1 |

TABLE 2—Age distribution (years) of the preferred methods of suicide.

| Method | Male | | | Female | | |
|-----------------|-------|------|--------|--------|------|--------|
| | Range | Mean | Median | Range | Mean | Median |
| Hanging | 13–90 | 42.4 | 40.0 | 15–80 | 33.0 | 32.0 |
| Poisoning | 16–80 | 37.9 | 35.0 | 16–80 | 36.6 | 32.0 |
| Drowning | 22–73 | 41.7 | 40.0 | 19–80 | 43.0 | 39.0 |
| Self-immolation | 20–52 | 35.5 | 33.0 | 19–85 | 36.4 | 29.0 |
| Others | 19–65 | 37.5 | 35.0 | 32–54 | 43.0 | 43.0 |
| Total | 13–90 | 40.1 | 37.0 | 15–85 | 36.6 | 32.0 |

TABLE 3—Gender-based distribution of the preferred methods of suicide in different age groups.

| Age groups | ≤19 years | | 20–44 years | | 45–64 years | | ≥65 years | |
|-----------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|
| | Male (n, %) | Female (n, %) | Male (n, %) | Female (n, %) | Male (n, %) | Female (n, %) | Male (n, %) | Female (n, %) |
| Hanging | 06, 54.5 | 11, 50.0 | 70, 32.9 | 36, 31.3 | 45, 46.4 | 12, 32.4 | 17, 58.6 | 02, 13.3 |
| Poisoning | 04, 36.4 | 06, 27.3 | 91, 42.7 | 34, 29.6 | 28, 28.9 | 11, 29.7 | 09, 31.0 | 04, 26.7 |
| Drowning | 00, – | 02, 09.1 | 32, 15.0 | 19, 16.5 | 18, 18.6 | 08, 21.6 | 02, 06.9 | 05, 33.3 |
| Self-immolation | 00, – | 03, 13.6 | 13, 06.1 | 25, 21.7 | 04, 04.1 | 05, 13.5 | 00, – | 04, 26.7 |
| Others | 01, 09.1 | 00, – | 07, 03.3 | 01, 0.9 | 02, 02.1 | 01, 02.7 | 01, 03.4 | 00, – |
| Total | 11, 100 | 22, 100 | 213, 100 | 115, 100 | 97, 100 | 37, 100 | 29, 100 | 15, 100 |

TABLE 4—Genderwise preference of suicide methods in different population groups.

| Study | Nationality | Period | Males | | | Females | | |
|-----------------------|-----------------|-----------|-----------|-----------|-----------|-----------|------------------|-----------|
| | | | First | Second | Third | First | Second | Third |
| Ojima (18) | U.S.A. | 1999 | Firearm | Hanging | Poisoning | Firearm | Poisoning | Hanging |
| Ojima (18) | Asians (U.S.A.) | 1999 | Hanging | Firearm | Jumping | Hanging | Firearm | Poisoning |
| Ojima (18) | Japan | 1999 | Hanging | Jumping | Gases | Hanging | Jumping | Drowning |
| Henderson (19) | U.K. | 1999–2003 | Hanging | Poisoning | – | Poisoning | Hanging | Jumping |
| Kposowa (20) | U.S.A. | 1998–2001 | Firearm | Hanging | Poisoning | Poisoning | Firearm | Hanging |
| Denning (21) | U.S.A. | | Firearm | Hanging | – | Poisoning | – | – |
| Petrauskiene (22) | Lithuania | 1993–1997 | Hanging | Firearm | – | Hanging | Poisoning | – |
| Nachman (23) | Israel | 1985–1997 | Hanging | Firearm | Jumping | Jumping | Hanging | Poisoning |
| Nikolic-Balkoski (24) | Serbia | 1997–2004 | Hanging | Firearm | – | Hanging | Poisoning | – |
| Stark (25) | Scotland | 1981–1999 | Hanging | Poisoning | – | Poisoning | – | – |
| Marin-Leon (26) | Brazil | 1976–2001 | Hanging | Firearm | – | Poisoning | Firearm, Hanging | – |
| Nordrum (27) | Norway | 1972–1992 | Firearm | Hanging | Poisoning | Hanging | Poisoning | Drowning |
| Benomran (28) | Glasgow | 1980–1983 | Hanging | Drowning | Poisoning | Poisoning | Hanging | Drowning |
| Benomran (28) | Libya | 1984–1987 | Hanging | Drowning | – | Hanging | Poisoning, Burns | – |
| He (29) | China | | Poisoning | Hanging | – | Poisoning | Hanging | – |
| Azma (30) | Turkey | 1984–2004 | Hanging | Firearm | Poisoning | Poisoning | Hanging | – |
| Sharma (31) | Northern India | 1996–2005 | Poisoning | Burns | Hanging | Burns | Poisoning | Hanging |
| Pal (32) | Eastern India | 2003 | Poisoning | Hanging | Burns | Poisoning | Burns | Hanging |
| Present study | Southern India | 2000–2003 | Hanging | Poisoning | Drowning | Hanging | Poisoning | Burns |

ownership make firearms relatively difficult to obtain. This non-availability explains the low popularity of firearms as a method of suicide in India when compared to the western world. Similarly nonavailability and accessibility to high rise buildings in the region may be the cause of less number of suicides by the method of jumping from heights, supporting the theory of availability and accessibility. More so, the popularity of drowning as a method of suicide in the west coastal region of southern India, owing to availability of wells in almost every house, and easy accessibility to ponds, rivers, and the sea (38), further confirms the argument. Although self-immolation is a painful method that results in disability, disfigurement, and delayed death, it continues to be a preferred method among females in this region, this being easily available and accessible to them. Similar observations are made in a study in a province of Iran where women are found to be at a greater risk of suicidal behavior by burns than men (12). Our findings are thus different to a popular perception that females are more concerned with quickness, painfulness, and disfigurement, but less concerned with the availability of the method (39).

Cultural attitudes toward death may influence the choice of method of suicide. A study by Stack and Wasserman (40) assesses the link between choice of violent methods of suicide and race from the standpoint of differential socioacceptability and differential availability. The study indicated that African-Americans are more likely than Caucasians to choose violent methods of suicide although they are less likely to own firearms. Intentional carbon monoxide poisoning by burning charcoal in a confined space, a relatively newer and popular method of suicide in Hong Kong is

another example of cultural acceptability. Some survivors who had attempted suicide by charcoal burning in interviews with the researchers also indicated that they chose this method because it was easy and painless (41). Popularity of self-immolation as a method of suicide in Indian females supports the concept of cultural acceptability. Ritual self-immolation has long been practiced in India. In the past, the practice was related to the act of Sati, which was a custom followed in ancient India wherein the widow used to ritually immolate herself in the funeral pyre of her departed husband. Nowadays, self-immolation is more commonly associated with dowry disputes, a traditional Indian custom where in the bride's family has to gift "dowry" to the bridegroom in the form of money, gold, or property (42). Unfulfillment or partial fulfillment of the desired dowry may lead to undue harassment of the bride. A bride unable to tolerate the stress, resorts to suicide, self-immolation being the preferred method (43). Self-immolation on the other hand is extremely rare and tends to be a political gesture in western countries when compared with the Indian sub-continent (44).

Most popularly held theories explaining the gender differences in choice of suicide methods, are those related to lethality and violent nature of suicide method. Although often used simultaneously, these two terms differ from each other. A violent method may not necessarily be lethal and a lethal method may not necessarily be a violent one. Suicide methods vary in lethality as measured by case fatality rate. Firearms, drowning, and hanging are the most lethal methods while the less lethal methods were drug overdose/poison ingestion and cutting/piercing. Fatality of poison ingestion is dose dependent. A higher case fatality in suicidal poisoning is reported

when compared to accidental poisoning confirming the relation between the dose and fatality (13). Fatality also depends on choice of agent. In developed countries, this choice protects women from dying because the agents used for overdose are often over the counter medications, which tend to be less lethal. However, in rural Asia, women often overdose on readily available lethal pesticides and thereby, convert what would be an impulsive nonfatal suicide attempt in the west to a completed suicide (45,46). Although poison ingestion can be a fatal method, it definitely is not a violent one and is often considered as a less lethal method. Self-immolation on the other hand is a violent method where fatality depends on total body surface area involved in burn injuries. Studies in India have reported that burns involving over 40% body surface area resulted in 80% mortality, while 100% mortality was reported in patients with involvement of over 70% of total body surface area (47,48). Majority of the deaths from burns are reported within a week (49). No definite criteria have ever been proposed for a method to be termed as a violent one. Amongst the common methods employed for suicide worldwide, except for poisoning all others can be categorized as violent. In our opinion, based on the criterion of violence involved, the methods preferably may be grouped as violent and less violent.

In our study, more men used the immediately fatal and more lethal method of hanging and relatively less lethal one of poisoning, while women were more likely to choose the more lethal method of drowning and relatively less lethal one of burns. Contrary to other parts of India, hanging was the preferred method of suicide and self-immolation was the least preferred one among the four commonly employed methods, owing to a relatively lower incidence of dowry related suicides in southern India. When compared to other parts of India, drowning is relatively more common among both sexes. In our study, older females preferred drowning in contrast to younger females who preferred hanging, both equally lethal methods of suicide. Besides regional variations, the choice of methods is shown to differ between rural and urban populations. A study done in neighboring rural and semi-urban areas of Manipal revealed poisoning to be the preferred method of suicide (50).

In trying to test the two popular notions of lethality of methods and violent methods of suicide, we considered the methods as more immediately fatal (hanging, drowning, railway related) and less immediately fatal (poisoning, self-immolation, cutting, piercing). On the basis of violence associated with the method, all with the exception of poisoning were considered to be violent methods. It appears that the situation is more complex than a simple dichotomy between more lethal and less lethal methods. In the past, hanging has been considered a very lethal method preferred by males. However, self-immolation and drowning happen to be equally lethal. As far as theory of violent method is considered, self-immolation and drowning are equally lethal and violent methods of suicide, while hanging is the least violent method among those that kill with minimal suffering. Although hanging is a lethal method with a high probability of effecting death, women used it at about the same rate as men. That self-poisoning forms a bulk of the total suicide mortalities is attributed to a general belief that poisoning kills with minimal suffering. A considerable number of men used poisoning as a method of suicide although theoretically women were more likely to use it.

Conclusion

Various researchers have related gender and the choice of method used to commit suicide depending on availability, accessibility, and popularity of means, quickness and knowledge about

lethal effectiveness, victim's motivation, planning and intent, disfigurement, violence involved, cultural and socioacceptability. The use of a certain means of suicide depends on the existence of opportunities to commit suicide in the everyday environment. Hanging and poisoning were the two preferred methods of committing suicide among males and females in this region of India. Thus females are as likely to use lethal and violent methods as males in this region. Females resorted to hanging as a method of suicide at a relatively younger age when compared to males. The major difference with reference to preference for a method of suicide was with regard to self-immolation which was about four times more prevalent in females as compared to males. Among females, younger females resorted to hanging when compared to older females who preferred drowning. In this region, availability, accessibility, popularity, and socioacceptability seem to be the major determinants in the choice of method among males and females rather than those associated with violence and lethality. We conclude that preference of method of suicide in men and women is complexly determined. Awareness and understanding of methods of suicide used by males and females may prove important in the development of preventive strategies. More extensive studies in different regions are suggested to find bias in preferred methods of suicide in both genders, so that preventive strategies can be planned and taken up accordingly. Poor data registry system in India is a cause of concern. Limitations withstanding, we further propose more elaborate prospective studies on case fatality for each method, circumstances, stressors, and underlying risk factors of suicides in India.

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