A Study of Epidemiology of Poisoning Cases Brought For Autopsy at Tertiary Health Care Centre in South-Western Maharashtra: A Ten-Year Retrospective Study

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Abstract

Introduction: Present study is the study of epidemiology of poisoning cases brought for autopsy at tertiary health care centre in South-Western Maharashtra by finding out the incidence, pattern, sociodemographic factors, toxic agents, seasonal and other factors related to their deaths.

Material and Methods: Present study is a retrospective cross-sectional study done in mortuary of a tertiary health care centre in South-Western Maharashtra. Study included total 104 cases of death due to poisoning from Jan 2009 to Dec 2018 and the data collected from inquest papers, autopsy reports and regional forensic science laboratory reports was analysed using a structured proforma in Microsoft excel sheet.

Result: Out of 2570 medico legal autopsies conducted during the study period, deaths due to poisoning comprised 104 cases i.e. an incidence of 4.05%. Maximum deaths due to poisoning are found to be due to Intentional self-poisoning (suicides) and rural areas are more affected than the urban areas. Most commonly used toxic substance for poisoning is found to be pesticides and the maximum deaths occurred during the monsoon season. Gender-wise analysis shows that death due to poisoning is more common in males and majority of victims irrespective of their gender were married.

Conclusion: Study provides crucial information on various sociodemographic factors related to poisoning deaths in South Western Maharashtra which is relevant in understanding the causative factors behind the mortality due to poisoning and also helpful in devising preventive measure to reduce the loss of human life.

***Keywords**: Poisoning, Epidemiology, Autopsy, Suicide, Pesticides.*

Introduction

Death by poisoning has been known since time immemorial. Some of the famous names and incidents such as Socrates, Meera Bai, Bhopal gas tragedy, Bradford sweet poisoning, Tokyo subway sarin attack and Punjab sweet poisoning, remind us of this dangerous threat to life. Death by poisoning whether intentional or unintentional is a significant global health concern as it is a major cause of worldwide mortality and morbidity. As per WHO estimates, in 2012 unintentional poisoning caused the loss of 193460 life's and loss of 10.7 million years of healthy life all across the globe. Each year about 3.7 lac people lose their life by deliberate consumption

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of highly toxic pesticides and about 1 lac people become victim of fatal snake bite.[1]

India is among the countries with high mortality due to poisoning and high incidence of suicide by farmers by pesticide consumption. About 50,000 people die in India every year due to poisoning as per the estimates.[2] Mortality rate from poisoning in India varies from shocking 15 to 35%.[2] The high incidence of farmer suicide has been plaguing the agricultural sector and is having a grave impact on our agriculture-based economy. Despite of being a highly debated issue and various measures like loan waivers for farmers, pesticide poisoning continues to be major contributor to the death by poisoning and much needs to be done to counter this menace.

Mortality due to poisoning varies from region to region and different regional studies have shown varying trends depending on multiple factors. Updated regional information on poisoning cases, availability of published data, regional poison information centers and robust surveillance system are must to significantly reduce the mortality and morbidity due to poisoning. Paucity of information on locally available toxic substances, population at risk, circumstances of poisoning is a hurdle in prevention of poisoning by targeted intervention programs and laws. Therefore, it is crucial to carry out region-based time to time review of poisoning patterns to help in reducing the mortality due to poisoning.

Present study aims at study of epidemiology of poisoning cases brought for autopsy at tertiary health care centre in South-Western Maharashtra by finding out the incidence, pattern, sociodemographic factors (i.e. age, gender, domicile and marital status), toxic agents, seasonal and other factors related to their deaths and to suggest preventive measures to avert loss of human lives due to poisoning.

Material and methods

This is a retrospective cross-sectional study done in mortuary of a tertiary health care centre in South-Western Maharashtra. All confirm cases of death due to poisoning from 1 Jan 2009 to 31 Dec 2018 were included in the study. Study included total 104 cases and data were collected from inquest papers, autopsy reports and regional forensic science laboratory reports. Ethical clearance was obtained from institutional ethical committee.

Data was entered in Microsoft excel sheet in a structured proforma consisting of age, gender, marital status, residence, type of substance causing poisoning, manner of poisoning, date, month and season of incidence and analysed. All the analysed data was presented in graphs, charts and tabular forms using the same software application.

Results

A total of 2570 medico legal autopsies were performed between Jan 2009 to Dec 2018 at the study centre. Deaths due to poisoning comprised 104 cases i.e. an incidence of 4.05% among the total autopsies conducted during the study period. Annual incidence rate of death due to poisoning was calculated for the study period and it showed a decreasing trend 2013 onwards. [Figure 1]

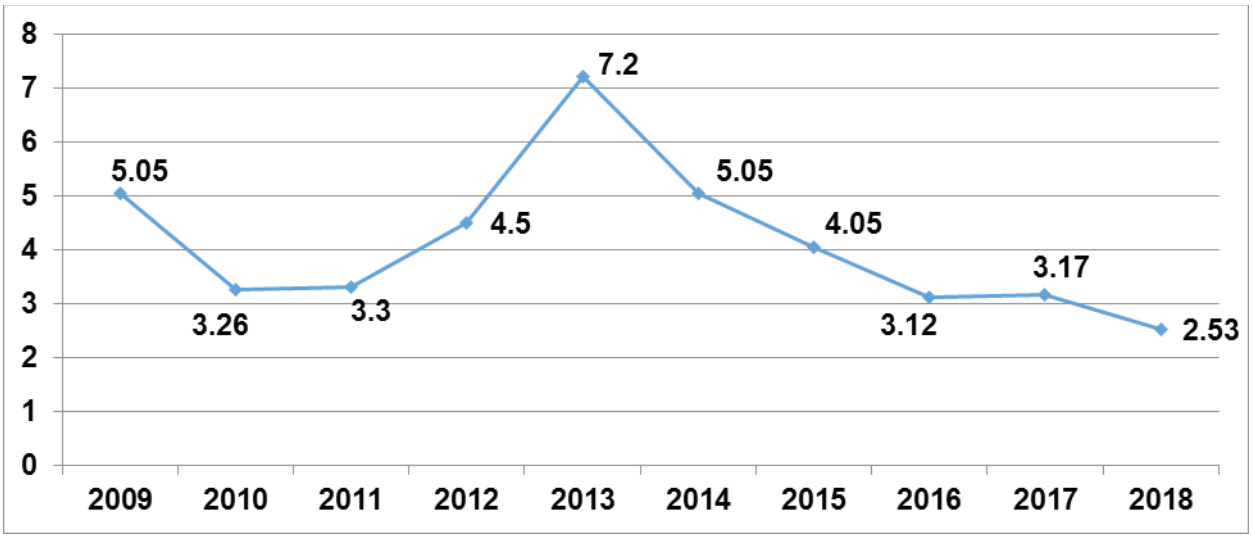

FIGURE 1: YEAR WISE INCIDENCE RATE OF FATAL POISONING

As per the manner of death, 93 (89.42%) cases were of suicidal poisoning, 8 (7.7%) cases were of accidental poisoning, 1 (0.96%) case of homicidal poisoning and in 2 (1.92%) cases, manner of poisoning was undetermined. [Figure 2]

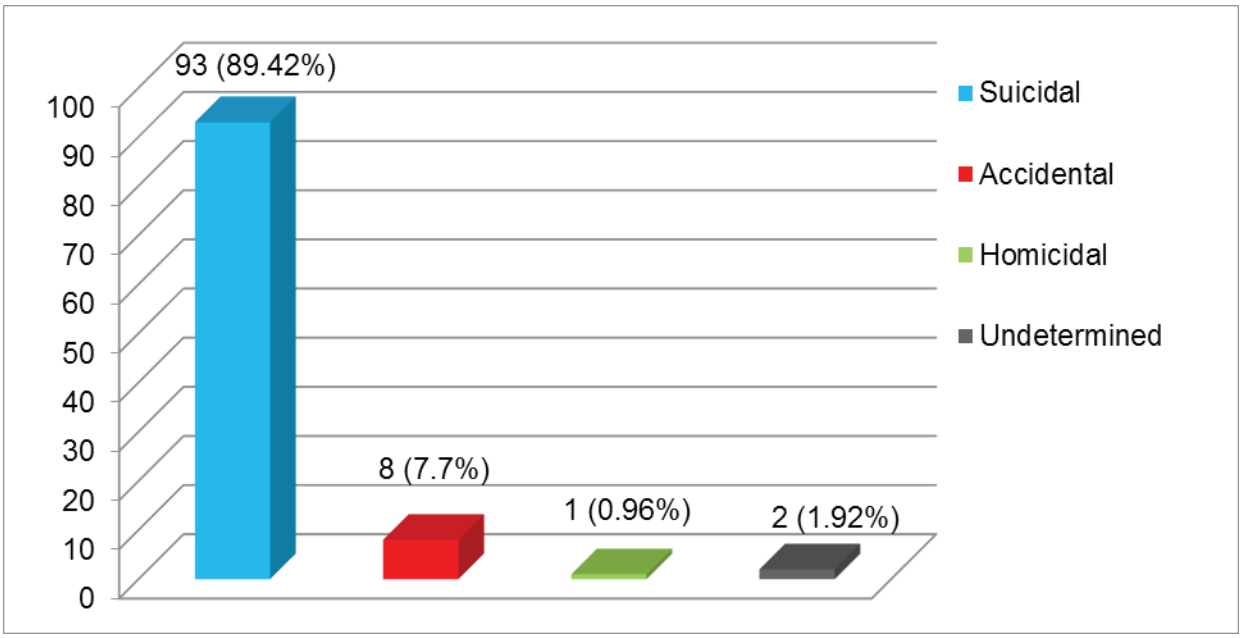

FIGURE 2: MANNER OF POISONING CAUSING DEATHS

Incidence of poisoning was found to be more common in rural areas (n=55, 52.88%) than in urban areas (n=49, 47.12%). [Figure 3]

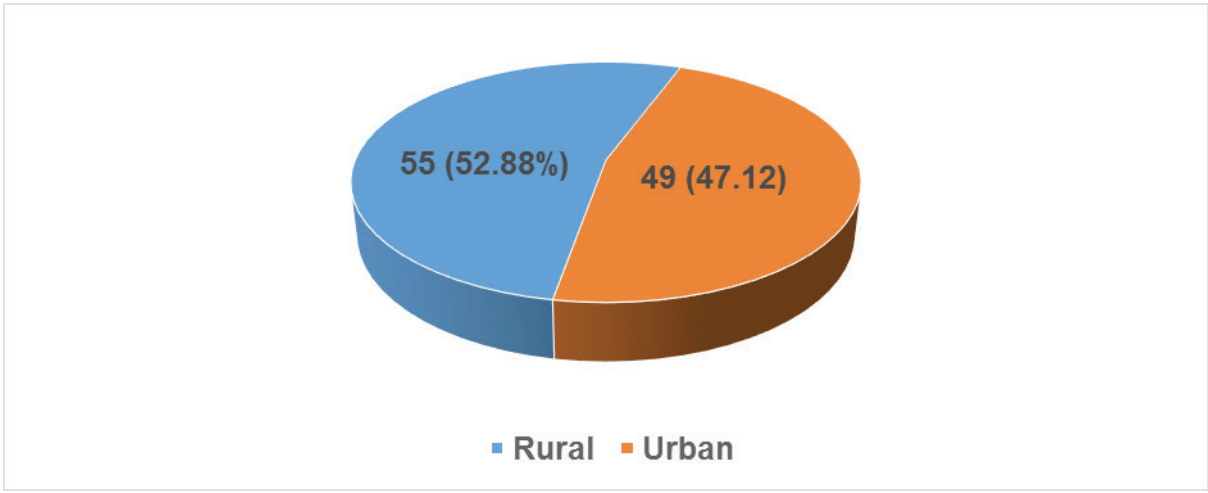

FIGURE 3: DOMICILE PATTERN OF VICITMS

The most common substances used for poisoning was found to be pesticides (n=79, 75.96%) and among them the commonest chemical used was organophosphates (n=54, 51.92%). [Figure 4]

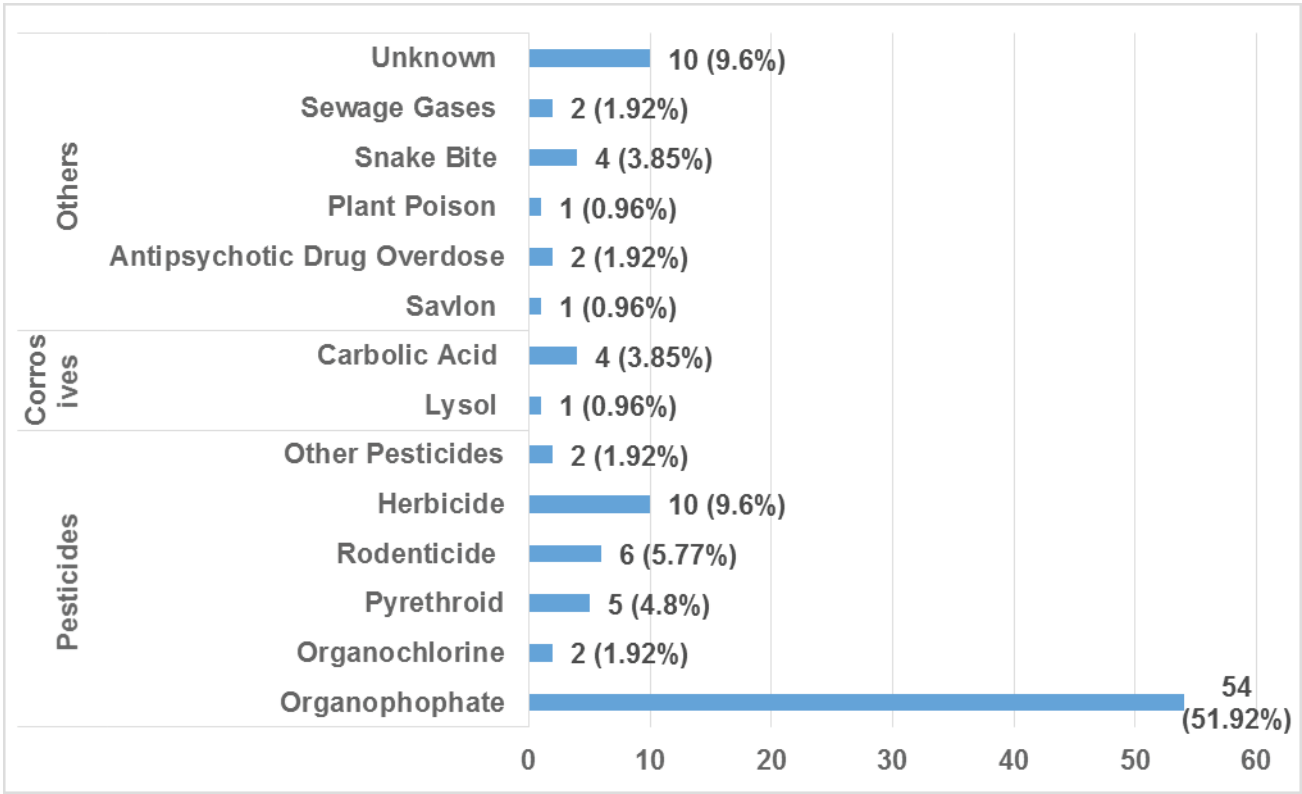

FIGURE 4: DISTRIBUTION OF DEATHS ACCORDING TO TYPE OF POISON

The present study shows that maximum fatalities due to poisoning occurred during the Monsoon season (n= 49, 47.11%) and the month of March (n=14, 13.46%). [Figure 5]

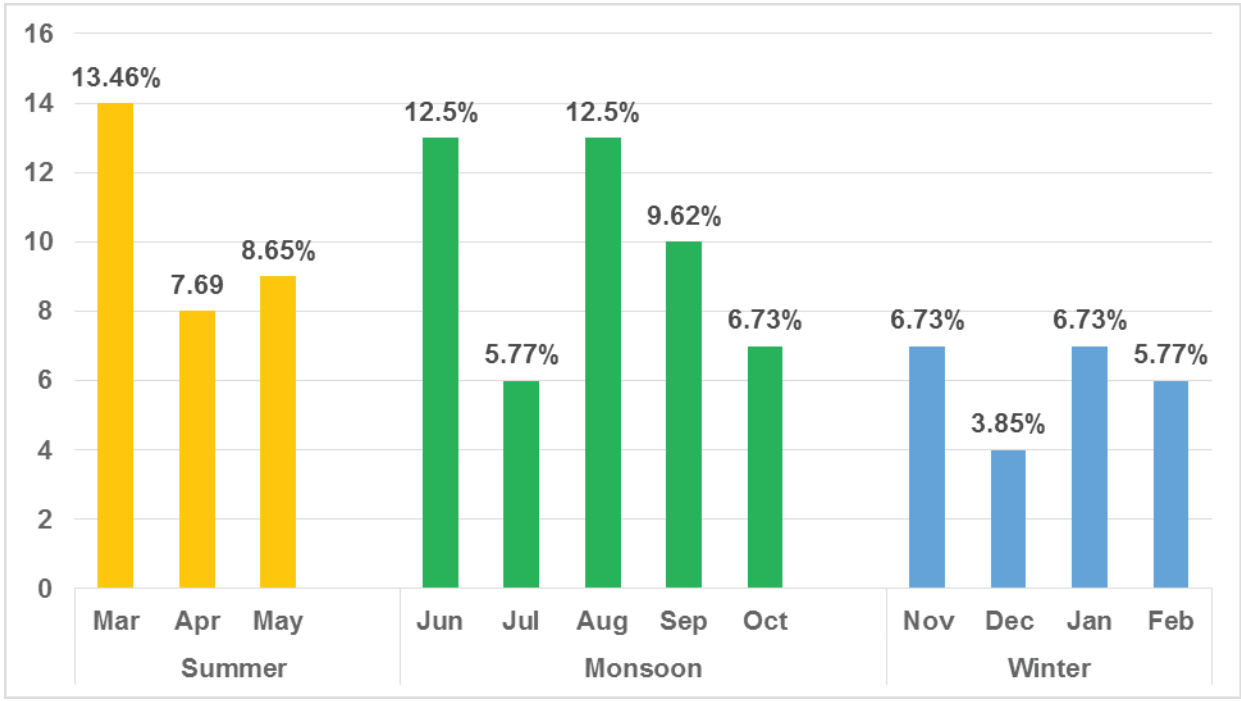

FIGURE 5: DISTRIBUTION OF POISOING DEATHS ACCORDING TO SEASON AND MONTH

Study shows that death due to poisoning is more common among males (n=59, 56.73%) in comparison to females (n=45, 43.27%) with a male-female ratio of 1.3:1 and the most common age group affected is 21 to 30 years (n=34, 32.69%) irrespective of gender. [Table 1]

TABLE 1: DISTRIBUTION OF DEATHS DUE TO POISONING ACCORDING TO AGE AND GENDER

Age Grp	Males	Females	Total	Male: Female Ratio
< 10 yrs	2 (3.39%)	1 (2.22%)	3 (2.88%)	2:1
11 – 20 yrs	1 (1.69%)	6 (13.33%)	7 (6.73%)	0.17:1
21 – 30 yrs	17 (28.81%)	17 (37.77%)	34 (32.69%)	1:1
31 – 40 yrs	15 (25.42%)	10 (22.22)	25 (24.03%)	1.5:1
41 – 50 yrs	08 (13.56%)	03 (6.67%)	11 (10.57%)	2.66:1
51 – 60 yrs	09 (15.25%)	04 (8.89%)	13 (12.5%)	2.25:1
> 60 yrs	07 (11.86%)	04 (8.89%)	11 (10.57%)	1.75:1
Total	59 (56.73%)	45 (43.27%)	104 (100%)	1.3:1

Most of the victims were married, both among the males (n=47, 79.66%) and females (n=35, 77.78%) constituting total 82 (78.85%) married cases. [Figure 6]

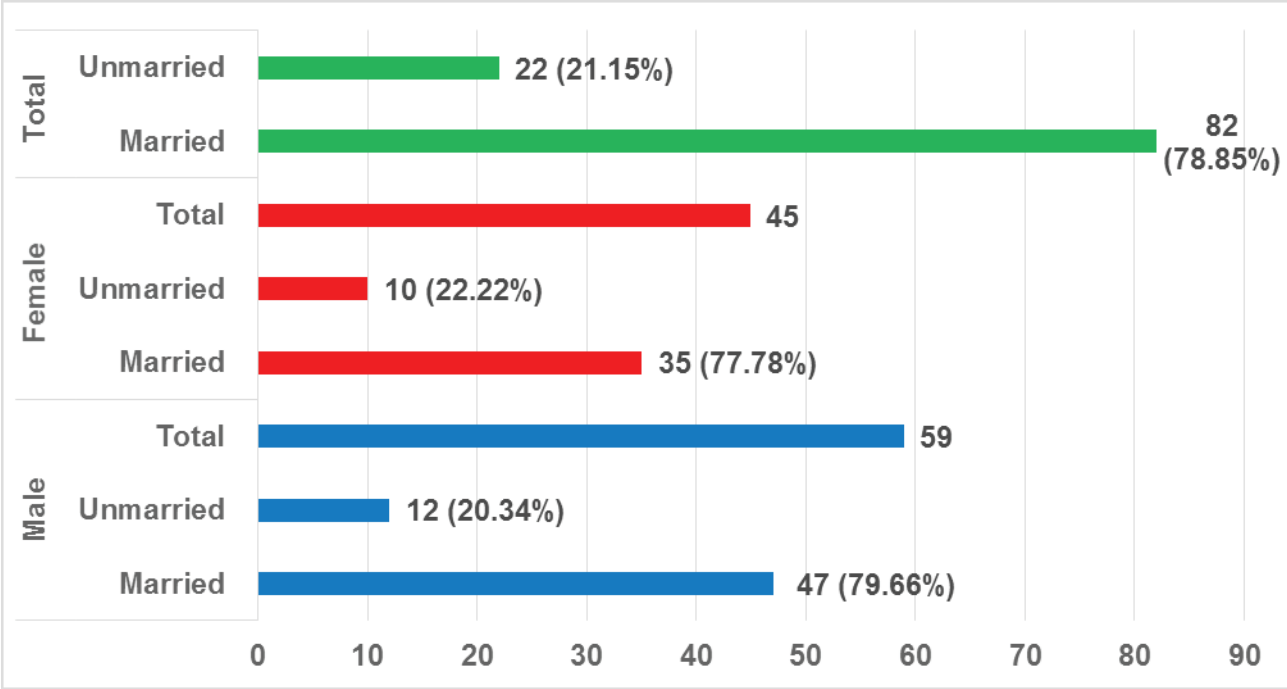

FIGURE 6: DISTRIBUTION OF DEATHS DUE TO POISONING ACCORDING TO MARITAL STATUS

Discussion

Analysis of the data in the present study gives an incidence rate of 4.05% for death due to poisoning out of total 2570 autopsies conducted during the study period. Review of literature shows that the incidence rate in the present study is less in comparison to other studies. [3-11]

The decrease in annual incidence rate of death due to poisoning after 2013 reflects an optimistic trend encouraging both government and society to boost the ongoing efforts in countering this menace. However, the emerging trend of relinquishing agriculture related occupations among the people as a factor behind the decline in incidence rate cannot be ignored.

In present study maximum poisoning cases according to the manner of death are found to be suicidal (n=93, 89.42%) followed by accidental (n=8, 7.7%). Only 1 (0.96%) case of homicidal poisoning death was reported during the study period and in 2 (1.92%) cases manner of poisoning was undetermined. The results are similar to other studies in respect of manner of death.[3,5,8-13]

Present study shows that incidence of poisoning is more common in rural areas (n=55, 52.88%) than in urban areas (n=49, 47.12%). The results are similar to findings of other studies [3,5-7,11] except the study conducted in Kanpur [10] where more poisoning deaths were found to occur in urban area. Rural population forms about 54.77 % of the total population of Maharashtra which explains the more occurrence of poisoning deaths in rural areas.[14]

The most common substances found to be used for poisoning in the present study is pesticides (n=79, 75.96%) and the results are in concurrence with findings of other studies.[3,6,10-12,15] Among the pesticides the commonest chemical found to be used is organophosphates (n=54, 51.92%) followed by herbicides (n=10, 9.6%). Maharashtra's economy is predominantly agrarian with agriculture as the mainstay which explains easy availability of pesticides in most of agriculture related households.[16] Participation of community in implementation of preventive measures like central storage facility for pesticides at village level, regulation of sale by registered person and purchase by certified person, will help in reducing the incidence of death by poisoning. Seemingly small precaution

of storage of pesticides in locked cabinets under the supervision of responsible elder member of the family can be of great help in preventing death due to pesticide poisoning.

The study shows the occurrence of fatalities due to consumption of easily available household items like mosquito repellent (n=1, 0.96%), Lysol (n=1, 0.96%), carbolic acid (n=4, 3.85%), and antiseptic savlon (n=1, 0.96%). Review of literature shows that results are similar to other studies.[10,11,12,15] These items are effortlessly available in most of the urban homes and are usually handled casually. Safe storage of these harmless appearing toxic chemicals can prevent tragic loss to the family.

Consumption of overdose of antipsychotic medicines led to death of 2 (1.96%) people in the present study. Review of literature shows similar results in study conducted at Thane [11] but the study conducted at Manipal [4] shows high number of deaths due to medicinal overdose. The variation is probably because of different socio-economic profile of victims.

Snake bite was responsible for death of 4 (3.85%) people in the present study and the results are similar to study conducted in Bangalore [12] but deaths due to snake bite were far more in study conducted in Jamnagar [3] and Berhampur [15]. The reason for the difference is geographical variation of the regions. Use of innovative measure like wearing of knee length rubber boots in fields and solar powered snake repellent sticks could prove beneficial in preventing snake bite.

Study found that 2 (1.92%) people lost their lives due to exposure to toxic gases while working in the sewages. Review of literature reveals that past studies do not mention such poisoning deaths.[3-13,15] Despite of the existence of laws prohibiting employment as manual scavengers in sewages, such incidents are still happening and are taking toll on human lives. Mandatory wearing of protective suits by sewage workers and strict legal action against defaulters is the need of the hour to prevent such mortalities.

Present study shows that maximum poisoning fatalities occurred during the monsoon season (n=49, 47.11%) followed by summers (n=31, 29.80%) which is different from the results of other studies carried out in different regions of the country where maximum poisoning deaths have occurred during the summers.[6,7,9,10,12,15] The study region in the South western Maharashtra faces long but uneven rainy season from June to October. Damage to the Kharif crops caused by the unexpected floods due to excessive rainfall and hailstorms lashing the regions is one of the major factors impelling farmers to take the extreme step. Plight of the farmers is further compounded by the health expenses, children education expenses and mounting debts. The proactive preparation by the hospitals for the expected increase in poisoning cases during the monsoons and establishment of regional poison information centre will prove advantageous in reducing the mortality.

Gender-wise analysis shows that males died more due to poisoning in comparison to females constituting 59 (56.73%)) and 45 (43.27%) cases respectively with a male-female ratio of 1.3:1. These results of the present study are in concurrence with other studies.[5-11] Present study shows that most of the victims were married, both among the males (n=47, 79.66%) and females (n=35, 77.78%) constituting total 82 (78.85%) married cases and the results are in concurrence with other studies conducted.[3-13] Study shows that married status of individual plays a significant role as the sought-after bliss of marital life brings along many responsibilities and unexpected problems requiring maturity, emotional and psychological support. Inability to cope up with the marital responsibilities and to resolve marital discord, are some of the factors impelling the individual to take the extreme step of ending his or her life. Pre-marital and post-marital counselling should be encouraged for couples which will be helpful in resolving marriage related problems.

Maximum deaths due to poisoning occurred in the age group of 21 to 30 years (n=34, 32.69%) followed by age group of 31 to 40 years (n=25, 24.03%). These findings are in concurrence with the results of other

studies [6-8,10-13] but different to findings of study conducted at Bankura [9] where the maximum deaths were found to occurred in age group of 40 to 49 years owing probably to socio-demographic variations. 21 to 30 years is the age group when the youth starts shouldering the various social and family responsibilities. The stresses created by the vagaries of life may push the individual towards committing suicide. Establishment of a suicide helpline by the government may prove to be an effective method in curtailing the mortality due suicidal poisoning.

Study shows that 11 [10.57%] seniors citizens lost their lives due to poisoning. Death by poisoning among the senior citizens is less in comparison to younger people and the findings are similar to other studies. [3-13] Depression due to chronic illness and a sense of alienation among the senior citizens are the major factors driving them to take the extreme step of committing suicide. There is need of sensitization of society towards the emotional and psychological needs of the senior citizens.

Study highlights the age group of 11 to 20 years where death of 6 female teenagers outnumbers the death of 1 male adolescent due to poisoning. Death of the teenagers by intentional self-poisoning warrants serious concern by all parents. There is need of sensitization of parents to understand the teenage behaviour in this era of social media technology and address the issues with patience, open mind and compassion especially involving the females.

The least number of cases (n=3, 2.88%) were found to be in the age group below 10 years. Death of 2 children below the age of 10 years had occurred by accidental poisoning which could have been prevented by secure storage of toxicological chemicals at home. 1 male child below the age of 10 years had become the victim of homicidal poisoning by a female relative out of jealousy of not being able to conceive a male child. This reflects another disturbing aspect of our society necessitating introspection and change in the patriarchal mindset of people.

Conclusion

Present study shows the incidence rate of death by poisoning and provides important information about the sociodemographic profile of victims in South-Western Maharashtra covering the period from Jan 2009 to Dec 2018. Study also provides crucial information about the common toxic substances used for poisoning and seasonal variation in poisoning deaths in South-Western Maharashtra. The information obtained is not only valuable in understanding the causative factors behind the mortality due to poisoning in the region but also of paramount significance for devising of preventive measures which can be implemented by family members, panchayat, local community, hospitals and the government authorities in combating this grave health concern and averting the loss of human lives.

Conflict of Interest: We declare that there is no conflict of interest.

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Ethical Clearance: Taken from IEC of AFMC, Pune

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