

International Journal of A J Institute of Medical Sciences 1 (2012) 104-111

**Original Research Article**

**Poisoning fatalities in Mangalore, South India: A three year snapshot**

B. Suresh Kumar Shetty,<sup>1</sup> Tanuj Kanchan,<sup>1</sup> Ritesh G. Menezes,<sup>2</sup> Mahabalesh Shetty,<sup>3</sup>  
M. Arun,<sup>4</sup> Preetham Raj V. Salian,<sup>5</sup> Preetham R. Acharya,<sup>6</sup> Alam Nawaz,<sup>7</sup> Archit Bloor,<sup>7</sup>  
Jitesh Marian Rasquinha<sup>8</sup>

<sup>1</sup>Department of Forensic Medicine and Toxicology, Kasturba Medical College, Manipal University, Mangalore, India

<sup>2</sup>Department of Forensic Medicine and Toxicology, Srinivas Institute of Medical Sciences and Research Centre, Mangalore, India

<sup>3</sup>Department of Forensic Medicine and Toxicology, K.S. Hegde Medical Academy, Mangalore, India

<sup>4</sup>Department of Forensic Medicine and Toxicology, J.S.S. Medical College, Mysore, India

<sup>5</sup>Department of Orthopedics, Kasturba Medical College, Manipal University, Mangalore, India

<sup>6</sup>Department of Respiratory Medicine, Kasturba Medical College, Manipal University, Mangalore, India

<sup>7</sup>Department of Internal Medicine, Kasturba Medical College, Manipal University, Mangalore, India

<sup>8</sup>Department of Anaesthesiology, Kasturba Medical College, Manipal University, Mangalore, India

---

**Abstract**

Poisoning is an important public health issue in India and worldwide. The present research is aimed to assess the epidemiological variables of fatal poisonings in Mangalore, South India. A prospective study was conducted during May 2004 and April 2007 at the Department of Forensic Medicine and Toxicology, Kasturba Medical College, Mangalore, India. A total of 130 fatal poisoning cases autopsied at the aforementioned centre were viewed during the study period. Poisoning deaths comprised of 7.5% of the total autopsies performed. Intentional self-poisoning constituted 79.2% of the fatal poisonings, followed by unintentional poisoning (19.2%). A male preponderance was observed, male-female ratio being 2.3:1. Majority of the cases (56.9%) were in the age group of 21-40 years. Majority of the victims (86.9%) consumed the poison at their residence. Most of the cases (69.2 %) occurred in the rural pockets of Mangalore. Pesticides were the most common agent associated with poisoning related mortalities. Organophosphates alone were responsible for most of the fatalities (40.6%) resulting from poisoning. Suicidal poisonings present a significant social and public health problem in our region. Preventive programmes must be developed for high-risk groups identified in the study. Legislative control on the sale and use of pesticides, and stress management are recommended along with better health care facilities to prevent poisoning related mortalities.

© International Journal of A J Institute of Medical Sciences. All rights reserved.

**Keywords:** Fatal poisoning; Medicolegal autopsy; Organophosphates Pesticides; Suicide

Received 10<sup>th</sup> July, 2012; Revised August, 2012; Accepted October, 2012.

---

## 1. Introduction

The history of acute fatal poisoning is as old as human history itself. Poisonings remains a significant contributor to morbidity and mortality in India.<sup>1,2</sup> Indian economy is basically agrarian, and nearly three-quarters of the Indian population depends upon agriculture for a livelihood. Pesticides are being increasingly used to reap a better agriculture yield. People of rural India with agricultural occupation are recognized as a population at risk for suicidal pesticide poisoning.<sup>3</sup> Deliberate self-poisoning is also reported to be a major health problem among children and adolescents.<sup>4</sup> Suicide is recognized as a major manner of pesticide poisoning with increasing incidence among the younger generation.<sup>5</sup>

It is important to understand the magnitude and pattern of fatal poisonings in a particular region, which is helpful in early diagnosis and treatment, as well as in implementing the preventive measures. Thus, the ultimate aim of reducing morbidity and mortality due to poisoning can be achieved. The objective of the present study was to study the epidemiological variables in relation to fatal poisonings and determine the problem status of fatal poisonings in Mangalore, a coastal district in the Southern part of India.

## 2. Materials and methods

The present prospective study extended for a period of three years from May 2004 to April 2007. During the study period, 130 cases of fatal poisoning were autopsied by the faculty of Department of Forensic Medicine and Toxicology, Kasturba Medical College, Mangalore, India at the Government Wenlock District Hospital (GWDH), Mangalore. GDWH

is a referral hospital for patients from Mangalore and neighbouring areas. GWDH caters to around 90% of all medicolegal autopsies conducted in cases of unnatural deaths in Mangalore city.<sup>6</sup> Only autopsies with confirmed diagnosis of poisoning were included in the study. The postmortem chemical analysis of the viscera and body fluids was done at the Regional Forensic Science Laboratory, Mangalore to confirm the type of poison consumed. In addition to the autopsy findings, relevant details were obtained from the investigating authorities and the relatives of the deceased to conclude the manner of poisoning deaths. Information pertaining to the cases included in the present research was also gathered from the inquest documents furnished by the police. Data were entered and analyzed using a statistical analysis programme, SPSS version 16.0, (SPSS, Inc., Chicago, IL, USA).

## 3. Results

A total of 1734 medicolegal autopsies were performed between May 2004 and April 2007 at the aforementioned centre (GWDH). Poisoning deaths comprised 7.5% (n=130) of the total autopsies conducted during the study period. Intentional self-poisoning (suicides) constituted 79.2% (n=103) of these deaths, followed by unintentional (accidental) consumption of poison (19.2%). No case of homicidal poisoning death was reported during the study period. In two cases the manner of death remained undetermined. Males outnumbered females constituting 69.2% (n=90) and 30.8% (n=40) of cases respectively with a male-female ratio of 2.3:1. Statistics on the religious practices of the people who committed suicide showed that the victims (90.7%) were mostly Hindu by religion. Victim profile of poisoning fatalities is shown in Table 1.

Table 1: Victim profile in poisoning fatalities (n=130)

		Number (n)	Percentage (%)
Gender	Male	90	69.2
	Female	40	30.8
Religion	Hindu	118	90.8
	Muslim	06	04.6
	Christian	06	04.6
Manner	Suicidal	103	79.2
	Accidental	25	19.2
	Unknown	02	1.6

Most of the victims (56.9%) were in the 3<sup>rd</sup> and 4<sup>th</sup> decades of life, resulting in loss of most productive and energetic existence of human lives. The number of fatal poisoning cases was highest (29.2%) in the 4<sup>th</sup> decade of life followed by the 3<sup>rd</sup> decade (27.7%). The ratio of males to females in the 4<sup>th</sup> decade was proportionately very high (6.6:1). There were no cases of fatal poisonings reported in the first decade of life. The

age distribution of victims is shown in Figure 1. Majority of the victims (43.0%, n=56) committed suicide during the rainy season. Most of the victims (86.9%, n= 113) consumed the poison at their residence. More than two-third of the cases (69.2%, n= 90) occurred in rural pockets of Mangalore. Circumstances associated with victims of fatal poisonings are shown in Table 2.

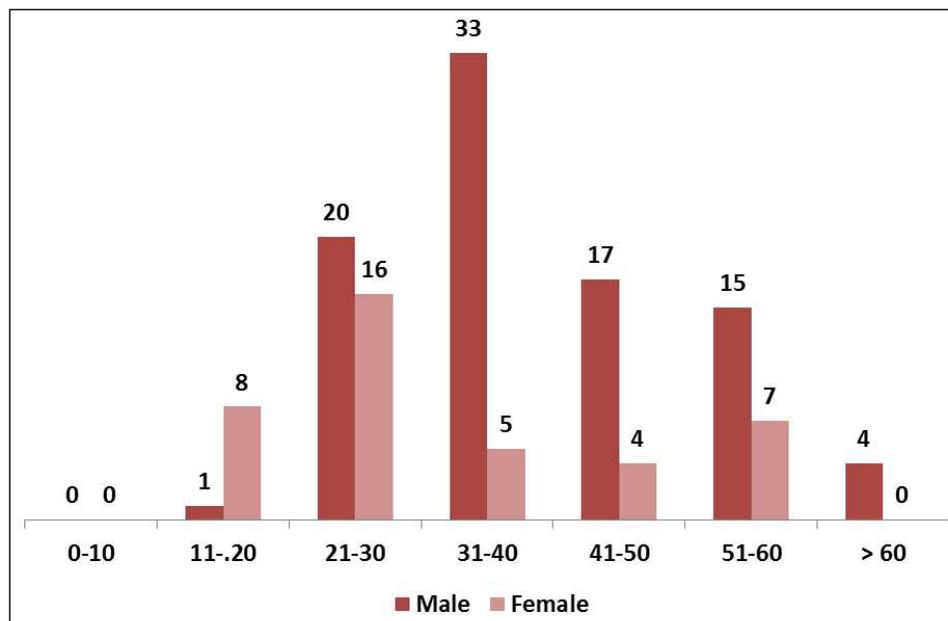


Fig 1: Age distribution of the victims

Table 2: Circumstances associated with victims of fatal poisonings (n= 130)

		Number (n)	Percentage (%)
Background	Rural	90	69.2
	Urban	40	30.8
Place	Indoor	113	86.9
	Outdoor	17	13.1
Seasonal variation	Rainy	56	43.1
	Summer	48	36.9
	Winter	26	20.0

Analysis of the manner of death in relation to sex showed that 69.9% of suicidal cases were males, and 68.0% of accidental cases were males. Males clearly outnumbered the females in both suicidal and accidental mannered deaths (Fig 2). Analysis of the manner of death in relation to age found that most of the suicides (n=32, 31.1%) occurred in the age group of 3140 years, with a male

preponderance of 15:1. Most of the accidental cases (n=9, 36 %) occurred in the age group of 2130 years, with a male preponderance in the ratio 8:1. Four cases (3.1%) reported above 60 years of age were all males, and the nine cases (6.9%) reported below 20 years of age were with a female preponderance (male:female=1:8) (Table 3).

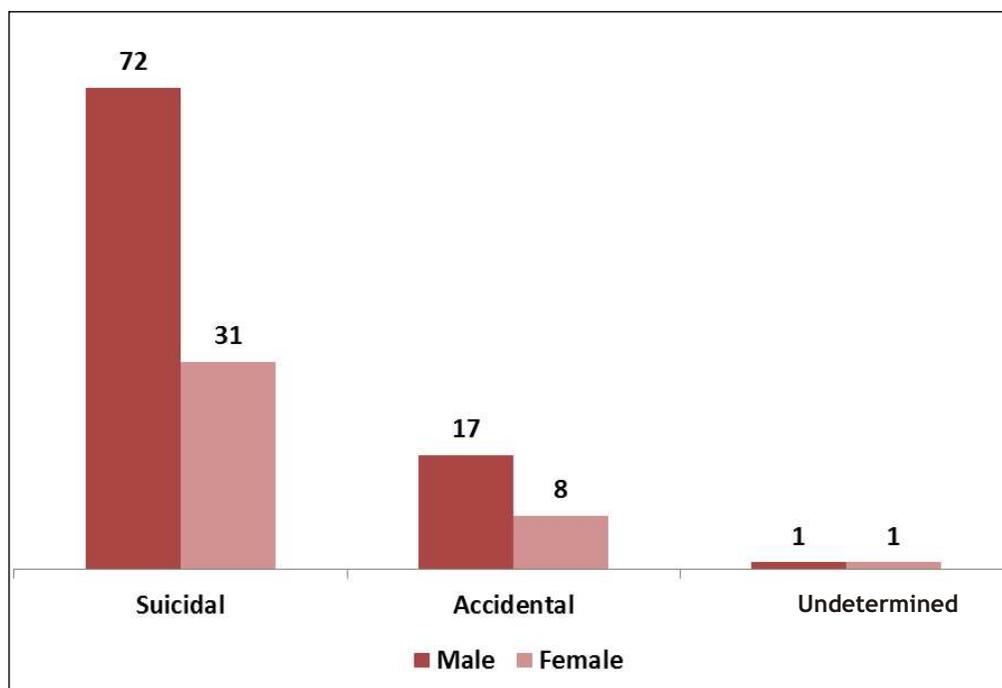


Fig 2: Gender distribution of victims for the manner of death

Table 3: Manner of death in relation to age of the victims (n=128)\*

Age (years)	Suicidal (intentional self-poisoning)			Accidental (unintentional poisoning)		
	Male (M) n (%)	Female (F) n (%)	M : F	Male (M) n (%)	Female (F) n (%)	M : F
11-20	01 (1.4)	05 (16.1)	1 : 5	00 (0.0)	03 (37.5)	--
21-30	12 (16.7)	15 (48.4)	1 : 1.3	08 (47.1)	01 (12.5)	8 : 1
31-40	30 (41.7)	02 (6.4)	15 : 1	03 (17.6)	02 (25.0)	1.5 : 1
41-50	13 (18.1)	04 (12.9)	3.3 : 1	03 (17.6)	00 (0.0)	--
51-60	13 (18.1)	05 (16.1)	2.6 : 1	02 (11.8)	02 (25.0)	1 : 1
>60	03 (4.2)	00 (0.0)	--	01 (5.9)	00 (0.0)	--
Total	72 (100)	31 (100)	2.3 : 1	17 (100)	08 (100)	2.1 : 1

\* Manner of death remained undetermined in two cases as per the preliminary death investigations

All the cases of poisoning involved oral route of administration. Overall, pesticides were responsible for majority of the poisoning mortalities. With regard to the type of poison consumed, organophosphates alone accounted for maximum number (40.6%) of mortalities followed by carbamates (7.8%), organochlorines (4.7%), medicinal agents (3.9%), copper sulfate (3.9%) and zinc phosphides (3.1%). Agents responsible for poisoning mortalities are listed in Table 4. On further analysis of agents separately for accidental and suicidal poisoning, it is observed that organophosphates were the most common agent associated with accidental and

suicidal poisoning in both male and females (Table 4). Organochloride compounds included paraquat, peradan, and gammexane whereas medicinal agents group included mortalities associated with salbutamol, dexamethasone and penicillin. In 14.1% cases (n=18), RFSL report was not yet received and in 14.8% cases (n=19), the chemical analysis report from the RFSL was negative for the poisons analysed in the blood and viscera sent for examination. The categories 'Others' and 'Unknown' were included in the study based on the treatment records of these patients that were suggestive of death due to poisoning.

Table 4: Agents responsible for poisoning mortalities (n=128)\*

Agent	Suicides (n,%)	Accidents (n,%)	Total (n, %)
Organophosphates	45 (43.7%)	07 (28.0%)	52 (40.6%)
Carbamates	08 (7.8%)	02 (8.0%)	10 (7.8%)
Organochlorines	06 (5.8%)	00 (--)	06 (4.7%)
Zinc phosphide	04 (3.9%)	00 (--)	04 (3.1%)
Pyrethroids	01 (0.9%)	01 (4.0%)	02 (1.6%)
Copper sulfate	03 (2.9%)	02 (8.0%)	05 (3.9%)
Alcohol	01 (0.9%)	01 (4.0%)	02 (1.6%)
Formic acid	02 (1.9%)	00 (--)	02 (1.6%)
Medicinal agents	04 (3.9%)	01 (4.0%)	05 (3.9%)
Phenol	00 (--)	01 (4.0%)	01 (0.8%)
Colchicine	00 (--)	01 (4.0%)	01 (0.8%)
Others	10 (3.9%)	09 (36.0%)	19 (14.9%)
Unknown	19 (9.7%)	00 (--)	19 (14.8%)
Total	103 (100%)	25 (100%)	128 (100%)

\* Manner of death remained undetermined in two cases as per the preliminary death investigations

#### 4. Discussion

In the present study, fatal poisonings constituted 7.1% of the total autopsied cases. The incidence is lower than that reported in other studies conducted in different regions of India.<sup>7,8</sup> Kumar et al.<sup>9</sup> have reported a higher proportion of fatal poisoning in Manipal, a neighbouring region. Higher incidence of poisonings is often related to the rural background and agriculture based setup in India. The lower proportion of poisoning fatalities in the present study can possibly be attributed to the fact that the study area constituted of a relatively more of urban than rural population with a high literacy rate in the urban population.

There was a distinct male preponderance which was similar to that reported in other studies.<sup>8,10</sup> A high incidence of poisoning among males may be attributed to the fact that males are more exposed to stress, strain and occupational exposure to agricultural agents when compared to females. A female preponderance has been reported in Imphal.<sup>11</sup> Most of the victims were in the 21-40 years age group, similar to studies done in other parts of the country and abroad, for this being the most active phase of life socially, physically and mentally.<sup>8-13</sup> The peak incidence during 3<sup>rd</sup> and 4<sup>th</sup> decades can be attributed to the tremendous stress a person is put to during this period of life.<sup>9</sup> During the study period no poisoning mortalities were recorded during the 1<sup>st</sup> decade of life. Greater public awareness appropriate safety and therapeutic measures probably have resulted in decline of poisoning fatalities in children.<sup>14</sup> Similar findings with regard to poisoning related mortalities during childhood are observed in the neighbouring Manipal region.<sup>12,15</sup> With regards to the religion of the victims, Hindus were the commonly affected ones followed by others. In India, majority of the population follows Hinduism and a similar religion based distribution is observed in different regions of India. Increased incidence of poisoning

mortalities among Hindus may in addition be attributed to the fact that farming community is more prone to suicides and Hindus, who form the bulk of Indian population, are more engaged in agriculture related occupations. The findings are similar to studies done elsewhere in India.<sup>16</sup> Islam, the Muslim religion, strictly forbids suicide that may be the reason for low incidence amongst Muslims.<sup>17</sup> Most of the poisoning deaths in the present study were reported during the rainy and summer seasons. Our observations correlate with the findings of the studies done in Southern<sup>12</sup> and Western India<sup>18</sup> and in contrast to a study by Mohanty et al.<sup>10</sup> from Eastern India. Irrespective of the sex of the victims the place of poison consumption was mostly at home, similar to that reported in an earlier study by Mohanty et al.<sup>10</sup> A majority of cases belonged to rural communities similar to that reported by Agarwal et al.<sup>7</sup> An urban prevalence is reported in Teheran.<sup>13</sup>

The most common agents responsible for fatal poisonings were pesticides with organophosphates alone being responsible for the majority of the fatalities, an observation similar to that reported in the earlier studies from different parts of India<sup>9,11,16</sup>, except for the Northern region of India where Aluminum phosphide is reported as the most common cause of poisoning in sub-urban and rural parts.<sup>19,23</sup> In the present study, however, not even a single case of aluminum phosphide fatality is observed which is indicative of regional variations in pattern of poisonings throughout India. Most of the poisoning deaths in the present study resulted from self-poisoning. This can be attributed to a general belief that poisoning kills with a minimal suffering. Our findings are comparable to other studies from India and further strengthens the view that easy availability of insecticides is responsible for the choice of poisoning as a preferred means of suicide in different regions of India.<sup>9,10,24</sup> An earlier study on completed suicides in the study centre observed poisoning as one of

the preferred method of suicide among males and females in the region.<sup>25</sup> In a study conducted in the neighbouring rural and semi-urban areas of Udupi-Manipal poisoning was reported as the preferred method of suicide.<sup>9</sup> In Northern India poisoning and burns were the preferred methods of suicide in males and females respectively whereas in the Eastern India poisoning remained the preferred method of suicide among males and females.<sup>26,27</sup> No case of homicidal poisoning was reported during the study period. Our findings reconfirm the decline in the popularity of poison as an agent of homicide due to its easy detection and less lethality as well as good treatment facilities.<sup>24</sup>

## 5. Conclusion

Suicidal poisoning is responsible for majority of poisoning deaths in India. Individuals in rural India resort to this desperate measure when unable to cope with financial and personal crisis. Societies at large owe a collective responsibility to this manner of death and mere condemnation or sympathy is not sufficient to curb these avoidable deaths. Suicidal poisonings present a significant social and public health problem in our region. Preventive programmes must be developed for high-risk groups identified in the study. Legislative control on the sale and use of pesticides, and stress management are recommended along with better health care facilities to prevent poisoning related mortalities.

## Acknowledgements

We are thankful to the non-teaching staff and teaching faculty of Department of Forensic Medicine and Toxicology, Kasturba Medical College, Mangalore, India for all the support during the study.

## References

1. Kanchan T, Menezes RG. Suicidal poisoning in Southern India: gender differences. *J Forensic Leg Med* 2008;15:7-14.
2. Menezes RG, Rao NG, Karanth SS, Kamath A, Manipady S, Pillay VV. *Jatropha curcas* poisoning. *Indian J Pediatr* 2006;73:634.
3. Sunder M. Suicide in farmers in India. *Br J Psychiatry* 1999;175:585-586.
4. Kanchan T, Menezes RG. Mortalities among children and adolescents in Manipal, Southern India. *J Trauma* 2008;64:1600-1607.
5. Arun M, Palimar V, Menezes RG, Babu YPR, Bhagavath P, Mohanty MK. Autopsy study of fatal deliberate self-harm. *Med Sci Law* 2007;47:69-73.
6. Shetty BSK, Shetty M. Epidemiology of drowning in Mangalore, a coastal Taluk of South India. *J Forensic Leg Med* 2007;14:410-415.
7. Aggarwal NK, Aggarwal BBL. Trends of poisoning in Delhi. *J Indian Acad Forensic Med* 1998;20:32-36.
8. Dhatarwal SK, Singh H. Profile of deaths due to poisoning in Rohtak, Haryana. *J Forensic Med Toxicol* 2001;18:28-29.
9. Kumar TS, Kanchan T, Yoganarashima K, Kumar GP. Profile of unnatural deaths in Manipal, South India 1994-2004. *J Forensic Leg Med* 2006;13:117-120.
10. Mohanty S, Sahu G, Mohanty MK, Patnaik M. Suicide in India- A four year retrospective study. *J Forensic Leg Med* 2007;14:185-189.
11. Taruni NG, Bijoy TH, Moomonchand. A profile of poisoning cases admitted in RIMS hospital, India. *J Forensic Med Toxicol* 2001;18:31-33.
12. Kanchan T, Menezes RG, Kumar TSM, Bakkannavar SM, Bukelo MJ, Sharma PS, et al. Toxicoepidemiology of fatal poisonings in Southern India. *J Forensic Leg Med* 2010;17:344-347.
13. Kambiz S, Faryadi M, Sardari F. Acute pesticide poisoning related deaths in Teheran during the period 2003-2004. *J Forensic Leg Med* 2007;14:352-354.
14. Andiran N, Sarikayalar F. Pattern of acute poisoning in Ankara: What changed in twenty years? *Turk J Pediatr* 2004;46:147-152.
15. Kanchan T, Menezes RG, Monteiro FN. Fatal unintentional injuries among young children A hospital based retrospective analysis. *J Forensic Leg Med* 2009;16:307-311.

16. Gupta BD, Vaghela PC. Profile of fatal poisoning in and around Jamnagar. *J Indian Acad Forensic Med* 2005;27:145-148.
17. Bertolote JM, Fleishmann A. A global perspective in the epidemiology of suicide. *Suicidologi* 2002;7:6-8.
18. Sheikh MI, Agarwal SS, Kumar L, Jhaveri S. Changing trends of poisoning in Surat. *Int J Med Toxicol Legal Med* 2004;6:17-20.
19. Singh D, Jit I, Tyagi S. Changing trends in acute poisoning in Chandigarh zone: A 25-year autopsy experience from a tertiary care hospital in Northern India. *Am J Forensic Med Pathol* 1999;20:203-210.
20. Sharma SK. Current scenario of Poisoning in India. *J Forensic Med Toxicol* 1998;15:89-94.
21. Bumbrah GS, Krishan K, Kanchan T, Sharma M, Sodhi GS. Phosphide poisoning: A review of literature. *Forensic Sci Int* 2012;214:1-6.
22. Siwach SB, Gupta A. The profile of acute poisonings in Haryana-Rohtak study. *J Assoc Physicians India* 1995;43:756-759.
23. Singh S, Wig N, Chaudhary D, Sood NK, Sharma BK. Changing pattern of acute poisoning in adults: Experience of large North-West Indian hospital (1970-1989). *J Assoc Physicians India* 1997;45:194-197.
24. Sharma BR, Harish D, Sharma V, Vij K. The epidemiology of poisoning: An Indian view point. *J Forensic Med Toxicol* 2002;19:5-11.
25. Kanchan T, Menon A, Menezes RG. Methods of choice in completed suicides: Gender differences and review of literature. *J Forensic Sci* 2009;54:938-942.
26. Sharma BR, Gupta M, Sharma AK, Sharma S, Gupta N, Relhan N, Singh H. Suicides in Northern India: Comparison of trends and review of literature. *J Forensic Leg Med* 2007;14:318-26.
27. Pal PB, Karmakar R, Batabyal S, Haldar S. A study of suicide with special reference to endometrial study in female individuals. *J Indian Med Assoc* 2006;104:588-590,595.

#### Corresponding author

Dr. Tanuj Kanchan  
Associate Professor  
Department of Forensic Medicine  
Kasturba Medical College  
Manipal University, Mangalore, India  
Mobile: +91 9448252394  
E-mail: tanujkanchan@yahoo.co.in