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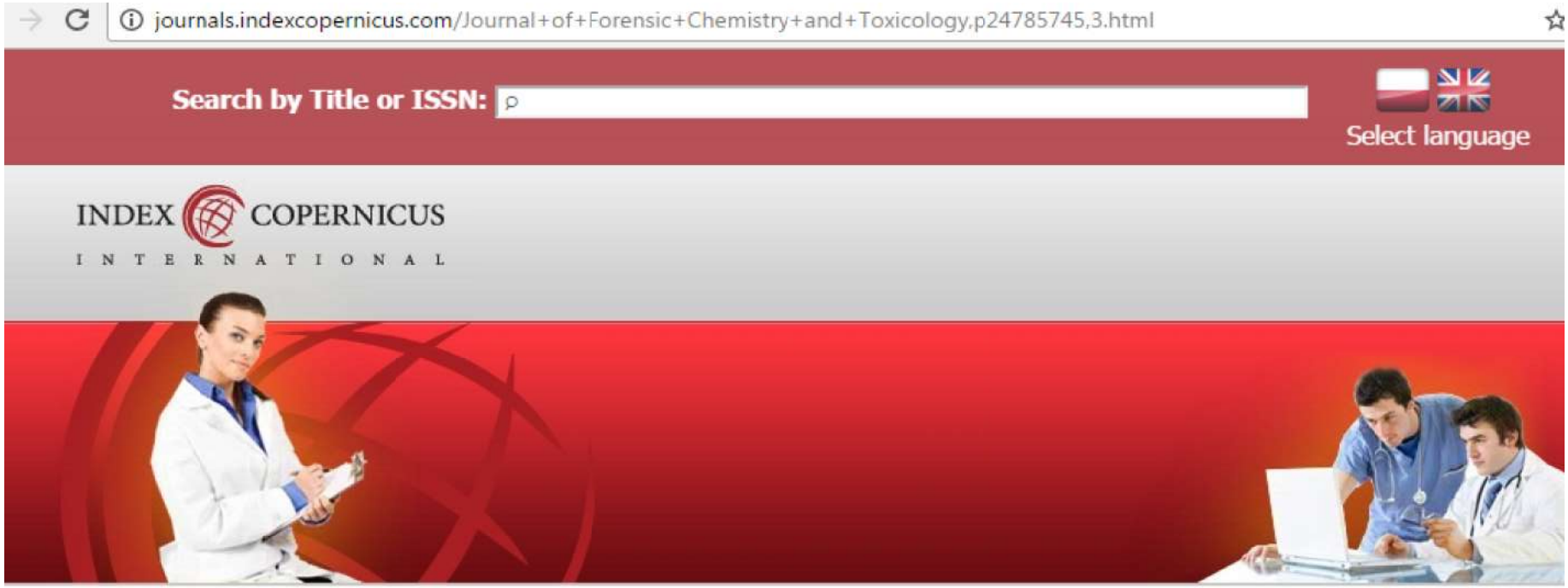

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Fatal Cases of Trauma with Pelvic Fracture in Level-I Trauma Care Centre in India: An Autopsy Based Study

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Abstract

Trauma patients with pelvic fractures are known to be at risk of death. This, a retrospective study was conducted in Apex Trauma Center in New Delhi to find out the prevalence of pelvic injuries in fatal trauma cases subjected to autopsy. All patients (N = 280) admitted with pelvic fracture to the center during the year 2015-16, were included in the study. Male: Female ratio was 6.5:1. Out of 280 patients, the highest population was 25-60 year age group. Abdomen was most commonly injured region in association with pelvis (N=63, 22.5%) and Out of total 280 patients, 101 (36.1%) patients were either dead on the spot or they died during journey to the hospital. Mean ISS was 42.12. 136 (48.5%) patient had the ISS value between 50-75 ISS group which include critical and non survivable injuries.

Keywords: Pelvic Fracture; Injury Severity Score; Abbreviated Injury Scale; Critical Non Survivable; Hemorrhage.

Introduction

Pelvic fractures encompass a broad spectrum of injuries, from low-energy osteoporotic fractures to high-energy disruptions of the pelvic ring. In this study we will focus on the higher energy injuries as they pose a very different medical challenge to healthcare systems. Patients who have sustained these injuries fall into two main categories, survivors and non-survivors. In non-survivors, mortality is a bimodal distribution.

Early death is commonly because of hemorrhage or associated brain injury. Late death is usually because of overwhelming sepsis and multi-organ failure. Survivors frequently experience the long-term medical and socioeconomic implications of pelvic fractures. These include mental health problems, chronic pain, pelvic obliquity, leg length or rotational discrepancy, gait abnormalities, sexual and urological dysfunction and long-term unemployment [1].

Trauma patients with pelvic fractures are known to be at risk of death [7,10,11]. The most commonly cited cause of death is hemorrhage from posterior pelvic ring disruption [3,5,6,7,9]. One of the primary goal of the management of pelvic fracture is to minimize the risk of death. However there is vide variability in the literature on the rate, cause and the risk factors for death in patient with pelvic fractures [4,6,7,9]. Primary cause of death have included posterior pelvic venous hemorrhage, pelvic arterial hemorrhage, extra pelvic hemorrhage, multisystem organ failure [2,3,5,6,7,8,9].

The bony and ligamentous anatomy of the pelvis is relatively straightforward and It is the contents and roles of the pelvis that make this anatomical region unique. The intact pelvis provides protection for its visceral contents and traversing neurovascular

structures. It is the site of load transfer between the axial skeleton and the lower extremities; its many ligamentous and muscle attachments are finely balanced to allow load transfer to take place when standing, sitting and during locomotion. The bony pelvis is turned into a basin by the pelvic floor - a complex network of ligaments, tendons and muscles that is pierced by the urethra, anus and vagina. When the pelvic floor is torn, huge amounts of blood can escape into the thighs and retroperitoneal space. It is useful to think of the pelvis as the Pelvic fractures often resulting from high energy blunt trauma are associated with significant mortality. The outcome and survival rates in patient with pelvic fractures depend upon the associated injuries [1].

There is a paucity of epidemiological studies related to mortality in pelvic fractures in the Asian population as most of the studies on this subject are from western countries therefore This study was planned which aimed to find out the prevalence of pelvic injuries in fatal trauma cases subjected to autopsy.

Methodology

This, a retrospective study was conducted in Apex Trauma Center in New Delhi to find out the prevalence of pelvic injuries in fatal trauma cases subjected to autopsy. All patients (N = 280) admitted with pelvic fracture to the center during the year 2015-16, were included in the study. The pattern of associated injury was observed and the Injury severity score (ISS) was calculated using Abbreviated injury scale (AIS) and correlated with the survival period.

Results and Observations

Out of total 280 patients, 243 (86.8%) were males and 37 (13.2%) females (Table 1).

Age Group

The highest number of patient i.e. 170 (60.7%) were between 25-60 year age group, followed by 71 (25.4%) between 16-24 year age group. 32 patient (11.4%) were more than 60 year age group and 7 patient (2.5%) were less than 15 year of age (Table 2).

Associated Injuries

Abdomen was most commonly injured region in association with pelvis (N=63, 22.5%), followed by abdomen and chest combined region (N=37, 13.2%). Head injury was associated in 26 patients (9.3%) followed by head, chest and abdomen combined injury (N=23, 8.2%). 83 (30%) patient had no associated injury at all (Table 3).

Table 1: Gender wise distribution of patients

Gender	No. of Patients	% Age
Male	243	86.8
Female	37	13.2
Total	280	100

Table 2: Age wise distribution of patients

Age Group	No. of Patients	% Age
<15 years	007	02.5
16-24 years	071	25.4
25-60 years	170	60.7
>60 years	032	11.4
Total	280	100

Table 3: Associated injuries in other body regions

Body Part Injured	No. of Patient	% Age
Abdomen	63	22.5
Head	26	09.3
Chest	12	04.3
Abdomen & Chest	37	13.2
Abdomen & Head	20	07.1
Head & Chest	15	05.4
Head, Chest & Abdomen	23	08.2
None	83	30.0
Total	280	100

Table 4: Survival period

Category	No. of Patient	% Age
Spot/ Brought dead	101	36.1
<3 Hrs	40	14.3
3-24 Hrs	57	20.4
>24 Hrs	82	29.2
Total	280	100

Table 5: Injury Severity Score

ISS Group	No. of Patient	% Age
0-25	063	22.5
25-50	081	29.0
50-75	136	48.5
Total	280	100

*42 patients had ISS 75 (non survivable)

Survival

Out of total 280 patients, 101 (36.1%) patients were either dead on the spot or they died during journey to the hospital. 40 (14.3%) patients had survival period of less than 3 hours, 57 (20.4%) patients had 3-24 hours while 82 (29.2%) patients had more than 25 hours survival period (Table 4).

Injury Severity Score

136 (48.5%) patient had the ISS value between 50-75 ISS group which include critical and non survivable injuries. 63 (22.5%) patient were found in 0-25 ISS group and 81 (29%) patient in 25-50 ISS group (Table 5).

Discussion

The human pelvis is an extremely stable structure requiring a great amount of force to cause disruption. It is also associated with an extensive vascular network. These two factors contribute to the higher mortality associated with pelvic ring disruptions compared to other bony injuries [3,7,10]. Our experience with pelvic fractures and mortality is similar to other reports in the literature [10]. In our study the patients were mostly male (86.8%) and were aged between 25-60 years (60.7%). Male: Female ratio was 6.5:1. This demographic trend is similar to other literature [2,3,4,5]. Adult people of this age group are the most active of any community and also indulging in most risk taking behavior which makes them more susceptible for all types of injuries sustain at home, roads or workplace.

Road traffic accidents were the most common mechanism of injury accounting for 79.26% of the study population which are supported with the trends published in the other studies [4,5,6].

Various studies have concluded that injuries sustained concurrently with pelvic fractures contributed with significant to mortality. The results of our study also support this observation. Mean injury severity score in our study was 42.12 and most of the patients were in the 50-75 ISS group which is also supported by the other studies [4]. Factors such as greater fracture severity and increased patient age were associated with higher mortality rates.

Conclusion

- The data in this study does not support pelvic fracture as the primary cause or precipitating event of death in the majority of Polytrauma patient.
- Mortality in these patients appears to be dependent on associated injuries rather than on the pelvic fracture itself.
- This suggests that although early therapeutic measures to address the pelvis may assist in controlling hemodynamic instability, rarely is this measure alone sufficient. In critical patient with pelvic fractures, management of Head, Chest and Abdomen has the most important influence on the patient's ultimate mortality.
- Protection using helmet, seatbelt etc. could reduce the severity of injury.
- Data suggest that the early transport to definitive care and within the golden hour with quality pre-hospital care could be life saving.
- There is need to set up more specialized trauma centers across the country with good accessibility

to poorer sections of society for comprehensive management of Polytrauma patients.

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Study of Fatal Burn Cases in Relation to Epidemiological and Socio-Economic Factors

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Abstract

Burns are amongst the leading causes of morbidity and mortality in the under-developed and developing nations. This study was undertaken to understand the Epidemiological and Socio-economic factors of the fatal burn cases coming for Autopsy. The cases were found to be more prevalent in the young age group, females, Hindu religion and lower income groups. Majority of the cases were accidental occurring from cooking apparatus at the household. The findings were compared with the other studies and results were found to be similar in most over a signification period of time, which are not only disturbing facts but needs serious social deliberation and measures so as to save precious human lives. Recommendations have been given so as to minimize such incidents at least at the household level.

Keywords: Burn Injury; Flame Burns; Kerosene Stove; Suicide; Dowry Deaths.

Introduction

Burns are amongst the leading causes of morbidity and mortality in the under-developed and developing nations. In India about 1,000,000 lakh people are moderately or severely burned every year [1]. Fatal burn injuries are not only a painful mode of death but also cause severe economic loss to community. The major reasons for the fires are use of kerosene stoves, short circuit in electrical wiring, fire crackers, industrial accidents etc. Suicide by immolation is a common method in India being more in females [2]. Sometimes a fire incident can lead to a mass disaster leading to mass causalities like Uphar Fire Tragedy, AMRI Hospital fire [3]. The Government and other social agencies have been continuously spreading the awareness for the prevention of burn injuries still the fire incidents keep on happening. This study was undertaken to understand the demographic profile and other factors like age, sex, socioeconomic status, time of occurrence, cause of fire etc involved in the Fatal Burn Cases, so that steps can be recommended to minimize such incidents.

Materials and Methods

The study was conducted on cases coming for medico legal postmortem examination in the Department of Forensic Medicine, Maulana Azad Medical College and Associated hospitals, New Delhi during the period 2006-2007. All cases of flame burns injuries with known time of incidence were included in the study. The chemical and electric burns cases and decomposed bodies were excluded from the study. 50 cases studied with information of every case were recorded in detailed proforma for critical analyses.

Results and Observations

Detailed observation of 50 autopsies performed in the mortuary of Maulana Azad Medical College and associated hospitals with burn injury with known method during the period from Jan. 2007 to Feb. 2008 were carried out and various epidemiological statistical results were drawn from the data.

The most vulnerable age group involved between 21 to 30 years of age comprising 50% of total 50 cases followed by age group of 31 to 40 years comprising 20% of cases. Female comprised 38 cases i.e. 76% of total cases, while males were only 12 in number i.e. 24% of total cases. (Table 1). Most of the burn occurred during the period between 18.01 pm to 21.00 pm which accounted for 24% of total cases followed by the period of 21.00 pm to 24.00 pm during which 16% of all burn cases occurred (Table 2). Maximum numbers of victims of burn injuries were from the lower income group i.e. 86% of total cases. Next in the frequency were from middle income group i.e. 14% of total cases. No case was reported from the higher income group (Table 3). 84% were Hindu of whom 31 were females (62%), while Muslim women were only 7 (14%) of the total cases (Table 4). Cooking apparatus were the most frequent source of fire, responsible for 32 cases of the burn fatalities with the use of kerosene oil pressure stoves (64%) followed by LPG cooking gas only in 04 cases (8%). The fire caught by petrol was seen in one case and by Angithi fire was seen in one case of the total cases. Strong suspicion of starting the fire by pouring kerosene oil over the body was observed in 12 cases in which 9 cases were females (Table 5). It was observed that 98% of the accident leading to burn occurred within the home for the small 2% of the accident occurred outside the home (Table 6).

Table 1: Showing age and sex wise distribution cases

S. No.	Age Group	Males	Females	Total	%
1.	0-10	-	-	-	-
2.	11-20	3	5	8	16%
3.	21-30	6	19	25	50%
4.	31-40	2	8	10	20%
5.	41-50	-	4	4	8%
6.	51-60	1	1	2	4%
7.	61-70	-	-	-	-
8.	71-80	-	1	1	2%
	Total	12	38	50	100%

Table 2: Diurnal variation

S. No.	Time Period	No. of Cases	% of Cases
1.	12am to 3am	7	14%
2.	3.01am to 6 am	-	-
3.	6.01 am to 9 am	6	12%
4.	9.01 am to 12 pm	4	8%
5.	12.01 pm to 15.00pm	6	12%
6.	15.01 pm to 18.00 pm	7	14%
7.	18.01 pm to 21.00 pm	12	24%
8.	21.01 pm to 24.00 pm	8	16%
	Total	**50**	**100%**

Table 3: Socio-economic status of cases

S. No.	Socio-Economic Status	No. of Cases	% of Cases
1.	Higher Income Group	-	-
2.	Middle Income Group	07	14%
3.	Lower Income Group	43	86%
	Total	50	100%

Table 4: Religious affiliation of the victims

S. No.	Religion	Male		Female		Total	
		No.	%	No.	%	No.	%
1.	Hindu	11	22%	31	62%	42	84%
2.	Muslim	1	2%	7	14%	8	16%
	Total	12	24%	38	76%	50	100%

Table 5: Source and manner of fire

Nature of death motive / circumstances	Male		Female		Total	
	No.	%	No.	%	No.	%
Accidental while cooking						
Kerosene stove	7	14%	25	50%	32	64%
Cooking gas	01	2%	03	6%	04	8%
Angithi Fire	-	-	01	2%	01	2%
Total	08	16%	29	58%	37	74%
Suicidal						
Kerosene Oil / Dowry	3	6%	09	18%	12	24%
Petrol	01	2%	-	-	01	2%
Total	04	8%	09	18%	13	26%
Grand Total (1+2)	12	24%	38	76%	50	100%

Table 6: Showing location of the accident

S. No.	Place of Accident	No. of Cases	Total	%
1.	Home	49	49	98%
2.	Outside home	01	01	2%
	Total	50	50	100%

Discussion

This study represents only a part of the problem of total burn injuries since the total number of such cases are distributed in different mortuaries which are catering to different regions/areas of the Delhi. 70% of the cases were found in the age group of 21-40 years and females were the predominant group. Females are mainly involved in the kitchen chores in Indian Social setup. In our study the burns from cooking apparatus accounted for 72% of the total burns. Moreover suicide by burning is a common method in females in our country [2]. Females committing suicide were about double than the males in the present study. The females in our country are more subjected to family tensions, domestic violence and not to forget the demand for dowry. The authors feel that in a depressed state of mind they have an easy access to a method of suicide leading to Self-immolation. This can be corroborated with the fact that the numbers of Hindu females are about 4.5 times than Muslims where the custom of dowry is not that much prevalent [4,5]. Many times the suicidal burns are passed by the relatives as accidental by giving false history to the police.

The main kerosene pressure stoves were found to be the main culprit in our study. The chain of events leading to fire was discussed with the relatives and witnesses. It was observed that in most of the cases the burner of the stoves get blocked in between the cooking, when the victim tried to get rid of this blockage by using a pin without releasing the pressure of the stoves so due to pressure of the stoves the kerosene oil spills over the body and clothes and fire occurred. In some cases due to excess pressure of the stoves, the stoves were burst and caused the fire. This can be understood from the fact that most of the victims of fire were from the lower income group living in a over-crowded small houses and more susceptible to fire safety due to paucity of space with kitchen work and living area being accommodated in one room only. The time of the incidents in most of the cases coincided with the times of food preparation. The Indian women generally wear synthetic clothes with loose hanging drapes like chunni, saree in the households which easily catches fire by a flame while cooking with a little amount of carelessness.

The authors compared their findings with other studies done in different regions of country and found that results are similar in most despite the passage of time from 1989 to 2015 [4-13]. This is disturbing facts and needs serious social deliberation and measures so as to save precious human lives.

Recommendations

Flame burns not only contribute as a potential factor in increasing the amount of morbidity and mortality, but also a painful method of death. The following measures should be taken as preventive steps to minimize such incidents at least in a Household.

1. The kerosene pressure stoves should be made of good quality to minimize the bursts of the stove and their flames should be guarded.
2. Women working in the kitchen should be careful about their clothing particularly drapes.

3. Inflammable materials should not be kept close to the source of fire.
4. Dowry deaths should be prevented by making more strict laws for offender and preventive intervention by police.
5. Housing conditions needs to be improved so that every family can live in a built house with fire safety features.
6. In areas where complete LPG coverage has been done the manufacture and sale of kerosene pressure stoves should be banned.
7. Government should take the necessary steps by educating particularly in area where the uses of kerosene oil stoves are still prevalent.

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Original Article

Determination of Ethanol in Blood and Urine Samples- A Case Study Showing the Significance of (i) Application of One Method Over the Other and (ii) Inclusion of Uncertainty of Measurement

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Abstract

Drunken drivers in India always pose a high risk to other users of the roads. Nearly 0.14 million people lost their lives every year in last three years in India, which is more than all casualties of wars of India [6]. Statistics derived from postmortem reports from road traffic fatalities in various countries show that 20-50% of drivers had been drinking alcohol before the crash and level of consumed alcohol in their body was above the legal limit for driving [2,3]. The influence of alcohol or drugs, many a times, goes to the extent that driver becomes incapable of having control of vehicle leading to the ill fate [2,3]. Seeing the intensity of the matter, Government of India amended the relevant laws from time to time to make it more stringent to deter the offenders. The Motor Vehicle (Amendment) Bill 2016 is such an effort by the Government of India, which was approved by the Union Cabinet of India on 3rd of August 2016 [7]. Such cases, when passes through the process of Criminal Justice Delivery System, the quantity of ethanol determined by a forensic chemist in blood sample of the accused plays a vital role in fair trial. There are several methods available for determination of quantity of ethanol in blood and urine samples. Two such methods were used for ethanol determination in blood and urine samples by the authors. The objective of this paper is to describe the preferential selection of one method over the other in some cases and inclusion of the value of uncertainty of measurement while reporting the result. The available blood and urine samples were analyzed to determine the ethanol contents with the help of two methods. The contents of ethanol determined with two methods were found different to the extent of about 20 to 30 mg%. The results of the method with lower values were found justified with the case history and were reported along with inclusion of value of uncertainty of measurement.

Keywords: Ethanol; Cavett Cup; Kojelka-Hine Apparatus; mg%; UOM-Uncertainty of Measurement.

Introduction

The blood and urine samples of a person were received in Forensic Science laboratory (H), Madhuban, Haryana to find out the level of ethanol consumption. As per the police investigation findings, the person was driving in his car on a national highway. His wife was also sitting on the front side seat of the car. Suddenly, the person lost the balance and his car smashed into a pole on side of the road, crashing the driver side of the car. The driver was badly injured while his wife also sustained some injuries. Both of them were admitted into the nearby hospital where the lady was relieved with first aid and some minor medication while the driver lost his life after about 24 hours of treatment. The blood samples of both of them were collected by the medical officer, at the time of their admission in the hospital for determination of ethanol. When the case was taken up for examination, it was observed from the medico-legal report that the driver was a diabetic

person and hence there was a big possibility of presence of acetone in the blood and urine samples of the driver, which is readily oxidized by Potassium dichromate thus contributing in the enhanced value of resultant ethanol contents. So the application of cavett method for determination of ethanol in such cases would have led to injustice to the person. Hence alternatively, Kojelka-Hine method was used to eliminate the contribution of acetone towards oxidation of dichromate [1,4,5]. At the same time, cavett method was also applied to blood and urine samples to see the amount of conribution of acetone towards the oxidation of dichromate. The preference of application of Kojelka-Hine method over the cavett method becomes important for fair trial in such cases where the person is diabetic or the patients who have been medicated with urotropine, salicylates or other such derivatives [1,4,5].

Thus the health record or treatment history of the person can influence the route of examination of scientific evidences, and it becomes necessary for the forensic toxicologist to get such type of information from the investigating agency for fair delivery of the justice to the public. The blood and urine samples were analyzed in quadruplet sets at the same time i.e. four sets of blood sample and four sets of urine sample of each person were analyzed by Kojelka-Hine method to give four concordant readings in each case. Their mean value was taken to reach the conclusion.

The uncertainty of measurement of a value plays a crucial role in fair trial in a court of law and it should be included while reporting the results because it can be helpful in acquittal or conviction of the person [8,9].

If the blood alcohol concentration during driving is punishable beyond 70mg% and the result comes out to be 73 mg% with UOM ±5mg%, then lower side of the result i.e. 68mg% (73-5= 68) shall be considered in court of law so as to adhere to basic principle that None of the innocent should be punished, whatever number of accused get acquitted'. In the present work also, UOM was calculated and final result was reported [8,9].

In the present case, the person, who expired, was under insurance cover and when his wife filed claim from the insurance company, the claim was rejected on the grounds of drunken driving. The lady also lost the case in the court of law despite inclusion of uncertainty of measurement in the result as the blood and urine alcohol concentration determined was far beyond the set limit of 30 mg% as per Section 185 of 'The Motor Vehicle Act, 1988' of Government of India.

Materials and Methods

• *Apparatus and Accessories*

a. Kojelka-Hine Glass apparatus [1,4,5].
b. Cavett cup apparatus [1,4].
c. Micropipette (LABQUEST) of Borosil make, with variable volume capacity of 100-1000 µl was used.

• *Chemicals and Reagents*

Potassium dichromate, Sodium thiosulphate, Conc. Sulphuric acid, Mercuric chloride, Potassium iodide from Merck Germany, freshly prepared water, starch solution were used.

• *Glassware*

Burette 50ml and 10ml capacity, test tube, Erlenmeyer flask of 150ml capacity, Volumetric flasks 500ml & 1 liter from Borosil India were used. Prior to use, all glassware were thoroughly washed and rinsed 2-3 times with water and dried in oven.

• *Preparation of Reagents*

a. 0.1N acidified Potassium Dichromate: This solution was prepared by dissolving 4.903 gm K_2Cr_2O7 in 1 liter solution of 60% v/v Sulphuric acid in water.
b. 0.1N Sodium Thiosulphate: This solution was prepared by dissolving 24.818 gm of Sodium Thiosulphate ($Na_2S_2O_3.5H_2O$) in water.
c. Saturated solution of mercuric chloride: This solution was prepared by mixing 7gm of $HgCl_2$ per 100 ml of water.
d. Saturated solution of Sodium Hydroxide: 600 gm NaOH in 500 ml water.
e. Potassium Iodide Solution: 20% w/v of KI in water.
f. Starch solution: 1% in water.
g. Sodium Tungstate solution: 10% in water.
h. Sulphiric acid, Approx. 1N: 30ml of conc. Sulphuric acid dissolved in 1liter water.

Note: The term water mentioned in this text means double distilled water.

• *Method*

Kojelka-Hine glass apparatus and Cavett apparatus were cleaned with chromic acid and then

rinsed with water six times. The cleaned apparatus were dried in oven. The kojelka-Hine and Cavett apparatus were set up as shown in Fig.1 and Fig.2 respectively.

a. Kojelka & Hine Method [1,4,5]: Kojelka & Hine apparatus was set up as shown in Figire 1. One ml of blood sample (with the help of micropipette), 5 ml of Sodium Tungstate and 5 ml of the 1N Sulphuric acid were introduced in the distillation tube D. 10 ml of saturated solution of $HgCl_2$ and 10 ml of saturated solution of NaOH were added to tube E and mixed. Inserted the stopper (Tube C), lubricating the joint with graphite and connected the train as shown in Figure 1. The tubes were kept in beaker of boiling.

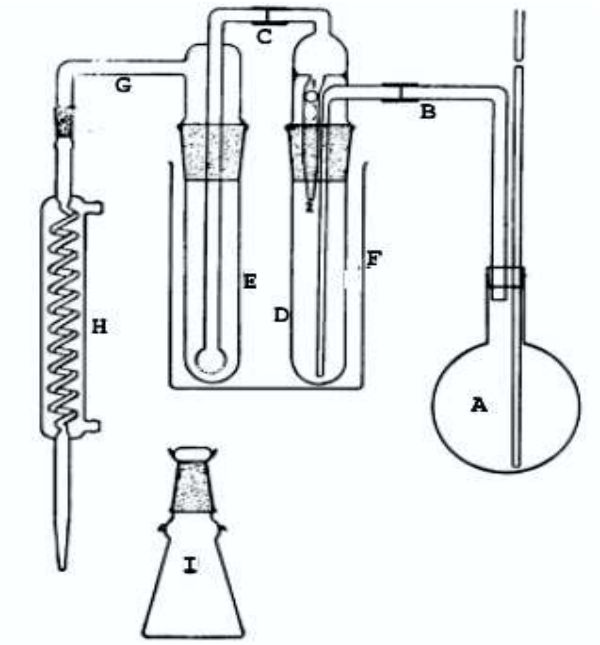

Fig. 1: Assembled apparatus of Kojelka and Hine

A. Round bottom flask 500ml (a steam generator) with air pipe; B. U shaped glass tube (having ground joint in middle) with one end opening in flask A near its neck and other end opening at the bottom of Large tube D; C. U shaped glass tube (having ground joint in middle) with one end opening in tube D near its neck and other end (porous bulb) opening at the bottom of Large tube E; D & E. Large tubes with ground glass mouth; F. Water bath, 2 litre beaker; G. Glass tube connecting C & condenser as shown; H. Glass Condenser; I. Receiver-150 ml Erlenmeyer flask with cap.] water and passed the steam originating from generator A through heated tubes D & E. Put the flask I to receive the distillate from condenser H, with condenser tube well inside the flask I. 25 ml of distillate was collected. The volatile compounds like acetone, formaldehyde are retained behind from the distillate. Ethanol from blood reaches in distillate.

After collection of 25 ml of distillate, process of steam distillation was stopped and receiver I was removed. To the distillate, 10 ml of 0.1N Potassium Dichromate solution was added slowly, and stopper was put in place. The mixture was shaken slowly to mix the contents and then placed in boiling water for 20 minutes. Then, cooled the solution of receiver I and diluted with about 10 ml of water. To it, 10 ml of Potassium Iodide solution was added and wait for 20 minutes to allow it to completely react with unused Potassium Dichromate and then titrated the liberated iodine with 0.1N Sodium Thiosulphate, using starch solution as indicator (with light blue coloured end point). Subtracted the average blank value for normal blood. Total four such readings were taken for each blood and urine sample with this method.

Chemical Reactions Involved

$$K_2Cr_2O_7 + 4H_2SO_4 \rightarrow K_2SO4 + Cr_2(SO_4)_3 + 4H_2O + 3O$$
$$CH_3CH_2OH + 2O \rightarrow CH_3COOH + H_2O$$

Each milliliter of 0.1N $K_2Cr_2O_7$ used is equivalent to 1.15 mg alcohol.

Observations & Calculation

Table 1: Data of blood/Urine Sample of Man (Driver)

Kojelka & Hine method	Blood/Urine Sample of Man (Driver)							
	Blood sample Replica 1	**Blood sample Replica 2**	**Blood sample Replica 3**	**Blood sample Replica 4**	**Urine sample Replica 1**	**Urine sample Replica 2**	**Urine sample Replica 3**	**Urine sample Replica 4**
Amount of sample taken	1 ml	1 ml	1 ml	1 ml	1 ml	1 ml	1 ml	1 ml
Amount of 0.1N Potassium Dichromate taken	10 ml	10 ml	10 ml	10 ml	10 ml	10 ml	10 ml	10 ml
Value of Blank (B)	10.1 ml	10.1 ml	10.1 ml	10.1 ml	10.1 ml	10.1 ml	10.1 ml	10.1 ml
Amount of 0.1N Sodium Thiosulphate consumed (T)	9.3 ml	9.3 ml	9.2 ml	9.3 ml	8.8 ml	8.9 ml	8.9 ml	8.8 ml
Amount of 0.1N Potassium Dichromate consumed by test sample Y= (B-T)	0.8 ml	0.8 ml	0.9 ml	0.8 ml	1.3 ml	1.2 ml	1.2 ml	1.3 ml
Conc. Of ethanol in test sample = Y×1.15×100/volume of test sample	92 mg%	92 mg%	103.5 mg%	92 mg%	149.5 mg%	138 mg%	138 mg%	149.5 mg%

Table 2: Data of Blood/Urine Sample of Lady

Kojelka & Hine method	Blood/Urine Sample of Lady							
	Blood sample Replica 1	**Blood sample Replica 2**	**Blood sample Replica 3**	**Blood sample Replica 4**	**Urine sample Replica 1**	**Urine sample Replica 2**	**Urine sample Replica 3**	**Urine sample Replica 4**
Amount of sample taken	1 ml	1 ml	1 ml	1 ml	1 ml	1 ml	1 ml	1 ml
Amount of 0.1N Potassium Dichromate taken	10 ml	10 ml	10 ml	10 ml	10 ml	10 ml	10 ml	10 ml
Value of Blank (B)	10.2 ml	10.2 ml	10.2 ml	10.2 ml	10.2 ml	10.2 ml	10.2 ml	10.2 ml
Amount of 0.1N Sodium Thiosulphate consumed (T)	10.1 ml	10.2 ml	10.2 ml	10.1 ml	10.2 ml	10.2 ml	10.2 ml	10.1 ml
Amount of 0.1N Potassium Dichromate consumed by test sample Y= (B-T)	0.1 ml	Nil	Nil	0.1 ml	Nil	Nil	Nil	0.1 ml
Conc. Of ethanol in test sample = Y×1.15×100/volume of test sample	11.5 mg%	Nil	Nil	11.5 mg%	Nil	Nil	Nil	11.5 mg%

Table 3: Calculations of Uncertainty of Measurement (UOM)[8,9]

Kojelka & Hine method	Blood sample of Man (Driver)	Urine sample of Man (Driver)
Measured values (n) 1, 2, 3 & 4	92, 92, 103.5, 92	149.5, 138, 138, 149.5
Mean of all measured values (A)	94.875	143.75
Deviations from Mean value (B)	-2.875, -2.875, -2.875, 8.625	5.75, -5.75, -5.75, 5.75
Value of Square of all B values	8.265625, 8.265625, 8.265625, 74.390625	33.0625, 33.0625, 33.0625, 33.0625
Sum of square of all B values (C)=	99.1875	132.25
Standard Deviation (S)=√(C/n-1)	5.75	6.6395
Standard uncertainty (UA)= S/√n	2.875	3.32
Degree of freedom	3	3
Uncertainty due to burette 50 ml (From Calibration certificate) (UB1)	0.05	0.05
Uncertainty due to measuring cylinder10 ml (From Calibration certificate) (UB2)	0.05	0.05
Uncertainty due to micropipette 1 ml (From Calibration certificate) (UB3)	0.01	0.01
Total uncertainty (UOM)= √(UA²+UB1²+UB2²+UB3²)	2.49	3.32
Expression of the result of Ethanol concentration with UOM	94.9mg% ± 2.5	140.9mg% ± 3.3

b. Cavett Method[1,4]: The blood and urine samples of the Man and Lady were also analyzed with cavett method using the chemicals of same strength as mentioned in Kojelka & Hine method. The apparatus was setup as shown in Figure 2.

The 10 ml of acidified 0.1N Potassium Dichromate was taken in flask A. One ml of blood/urine sample was taken in Cavett cup B and immediately put into the flask as shown in Figure 2. The joint was sealed with water. The apparatus was kept in incubator at 45°C for two and a half hour. Then it is taken out and cooled at room temperature. The Cavett cup was taken out and 10 ml of Potassium Iodide solution

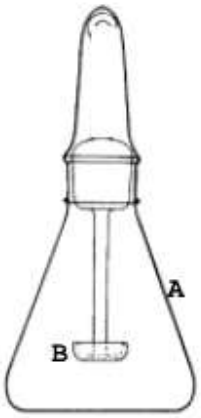

Fig. 2: Assembled apparatus of Cavett Cup; A. 150 ml Flask; B. Cavett Cup attached with glass top with a glass rod.

was added and wait for 20 minutes to allow it to completely react with unused Potassium Dichromate and then titrated the liberated iodine with 0.1N Sodium Thiosulphate, using starch solution as indicator (with light blue coloured end point). Subtracted the average blank value for normal blood, as was done in Kojelka & Hine method. Due to limited availability of samples, only single reading of each of blood & urine sample of Man (Driver) and Lady was taken with this method.

Observations & Calculation

Table 4: Data of blood/Urine Sample of Man (Driver)

Cavett cup method	Blood/Urine Sample of Man (Driver)		Blood/Urine Sample of Lady	
	Blood sample	Urine sample	Blood sample	Urine sample
Amount of sample taken	1 ml	1 ml	1 ml	1 ml
Amount of 0.1N Potassium Dichromate taken	10 ml	10 ml	10 ml	10 ml
Value of Blank (B)	10.1 ml	10.1 ml	10.2 ml	10.2 ml
Amount of 0.1N Sodium Thiosulphate consumed (T)	9.1 ml	8.6 ml	10.1 ml	10.2 ml
Amount of 0.1N Potassium Dichromate consumed by test sample Y= (B-T)	1.0 ml	1.5 ml	0.1 ml	0
Conc. Of ethanol in test sample = Y×1.15×100/volume of test sample	115 mg%	172.5 mg%	11.5	NIL

Results and Discussion

The value of alcohol contents reported by a Forensic Chemist in his report has a direct impact in fair trial of accused in Motor Vehicle Tribunals. The value of measurement of Uncertainty plays a vital role in cases where the reported value of ethanol contents lies near the threshold value of 30 mg% in Indian context.

The person gets acquitted easily, if the inclusion of measurement of Uncertainty lowers down the ethanol contents of blood and urine samples to below 30 mg%. But in this case, the values of ethanol content in blood and urine samples of Man (Driver) were 115 mg% and 172.5 mg% respectively by Cavett cup method; and 94.9 mg% & 140.875 mg% in blood and urine samples with uncertainty of measurement ±2.5 and ±3.3 respectively by Kojelka & Hine method. The higher values of results of Cavett cup method can be accounted for diabetic condition of the person.

Though, in this case, the results of both the methods were far beyond the set limit of 30mg% as per Motor Vehicle Act of India and it made no difference for the accused to be prosecuted whether the results were reported on the basis of Cavett method or Kojelka & Hine method, a forensic scientist should prefer the Kojelka & Hine method over Cavett method while reporting the results of ethanol contents in blood/urine samples in cases where the accused/ patient is suffering from diabetes for a fair trial in the Criminal Justice Deliver System.

Conclusion

For fair trial in Indian Criminal Justice Delivery System, the reports by Forensic scientists should be prepared objectively, without polarizing the mind. This article describes the preference of one method over the other in a particular condition of the person. Kojelka & Hine method's applicability over the Cavett method helps the Forensic scientists to prepare the results of ethanol contents in blood/urine samples more judicially.

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Original Article

Separation and Detection of Nux Vomika Alkaloids by Thin-Layer Chromatography

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Abstract

Strychnine and brucine are the poisonous alkaloids, derived from seeds of strychnos nux vomica. These seeds are readily available in villages and often misused for poisoning. A systematic and complete detection and quantitation of different poisons including plant poison is carried out by forensic toxicologists. Their method involves screening of poisons and their instrumental assay. Although instrumental methods are sensitive, they are costly and involve elaborate instrumental assay. Therefore, a simple, rapid and cheap thin-layer chromatographic method for separation and detection of bioactive compounds (strychnine and brucine) is described. These alkaloids have -N-C=O group in their structure. This reacts with active chlorine to give corresponding chloramines, which oxidises o-tolidine to give blue coloured compound on thin-layer chromatographic plate. The detection limit was found to be 5µg and 8µg per spot for strychnine and brucine respectively.

Keywords: Strychnine; Brucine; Thin-Layer Chromatography; Chlorine-O-Tolidine.

Introduction

Strychnine and brucine are the main alkaloids obtained from seeds of strychnos nux vomica and other species of strychnos plants, which grow in India [1]. The bark, wood and leaves of the plant contain brucine but not strychnine [2]. Due to ready availability of seeds they are sometimes misused in villages for homicidal or suicidal purposes. Some accidental poisoning cases from villages are reported as the villagers are unaware of their toxicity [3]. Such poisoning cases are received in toxicology division of forensic science laboratory for analysis. Several instrumental methods such as high performance liquid chromatography [4], capillary zone electrophoresis [5], spectrophotometry [6,7] etc., are reported in the literature. But these methods are costly and requires elaborate instrumental assay, hence thin-layer chromatography [TLC] is method of choice for screening of poisons, where large number of biological samples are to be analysed.

Chromogenic reagents such as Dragendorff [8, 9], iodiplatinate followed by UV detection [10] are reported in the literature. TLC [11] and HPTLC [12, 13, and 14] methods are reported in literature for the detection of strychnine and brucine in ayurvedic and homeopathic drugs, nux vomica seeds and biological samples. The objective of this work is to search an alternative and sensitive reagent. We report chlorine-o-tolidine reagent for selective detection of strychnine and brucine.

Materials and Methods

All chemicals used were of analytical reagent grade. Seeds of strychnos nux vomica were obtained from konkan region of Maharashtra. Seeds were dried

and crushed in grinding machine to form powder. It was stored in a glass container. Reference standard strychnine and brucine were purchased from Natural Remidies Pvt. Ltd. Karnataka. Standard solutions of strychnine 1mg/ml and brucine 1mg/ml each in methanol were prepared and were suitably diluted for spotting.

Dried 2 gm powder of nux vomica was extracted in methanol (2x50ml) under reflux for an hour on water bath. The extract was cooled and filtered and concentrated. The volume was made up to 50 ml in a volumetric flask with methanol.

Spray reagents: (I) A 0.05% solution of o-tolidine (S.D. Fine Chemicals, Mumbai) was prepared by dissolving 50 mg o-tolidine in 100 ml 10% acetic acid. (II) Chlorine gas was prepared from a 1:1 mixture of 1.5 % (w/v) potassium permanganate solution and 10% (v/v) hydrochloric acid.

Thin-Layer Chromatography

Standard glass plates (10x20cm) were coated with 0.25 mm layer of silica gel G (Sisco Chemicals , Mumbai) in water (1:2) , allowed to dry at room temperature and then activated at 110°C for about one hour. Aliquots of 10µl each of nux vomica seed extract together with reference solutions of strychnine and brucine were spotted on TLC plate 1.5 cm from the bottom of the plate by means of a micropipette and spots were left to dry in air. The plate was developed by ascending technique, in presaturated TLC chamber, using two solvent systems, chloroform:methanol (9+1) and chloroform:diethylamine(9+1) at 25°C temperature. The mobile phase was allowed to run to a distance of about 10 cm. Approximately 20 ml of solvent was required for run (development time ca 20 min). The plate was removed from the chamber dried in air, was placed for ca 5 min in a chamber containing chlorine gas (prepared 10 min earlier). Excess of chlorine gas was removed from the plate by leaving it to stand in the air; complete removal was tested by spraying the corner of the plate with o-tolidine reagent. When a faint blue colour appeared the plate was uniformly sprayed with o-tolidine reagent then 1 %(w/v) aqueous phosphomolybdic acid.

Results and Discussion

After detection; seed extract, strychnine and brucine standard showed blue spots on a white back ground. A representative reaction for strychnine (I) is represented in Figure 1. The structure of strychnine and brucine reveals that they contain –N-C=O- group. On chlorination they give chloramines (II) which further oxidize with o-tolidine (III) to an intensely blue quinonoid compound (IV). The blue coloured spot began to fade after an hour; it was stabilized for a day by spraying the plate with 1% phosphomolybdic acid solution. Both the mobile phases used gives compact spots. The R_F values and detection limit are listed in Table 1.

Table 1: R_F values and detection limits of nux vomica alkaloids

Alkaloids	Solvent System		Detection limit
	I	II	µg
Strychnine	0.82	0.78	5
Brucine	0.31	0.60	8
Seeds			
Strychnine	0.78	0.74	--
Brucine	0.28	0.56	--

Solvent system: I Chloroform:methanol (9+1), II Chloroform:Diethyamine (9+1)

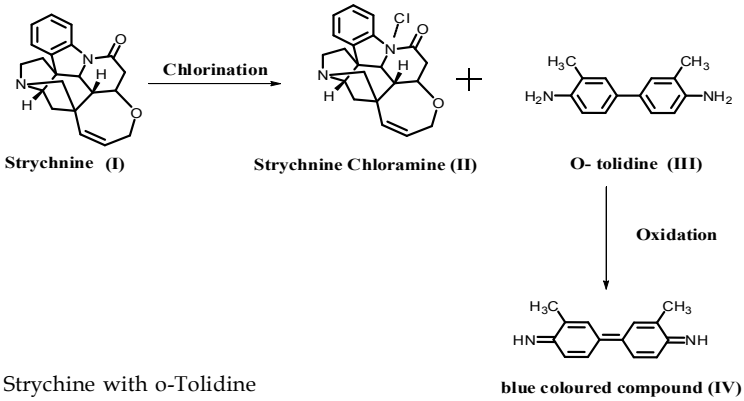

Fig. 1: Reaction of Strychine with o-Tolidine

It is essential to ensure the plate is free from chlorine before spraying with o-tolidine, otherwise the nux vomica alkaloids gives yellow spots, rather than blue. The reagent does not give a colour reaction with other constituents of nux vomica seeds. Dragendorff's and iodiplatinate reagent is reported in literature for detection of nux vomica alkaloids,but also gives coloured spots with several basic nitrogen containing compounds. The method described in this paper involves one-step extraction of alkaloids and less expertise is required than for use of instrumental methods. Chlorination then use of o-tolidine reagent can be used routinely in toxicological analysis for screening of strychnine and brucine in human poisoning cases in single run. This reagent with some modification has also been reported for detection of amino acids [15], benzodiazepines [16] and antidepressants [17].

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Original Article

Scenario of Usefulness of Viscera Preservation

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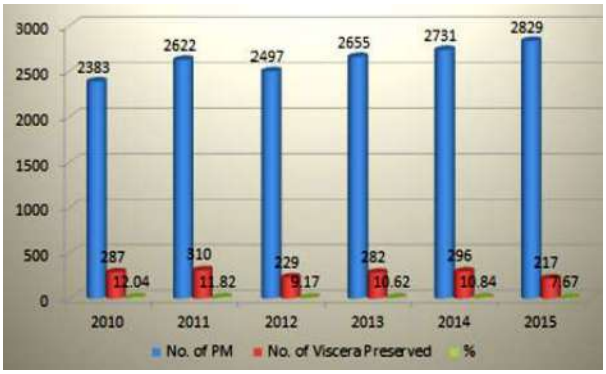
Abstract

Preservation of viscera in all suspected cases of poisoning during medico-legal autopsy, its toxico-chemical analysis by Forensic Science Laboratory and its reliability as testimonial in adjudicating criminal cases in court of law for best interest of justice, has been the matter of debate and of scientific review. At one hand, no scientific evidence is considered as 100 % temper proof and on the hand; evidences should be beyond all reasonable doubts to convict any accused in the court of law. In the situation, when in many cases, either there is no eye witness of a crime or even if eye witnesses are there, chances of them becoming hostile for what so ever reason, court is left with no other option than to rely on scientific evidences and injury report, autopsy report and viscera examination report plays significant role in the administration of justice. 'SunandaPuskar' episode has added a new spice in the ongoing controversy. Present study titled "Scenario of Usefulness of Viscera Preservation"is sincere attempt to revel how much reliance should be paid on viscera examination report while adjudicating the criminal cases allegedly of poisoning.

Keywords: Poisoning; Viscera; FSL; Autopsy; Reliability; Court; Justice.



Order of Hon'ble Supreme Court (2014)

"We direct that in cases where poisoning is suspected, immediately after the post-mortem, the viscera should be sent to the FSL. The prosecuting agencies should ensure that the viscera is, in fact, sent to the FSL for examination and the FSL should ensure that the viscera is examined immediately and report is sent to the investigating agencies/courts post haste. If the viscera report is not received, the concerned court must ask for explanation and must summon the concerned officer of the FSL to give an explanation as to why the viscera report is not forwarded to the investigating agency/court. The criminal court must ensure that it is brought on record," the Supreme Court has held."

How Long Viscera be Preserved?

The Calcutta high court recently appointed an amicus curiae or 'friend of the court' to assist it in getting answers to these questions. Aug 4, 2014. Experts have also told the amicus curiae that a viscera

can be preserved only if properly refrigerated. Preservation of the sample will also depend on the quality of chemicals used. If preserved in common salt water, as it is normally done, the sample will decompose in six months.

Material Method & Present Scenario

Retrospective analysis of data available in the Dept. of Forensic Medicine & Toxicology, Rajendra Institute of Medical Sciences, Ranchi from 2010 to 2015.

Result

Total Nos. of viscera preserved out of Total Nos. of Postmortem Examinations. (Table 1 and Figure 1)

- The proportion of viscera preservation varies from 7% to 12 % of the total Post Mortem examination conducted in each year.
- Average proportion of viscera preservation is 10.36%.

Table 1: Number of viscera preserved out of total postmartem Examinations

Year	Total no. of postmoetem examinations conducted	Total no. of viscera preserved	%
2010	2383	287	12.04
2011	2622	310	11.82
2012	2497	229	09.17
2013	2655	282	10.62
2014	2731	296	10.84
2015	2829	217	07.67

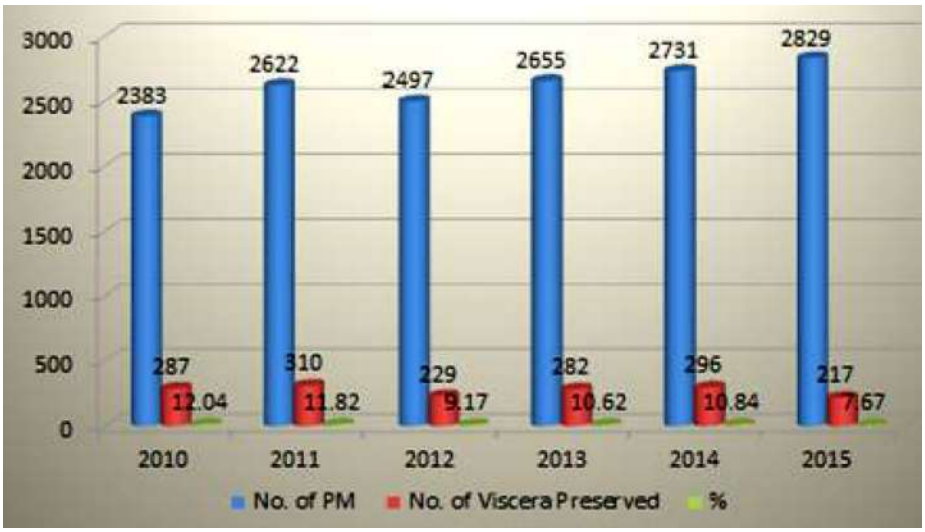


Fig. 1: Total Nos. of viscera preserved out of total Nos. postmortem examinations

Total Nos. of Viscera Received by I.O./ Police for sending to FSL out of total Nos. of viscera preserved (Table 2 and Figure 2)

Out of the total Nos. of viscera preserved, police/ IO received on an average about 11 % only (ranging from 4.84% to 17.05%) for sending to FSL for Chemical/Toxicological analysis.The remaining viscera (about 89%) remains pending and keep on getting accumulated in the department causing scarcity of space and related other effects.

Table 2: Total nos. of viscera received by I.O./ police for sending to FSL out of tatal nos. of viscera preserved

Year	No of viscera preserved	No. of viscera received by io/ police	%
2010	287	46	16.02
2011	310	15	4.84
2012	225	16	7.11
2013	282	36	12.77
2014	296	24	8.11
2015	217	37	17.05

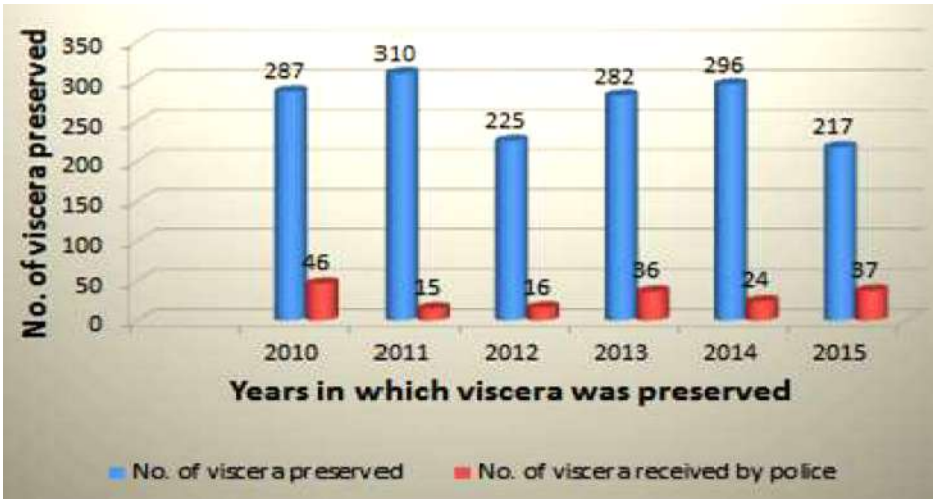


Fig. 2: Total Nos. of viscera received by I.O./police for sending to FSL out of total Nos. of viscera preserved

Duration after which viscera is being received by the police for sending to FSL (data of year 2012 only) (Table 3 and Figure 3)

- Only 11.11% viscera was received by the police within 3 months of preservation for sending to FSL for chemical analysis.
- Only 10.22% viscera was received by the police between 3 months to 6 months.
- Only 21.33% viscera was received by the Police/IO within 6 months of viscera preservation.
- 8% viscera was received by the police after 6 months of preservation of viscera.
- Even after 3 years, 70.67% of the viscera has not been received by the Police/IO for sending it to FSL.

Table 3: Duration after which viscera is being received by the police for sending to FSL (data of year 2012 only)

Duration	Number of Viscera Received by Police	% of Total (225) Viscera Preserved in 2012
0-3 month	25	11.11
3-6 month	23	10.22
6-9 month	9	4
9-12 month	7	3.11
1-2 year	2	0.89
>2 year	0	0
Not yet received even after 3 years	159	70.67

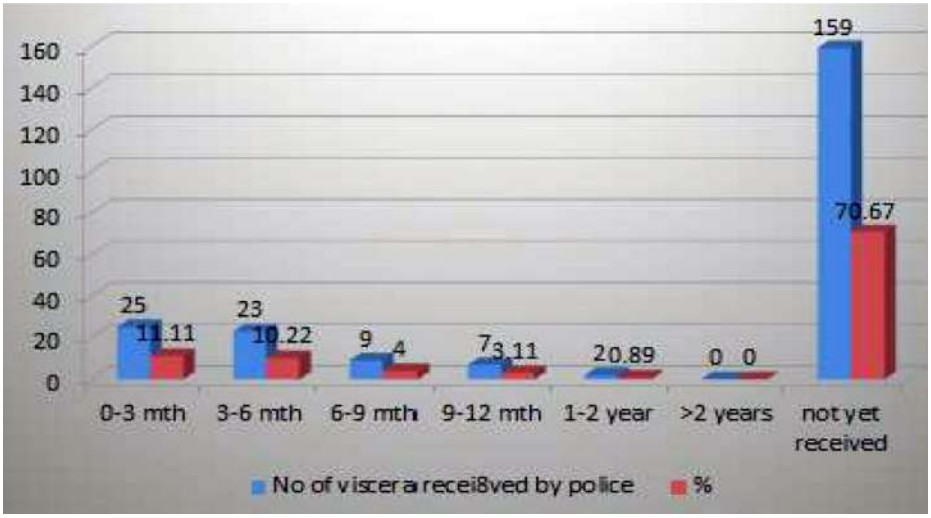


Fig. 3: Duration after which viscera is being received by the police for sending to FSL (data of year 2012 only)

Report of viscera, preserved in different yrs of PM Exams., received in 2014 (Table 4 and Figure 4)

- Viscera examination and reporting is being done by FSL in viscera which was preserved as long as 18 years ago.
- Viscera preservation and reporting time is variable from months to years and even decades.

Report of viscera, preserved in different yrs of PM Exams., received in 2015 (Table 5 and Figure 5)

- Viscera examination and reporting is being done by FSL in viscera which was preserved as long as 19 years ago.
- Time between the Viscera preservation and examination of viscera & reporting is quite variable ranging from months to years and even decades.
- About 67% of the report received in 2015 belonged to the viscera which were preserved before year 2000 i.e., more than 14 years back.

Number of viscera reports found positive w.r.t. Number of viscera reports received ((Table 6 and Figure 6)

- In 2010 about 87% reports were found positive whereas in 2015 only 5% reports were found positive.

Table 4: Report of viscera, preserved in different yrs of PM exams., Received in 2014

Year in which that viscera was preserved	Number of viscera report received in 2014	% of total viscera report received in the year 2014
1996	2	8.33
1997	4	16.67
1998	2	8.33
2009	1	4.17
2011	4	16.67
2013	8	33.33
2014	3	12.5
total	24	100

Table 5: Report of viscera, preserved in different yrs of PM exams., received in 2015

Year in which the vicera was preserved	Number of viscera report received in the year 2015	% of total viscera report received in the year 2015
1996	2	1.94
1997	3	2.91
1998	19	18.45
1999	34	33.01
2000	12	11.65
2007	1	0.97
2011	3	2.91
2012	4	3.88
2013	8	7.77
2014	9	8.74
2015	8	7.77
	total=103	100

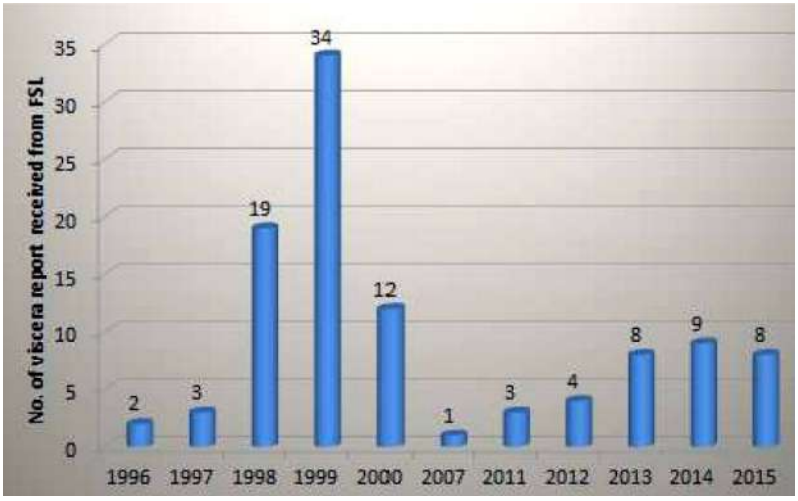


Fig. 4: Report of viscera, preserved in different yrs. of PM exams., received in 2014

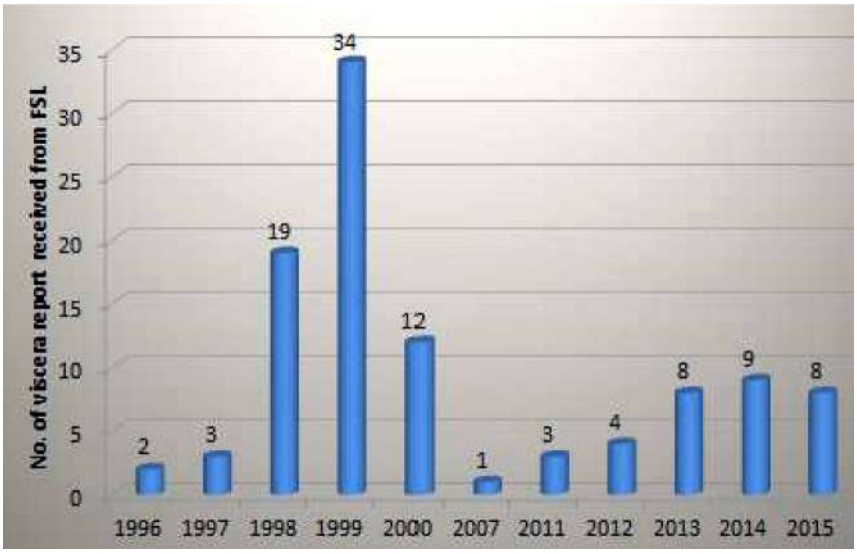


Fig. 5: Report of viscera, preserved in different yrs. of PM exams., received in 2015

- In other years (2011 to 2014)the positivity of viscera reports varied from 26% to 56%.
- Two extreme sides of the reports in 2010 and 2015 forces us to rethink on the authenticity of the viscera reports.

Types of poisons detected in viscera by FSL (qualitative only) (Table 7 and Figure 7)

- In 2010, out of 40 reports being positive, 35 were organophosphorus and 5 were carbamates.
- In 2012, out of 9 reports being positive, 5 were OP, 3 were ethyl alcohol and 1 was a combination of OP and ethyl alcohol.
- All reports were of qualitative nature and none of them was of quantitative nature. This also gives an ambiguous interpretation.

Analysis of Trend of Viscera examination Report for the year 2010 (Table 8 and Figure 8)

- In the month of February & May 2010, 100% of the reports were positive for poisoning.

Table 6: Number of viscrera report found positive W.R.T. Number of viscera report received

Year	Number of viscera report received	Number of viscera report found positive out of tatal report received in that year (%)	Number of viscera report found negative out of total report received in that year (%)
2010	46	40(86.96%)	6(13.04%)
2011	15	4(26.67)	11(74.37)
2012	16	9(56.25)	7(43.75)
2013	36	14(38.89)	22(61.11)
2014	24	8(33.33)	16(66.67)
2015	103	5(4.85)	98(95.15)

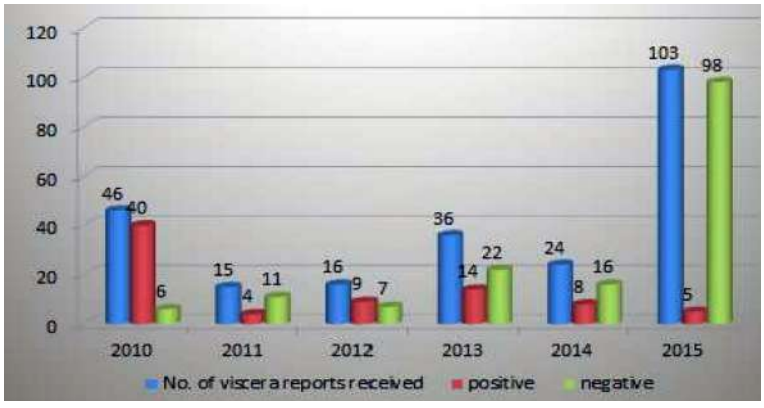


Fig. 6: Number of viscera report found positive w.r.t. number of viscera reports received

Table 7: Types of poisons detected in vicera by FSL (qualitative only)

Year of receiving viscera report	Total number of vicsera found positive that year	Type of poison organa-phosphorus	Type of poison carbamates	Type of poison ethyl alcohal	Type of poison OP+ Ethyl alcohal	Type of poison aluminium phosphide
2010	40	35	5			
2011	4	3	1			
2012	9	5		3	1	
2013	14	11		1		2
2014	8	8				
2015	5	2		3		

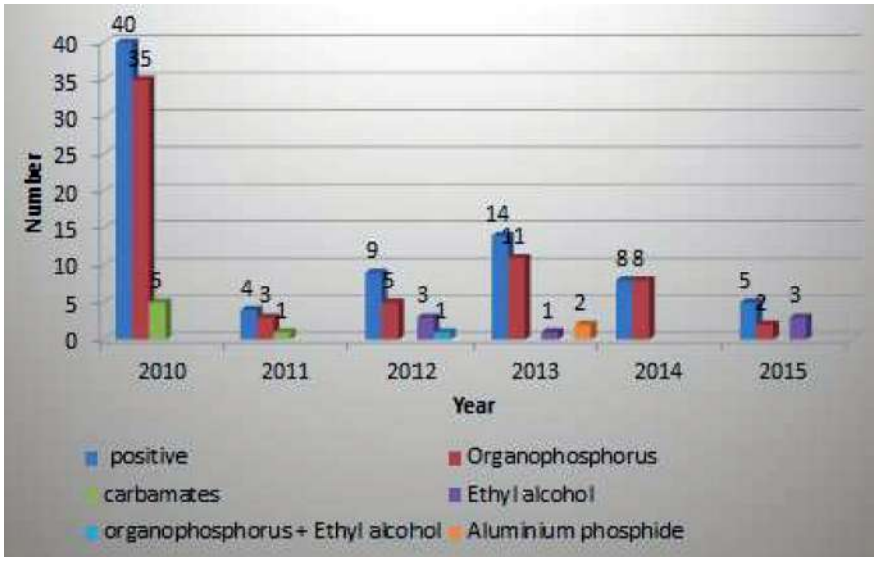


Fig. 7: Types of poisons detected in viscera by FSL (Qualitative only)

- In the first half of the year, none of the reports were negative.
- In the year 2010, only 6 (13.04%) out of 46 reports were negative.

Analysis of Trend of Viscera examination Report for the year 2015 ((Table 9 and Figure 9)

- Only 5 (4.85%) reports received in the year 2015 were positive for poisoning. Rest all were

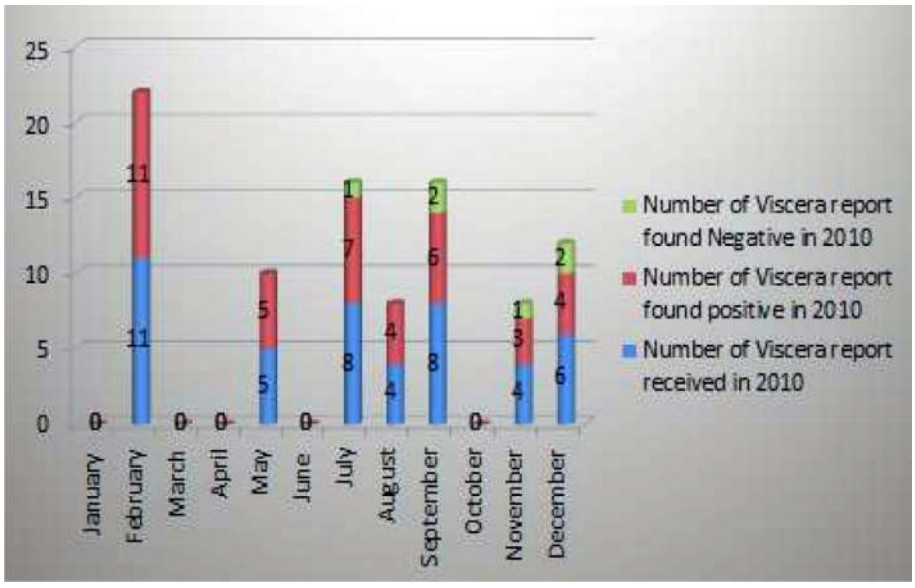


Fig. 8: Analysis of trend of viscera examination report for the year 2010

Table 8: Analysis of trend of viscera examination report for the year 2010

Month in which viscera report was received	Number of viscera report received in 2010	Number of viscera report found positive in 2010	Number of viscera report found negative in 2010
january	0	0	
february	11	11	
march	0	0	
april	0	0	
may	5	5	
june	0	0	
july	8	7	1
august	4	4	
september	8	6	2
october	0	0	
november	4	3	1
december	6	4	2

Table 9: Analysis of trend of viscera examination report for the year 2015

Month of reporting	Number of viscera report received in 2015	Number of viscera report found positive in 2015	Number of viscera report found negative in 2015
january	1	0	1
february	4	1 op	3
march	1	0	1
april	7	0	7
may	4	1 (ethyl alcohal)	3
june	6	0	6
july	14	0	14
august	17	0	17
september	14	Z(ethyl alcohal =OP)	12
october	23	0	23
november	9	1 OP	4
december	5		5

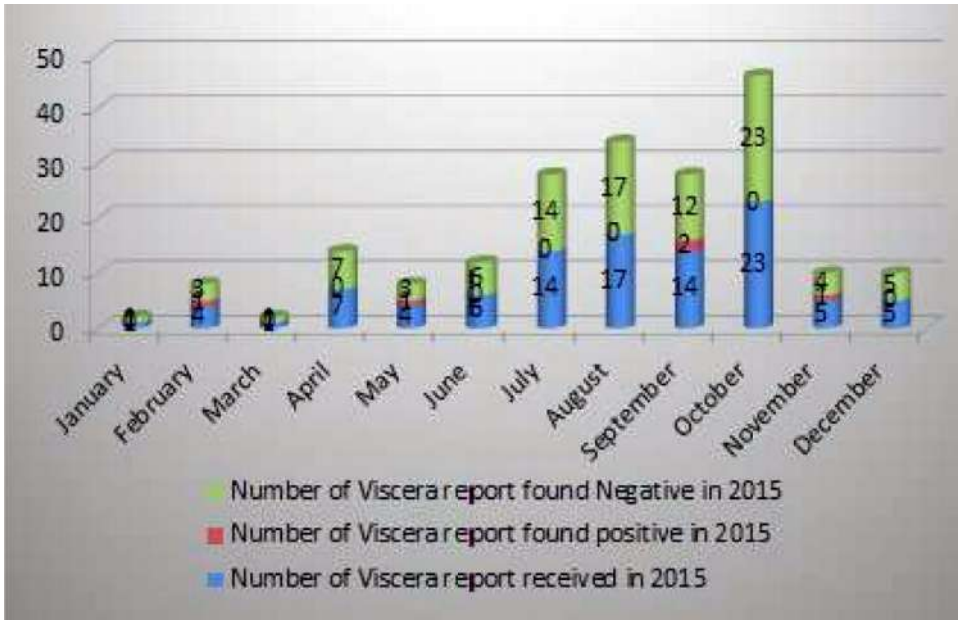


Fig. 9: Analysis of trend of viscera examination report for the year 2015

negative. It is just the opposite extremes of the reports received in the year 2010.

- Majority of the reporting was done in the second half of the year.

Conclusion

- The present study made a sincere attempt to analyze the existing ground reality in the light

of order passed by the Hon'blesupreme court.

- The present study has revealed gross delay in receiving the viscera by the police for sending to the FSL and also gross delay by the FSL in examining such viscera which ultimately makes the credibility and reliability of viscera examination doubtful and questionable. This becomes of more importance when viscera being biological product is bound to automatically degrade beyond 6 months in the existing situations but viscera is examined mostly after 6 months Also pick and choose policy is widely adopted in viscera examination.
- Delay in viscera examination, improper preservation, wrong analytical technique, early disintegration of poison, complete metabolism of poison, negligible amount of poison in viscera and tempering of viscera are some important factors for Viscera examination report being Negative. More so when quantitative assement of poison is not not being done by FSL is another factor which makes the reliability of viscera examination report questionable so admissibility in the court of law for the Justice.
- Though the doctors conducting the autopsy/ postmortem examination are duty bound to comply the order of the Hon'ble Supreme Court in preservation of the viscera in all cases of suspected poisoning, yet the final cause of death to be given by the doctors should be free from any restrictions or influence by the viscera report, more so when limited items of poisons are tested by FSL, rather they should largely rely on training, knowledge and experience combined together w.r.t. the reporting whether the cause of death is poisoning or not.
- Also, in the best interest of justice, respected courts shall be aware of the facts and shall not strictly adhere to positivity or negativity of viscera report.
- Hon'ble Supreme Court should review its order making viscera preservation mandatory in all cases of poisoning, most of the time, in the existing situation which goes in the favor of accused, under clause 'Benefit of Doubt' for reason well known to every conscious mind.

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Review Article

Medico-Legal Duties of Doctor in Poisoning Cases

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Abstract

The doctors are required to treat and manage the poisoning cases coming in the emergency. It forms a significant part of the emergency cases [1]. The doctors may perform the medical part of the management but neglect the legal duties due to ignorance or lake of time in emergency. In this article we have tried to put forward the medical as well as legal aspect of management in poisoning case which will help the doctor to do justice to the medicolegal management of poisoning case.

Keyword: Medico-Legal; Poisoning; Toxicology; Documentation; Gastric Lavage etc.

Introduction

Poison is any substance which if introduced into the living body or brought in contact will produce ill health or death by its systemic or local effects or both. There is no real boundary between a medicine and a poison - as a medicine in toxic dose is a poison and a poison in a small dose may be a medicine. In law the real difference between a medicine and a poison is the intention with which it is given. Poisoning is one of the common emergency cases encountered by doctors in the emergency department which may be accidental, suicidal or rarely homicidal.

The epidemiology of the nature of poisoning varies from region to region. The doctor has to manage the poisoning case efficiently to save the patient and also fulfill the basic medico-legal duties to assist the investigating officer in the case. Ignorance of the medico-legal duty may jeopardize the poisoning case investigation and also put the doctor in problem for not discharging his legal duty. Ignorance of law is not an excuse/defense for avoiding punishment/ penalty in the court of law.

The duties of a doctor in a case of suspected poisoning has two parts:

1. *Medical duty:* Care and treatment of the patient
2. *Medico-legal duty:* Proper medico-legal documentation and preservation of samples to assist the investigating agency in relation to poisoning

Medical Duties

It is not in the scope of this article to describe in detail the treatment of all poisoning cases. But an attempt has been made to describe the basic standard management protocol of poisoning cases. Every hospital (Government or private) is under a legal obligation to treat all cases of poisoning irrespective of the nature or manner of poisoning. No case can be turned away on the pretext that the hospital concerned is not authorized to handle medicolegal cases. It needs to be emphasized that the first and foremost of its duties is to save the life of patient by exercising reasonable skill and care in the management. If adequate facilities are not available to manage the patient, it should be given first aid

treatment or whatever is best available and referred to the nearest referral hospital. If the nature of poisoning is known, immediate appropriate treatment should be instituted. But if the nature of poisoning is not known, treatment should be instituted on general lines as mentioned below.

General Approach to Management of Poisoning Cases [4]

1. Clinical Assessment and Diagnosis

As soon as the patient arrives in the emergency, a quick assessment should be carried out to detect the life threatening problems and to correct it.

2. Emergency Stabilization

The airway, breathing, circulation and CNS depression (ABCD of resuscitation) should be corrected immediately to save life.

3. Active Removal of Toxic Substance

This involves decontamination of exposed parts like skin/ eye by washing with copious water. The gut decontamination of GIT is done by gastric lavage and administration of activated charcoal. The routine use of gastric lavage in all poisonings by ingestion is discouraged. The indications for gastric lavage and oral activated charcoal should be restricted to the cases in which the toxicologist feels that a toxicologically significant amount of the substance has been ingested and the patient has come within an hour of ingestion [11]. The elimination of absorbed poison can be done by procedures like diuresis, peritoneal dialysis, hemodialysis, haemoperfusion, hyperbaric oxygen, plasma exchange/ exchange transfusion. The benefits and the right procedure for each poison should be weighed upon.

4. Antidotal Therapy

Administration of life saving antidotes if available is a blessing to the patient. But unfortunately antidotes are not available for all poisons and only for few poisons. It is very unfortunate that we don't have antidote for aluminium phosphide poisoning (common insecticide) which is the commonest cause of suicidal poisoning in north India. It is the need of the hour to have antidote banks in various parts of the country with sufficient stocks of all life saving antidotes. The list of antidotes are shown below in Table 2. The doctor can consult National poison information centre (NPIC) regarding management and antidote therapy. In India it was first started in the Department of pharmacology, AIIMS, New Delhi, in 1995. It provides 24x7 hours service on call. Later many other centers were started as shown in Table 1.

5. Nursing and Psychiatric Care

Good nursing care is the backbone of good patient care, especially for comatose and incapacitated patient. There is a need for psychiatric care in case of suicidal poisoning case to avoid further attempts. Prognostic assessment should be done and patient should be informed and counseled.

Table 1: Poison Information Centers in India [12]

S. No.	Contact Detail	Working days	Working Hours
1.	National Poison Information Centre, Department of Pharmacology, All India Institute of Medical Sciences, New Delhi-110029 Helpline: 1800116117 E-Mail:- npicaiims2010@gmail.com	7 Days	24 Hours
2.	Drugs and Poison Information Centre of JSS University, JSS Hospital, Mahatma Gandhi Road, Agrahara, Mysore- 570004 Karnataka Helpline: 91-821-2335577, 1800-425-0207 Fax: +91-821-4253628 E-mail: dic.jsscp@jssuni.cdu.in	7 Days	8.30 AM to 6.00 PM
3.	Drug & Poison Information Centre, Department of Pharmacy Practice, Kovai Medical Center and Hospital, Coimbatore- 641014, Tamil Nadu Helpline: 0422-4324221, 09952311334	6 Days (Monday to Saturday)	9.00 AM to 5.00 PM
4.	Poison Information Center, Department of Pharmacy Practice, Raghavendra Institute of Pharmaceutical Education and Research/ RDT Hospital, Chiyyedu Post, Anantapur, Andhra Pradesh- 515721	6 Days (Monday to Saturday)	10.00 AM to 4.00 PM

	Helpline: +91-8559244220, 08978541693 Fax: +91-8554255646 E-mail:- riperdruginfo@gmail.com E-mail:- Dixon.thomas@gmail.com		
5.	Poison Control Centre, Amrita Institute of Medical Sciences & Research, Cochin, Kerala-682041 Ph:0484-4008056,0484-2856034(D),0484-4001234 Fax: 0484-2802124 Helpline:09895282388 E-mail:toxicology@aims.amrita.edu; E-mail:-poisonunit@aims.amrita.edu; toxlab@aims.amrita.edu;	6 Days (Monday to Saturday)	9.00 AM to 5.00 PM
6.	Poison Information Centre, National Institute of Occupational Health, Meghani Nagar, Ahmedabad-380016, Gujarat Helpline:079-22684756, 079-22686351, 079-22686330, 079-22684756 Fax: 079-2866630 E-mail:picnioh1993@gmail.com patelab@icmr.org.in	5 Days (Monday to Friday)	9.00 AM to 6.00 PM
7.	Poison Control and Training Centre, Rajiv Gandhi Government General Hospital, Poonthamalli High Road, Chennai-600 003, Helpline:09840185742, 044-25305969	7 days	24 Hours
8.	CEARCH (Centre for Education, Awareness and Research on Chemicals and Health) B 232-236, Supath II Complex, Vadaj ashram Road, Ahmedabad, Gujarat-380013 Helpline: 079-27553595, 09824047400 E-mail:-cearchtoxicology@yahoo.com	7 days	24 Hours

Table 2: List of Antidotes[4]

Sl. No.	Antidotes	Indications
1	Acetylcysteine	Paracetamol
2	Amyl nitrite	Cyanide
3	Ascorbic acid	organic peroxides (Osmium)
4	Atropine	Cholinergic agents
5	Aurintricarboxylic acid (ATA)	Beryllium
7	Benzyl penicillin	Amanitins
8	Berlin Blue	Thallium
9	Calcium Salts	Oxalates, Fluorides
10	Dantrolene	Malignant hyperthermia
11	Desferrioxamine	Iron, aluminium
12	Diazepam	Chloroquine
13	Dicobalt edetate	Cyanide
14	Digoxin specific Fab antibody fragments	Digitalis glycosides (digoxin)
15	Dimercaprol	Arsenic, Lead, Mercury
16	4, Dimethyl aminophenol (4 –DMAP)	Cyanide
17	Ethanol	Methanol, ethylene glycol
18	Flumazenil	Benzodiazepines
19	Glucagon	Beta-blockers
20	Glucose	Insulin
21	Guanidine	Botulism
22	Hydroxocobalamine	Cyanide
23	Isoprenaline	Beta-blockers
24	Methionine	Botulism
25	4, Methylpyrazole	Ethylene glycol, methanol
26	N-Acetylpenicillamine	Mercury
27	Naloxone	Opiates
28	Neostigmine	Peripheral anticholinergics
29	Oximes	Organophosphates
30	Oxygen	Cyanide, carbon monoxide, hydrogen sulfide
31	Oxygen (Hyperbaric)	Carbon monoxide
32	Penicillamine	Copper
33	Pentetic acid (DTPA)	Radioactive metals
34	Phentolamine	Alpha adrenergics
35	Physostigmine	Central anticholinergics
36	Phytomenadione (Vitamin K)	Coumarin derivatives

37	Potassium hexacyanoferrate (Prussian blue)	Thallium
38	Propranolol	Beta adrenergics
39	protamine sulfate	Heparin
40	Pyridoxine	Isoniazid
41	Sodium nitrite	Cyanide
42	Sodium nitroprusside	Ergotism
43	Sodium salicylate	Beryllium
44	Sodium thiosulfate	Cyanide
45	Succimer (DMSA) i.e 2,3-dimercaptosuccinic acid	Lead, arsenic, mercury
46	Tocopherol	Carbon monoxide
47	Toluidine blue	Methaemoglobinaemia
48	Trientine (triethylene tetramine)	Copper
49	Unithiol (DMPS)i.e 2,3-dimercaptopropane sulfonate	Lead, Arsenic, Mercury

Legal Duties of a Doctor in Poisoning Case

1. Inform the Nearest Magistrate/Police Officer

It is a wrong concept repeated in many standard textbooks of Forensic Medicine in India, mentioning that the private doctors can report only the homicidal poisoning cases and are under no legal obligation to report the suicidal/accidental poisoning cases to the police. However the Government doctors have to report all cases of poisoning, whether accidental, suicidal or homicidal.

Some authors have justified by quoting section 39 CrPC.As per Sec. 39 CrPCit is the duty of the public to give information of commission of certain offences of IPCs mentioned under 39 CrPC, which includes Sec. 302,303 and 304 IPC (that is to say offences affecting human life), to the nearest magistrate/ police officer. They say that Section 309 IPC (offence of an attempt to commit suicide) or section 284 IPC(offence relating to accidental poisoning) have not been included in the section 39 CrPC which requires the public to give information.

But we know that though offences like 376IPC (rape) and 320 IPC (grievous hurt)which are not included in 39 CrPC, the doctoris bound to be report the case to the police, as he is in knowledge of the commission of offence and also involved in collection of evidentiary materials. Therefore non reporting of suicidal and accidental poisoning cases on the basis of 39 CrPC is not justified and reasonable. Besides the doctor is not the competent authority to decide the manner of poisoning. He may make mistake trying to do so as many a times the patient/relative may give incorrect or biased history due to personal motives or benefit[5]. Wrong report/opinion/decision by treating doctor can create legal complication in the case and invite problem for himself. If the doctor does not inform the police in any of the cases, he may be penalized under sec. 176 IPC (omission to give notice or information to public servant by a person legally bound to give), under sec. 201 IPC (causing disappearance of evidence of offence) or under Sec. 202 IPC (intentional omission to give information of offence by person bound to inform).Therefore it is prudent and safe advice that all cases of poisoning, irrespective of the manner, whether accidental, suicidal or homicidal should be reported to the police [6].

The doctor can call the nearest police station and inform about the case and note down the police diary number for future reference with date and time on the register maintained by the hospital or by himself. In many big hospitals they have a police post inside the hospital itself where they are directly informed and they in turn report to the respective jurisdiction police station where the incident happened. In case the police station does not give diary number he can call the police control room by dialing number 100 and ask for diary number. It will prevent the doctor from future litigation against not informing the police/magistrate. If the doctor fails to inform the magistrate/police, it is a punishable offence under Sec. 176 IPC (omission to give notice or information to public servant by person legally bound to give). If the police require information's regarding the case, the doctor must divulge all information's. There is no scope for professional secrecy (Sec 175 CrPC). If no information is given or wrong information is given deliberately, he becomes culpable under Sec 202 and 193/177 IPC respectively. If it is a case of food poisoning which may be accidental, originating from a public eatery like hotel, canteen or public function (marriage/festival dinner), it should be reported to the public health authority so that suitable preventive steps can be taken.

2. Dying Declaration

If the patient is in serious condition and may die the doctor should inform the nearest magistrate to record the dying declaration. Dying declaration is a written or oral statement of a person, who is dying as a result of some unlawful act, relating to the material

facts of cause of his death or bearing on the circumstance (Sec.32 (i) lEA) [3]. If there is no time to wait for magistrate, he should record the dying declaration himself in the presence of an independent witness like nurse or emergency staff. But the doctor should make sure that the patient is medically fit and in sound mind and compos mentis to give the statement to be valid in the court of law.

3. Detailed Medico-Legal Documentation and Proper Maintenance of Records [7]

The attending doctor should record all the findings and prepare a proper MLC report. He must record the preliminary particulars i.e, full name, age, sex, occupation, date and time, brought by whom and history of dying declaration whether necessary or not. In case of suspected poisoning, the diagnosis should not be mentioned as unknown poisoning. In such case, if its nature of poisoning is not clear, it should be mentioned as poisoning nature not known. Ask proper history of the nature of poisoning/ amount/time of consumption/route of consumption /previous suicidal attempt/drug abuse/psychiatric illness/ any disease etc from the patient/relatives/ eye witness. It will help in proper management as well as to know the nature of poisoning for medico-legal purpose. Sometimes the relative will bring the remnant of the poison consumed. It should be properly recorded in the MLC and forwarded to the investigating officer in a sealed condition with proper label to be tested in the Forensic Science laboratory. It also helps as a control sample for the toxicologist when testing the gastric lavage sample or postmortem viscera for the poison. It makes the job of the toxicologist easier for the detection of the specific poison. The recording of the nature of poison in the MLC and in postmortem report makes the toxicologist job-easier in detection of poison. The MLC records should be kept in a safe custody as per the hospital protocol. Usually the hospital has a medical record division to maintain and handle the records. Otherwise the doctor has to maintain his personal record of the MLC cases dealt by him.

4. Preservation of Sample

In poisoning cases Blood and urine are the sample of choice. It can be collected in a clean glass or plastic container with standard screw cap. For blood ideally two samples should be collected, 10 ml each, one with preservative and other without preservative. The one with preservative can use anticoagulant EDTA and Sodium fluoride. Now a days vacuitainer are used to collect blood sample which already contains the anticoagulant and the preservative. The urine can be collected (20ml) with thymol preservative. Ideally two samples should be taken, one immediately after the victim arrives and the bladder should be completely emptied. The second sample should be taken 30 minutes after the first sample. The second sample will give the blood level of the poison [6]. Urine is a very good sample for screening drugs. However the attending physician should collect all the available relevant samples for evidence of poisoning such as vomitus, gastric lavage, urine, faeces, clothes stained with vomitus/fluid etc. The gastric lavage is commonly done as per need in emergency medicine for management of poisoning by ingestion except for some contra indications. The first lavage sample is ideal for the detection of poison consumed in the stomach. Subsequent lavage will cause dilution of the poison present. The lavage sample can be preserved by adding pure NaCI crystals (approx. 4 gm/100 ml) to it as preservative to prevent decomposition of the sample. Ideally all the samples should be kept in refrigeration at about 4 degree celcius and submitted to the Forensic Science laboratory as early as possible.

In case of food poisoning the doctor should collect the contaminated food. If the food poisoning has affected a group of people in the society, it should be reported to the public authority for taking precautions and controlling. All the samples should be properly sealed, labeled (name of the patient, material preserved, date and time) signed and handed over to the investigation officer for onward transmission to the FSL for toxicological analysis[8]. He also must preserve other evidence of poisoning like bottle/cup/tumbler used, clothe or bed sheets stained by the vomit/urine/faeces or poison container for possible future examination and corroboration. It is very important duty of the treating physician to preserve all the available and relevant evidence in a proper manner and hand it over to the investigating officer.

Many a times the doctor may be careless, not knowing its legal implications. If the doctor intentionally fails to preserve the samples, he is liable to be punished under Sec. 201 IPC (causing disappearance of evidence).

5. Recommend for Medico-Legal Postmortem in Case of Death

If the patient dies of suspected poisoning or was brought dead to the hospital the doctor should not issue a death certificate. The police should be informed and the deceased body should be forwarded

for medico-legal postmortem to ascertain the poison and the exact cause of death.

6. Opinion in Poisoning Cases

The opinion in cases of death due to suspected poisoning or patient survived of suspected poisoning should be given carefully. The investigating officer will seek the medicolegal opinion on the case from the treating doctor in non fatal cases or from the autopsy doctor who conducted the postmortem in fatal cases. The doctor should take a holistic approach while formulating the opinion. He has to interpret the toxicology report considering its physiological effects/clinical manifestation on the body in relation to the concentration and the postmortem findings. Ideally we should have both the qualitative and quantitative report of the poison detected so that it can be correlated with the fatal dose. For this the doctor should be aware of the therapeutic and toxic dose of the common drugs and poisons. Generally the clinical findings in treatment papers, postmortem findings and viscera chemical analysis report is sufficient to opine on the final cause of death.

Ideally we should have the qualitative and quantitative report of the poison detected to opine on the cause of death in the case and the doctor should be aware of the therapeutic as well as toxic or fatal dose of the common poisons, However in India the doctors are generally don't receiving the quantitative report of all the poisons except alcohol. It may be due to lack of sophisticated equipments like GC-MS, LC-MS, ICP-MS, GC MS/MS, LC-MS/MS etc. The doctor should be careful while opining just based on qualitative report only. There are also exceptional cases where the viscera chemical analysis report may be negative Inspite of clear positive postmortem findings suggestive of poisoning. In such cases the doctor needs to be careful in giving final opinion. But after ruling out natural pathology/anomalies, he can still give poisoning as the probable cause of death based on the postmortem findings. There are many cases where the accused has been convicted, even though the viscera reports were negative. The judge relied on the circumstantial evidence and the postmortem report.

The court has said that the mere non detection of the poison does not mean that the death was natural (Mahavir Vs state of Bihar, 1972 AIR 1331, SCR (3) 639). In another case supreme court has observed that- In a case of unnatural death inviting Sec 304-B IPC or Sec 306 IPC, as long as there is evidence of poisoning, identification of the poison may not be absolutely necessary. Even when a viscera report is sought for, its absence is not fatal to the case and rejected the contention of the accused (Bhupinder Vs State of Madhya Pradesh, criminal appeal no. 1774, 2008). Similarly the court has said that – What assistance a man of science can give he gives, but it is too much to say that the guilt of the accused must in all cases, should be demonstrated by the isolation of the poison (Anant Chintaman Lagu Vs The State of Bombay, AIR 1960, SC 500). There are some genuine reasons to give false negative report [9]. One such circumstance is when the patient of poisoning case admitted and treated in the hospital for few days. It is very much probable that the poison might have been metabolized and eliminated or excreted from the body. The doctor needs to be aware of the facts which can give false negative or false positive reports. The specific questions that needs to be kept in mind while framing opinion are [10]:

a. Whether the poison was sufficient to cause death or is this a fatal level.
b. Whether it is sufficient to affect the actions of the deceased so as to cause the death.
c. Whether it is insufficient to have any involvement in the cause of death.

The doctor must take into account many factors, while interpreting the toxicological report:

a. Route of administration
b. Synergistic effect of drugs
c. Age, sex, body weight, genetic factors, tolerance, environmental exposure and general health condition ofthe individual.
d. Whether the drug/poison is therapeutic, chronic high level or acute overdose.
e. When the presence of even trace amount of highly toxic substance is established, the cause of death may be justified as poisoning.
f. Postmortem drug redistribution
g. False positive and false negative toxicology results

7. Chronic Poisoning Case

The doctor has to be aware of the chronic poisoning cases in his area. Certain cases like chronic arsenic poisoning has been reported in certain parts of India due to high level of arsenic in the ground water. It gets deposited in the body after many years of people consuming contaminated water leading to skin manifestation or systemic disorder. There has also been heavy metal chronic poisoning due to

consumption of locally made ayurvedic medicine containing high level of arsenic. When such poisoning comes into his knowledge it his duty to report it to the concerned public authority, so that action can be taken to prevent the damage. It is under privileged communication that doctor can inform the concerned public authority as a duty to protect the interest of the community or the state. There can be false positive results of insecticide due to consumption of water or vegetable contaminated with insecticides like organophoshates. The doctor can always consult a ForensicMedicine doctor to clear any medico-legal queries before framing opinion.

Medico-Legal Discussion

As per section 324 IPC (voluntarily causing hurt by dangerous weapon or means), 326 IPC (voluntarily causing grievous hurt by dangerous weapon or means), poison is also considered as a dangerous weapon/means which can cause hurt/ grievous hurt.

It is also worth knowing that with advancement of science the criminals have started using sophisticated chemical weapons/poisons which acts fast in trace amounts and are very fatal and not easily detectable, like radioactive substance (polonium), sarin gas, VX, Sulphur mustard etc. The doctor needs to be updated about the latest development and trends/epidemiology of common poisons in his area to manage poisoning case more effectively.

Conclusion

This article is meant to bring medicolegal awareness among the doctors treating the poisoning cases to manage the patient and also assist the legal investigation.

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Case Report

Homicide-Suicide: One of the Faces of 'Love'

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Abstract

Homicide – suicide cases are uncommon methods of death. However, with the advent of internet and technology there appears to be a rise in the number of these cases. These cases are different as they are easily solved. They are also easily prevented if timely counselling and peer guidance is obtained. Recording statistics of these crimes can help in better understanding of the crime. Here we present an interesting case of a dejected lover who has committed the crime of passion in as cruel manner as possible, while celebrating the last date with his partner.

Keywords: Homicide-Suicide; Dyadic Death; Crime of Passion; Strangulation.

Introduction

Homicide-Suicide is a relatively uncommon method of death. The National Crime Records Bureau (NCRB) of India does not record these crimes together, rather they are recorded separately as homicides and suicides [1,2]. However with the advent and spread of internet, there appears to be a rise in reported homicide and suicide cases [3-8]. These cases (homicide-suicide) are important, though they do not burden the police since they are easily solved, as they leave the family members of the deceased in a state of despair and shock. A Forensic Pathologist can match wounds with positions of bodies at a scene and Psychiatrists can develop a deeper insight into the minds of people who commit such crimes especially if they survive [9]. Here we present an interesting case of a dejected lover who had committed the crime of passion in as cruel manner as possible, while celebrating the last date with his partner. The authors aim to increase the awareness amongst the society so as to prevent such unfortunate incidents.

Case History

The girl was learning dance from a dance academy but had stopped going there for 3 months prior to the incident. On 28/6/2016 she left home for some household work and told her family that she would also be visiting her dance academy. Her mother talked to her at 4:30 pm and she replied that she will be coming back to home in few hours. But when she did not return and she was traceable then her family went to the dance academy and found it locked from outside. The girl didn't return in night, and her family members again went to dance academy the next day. The place was a basement with an iron channel at the entrance which was closed with a lock. A wooden door was inside of the channel (Photograph 1). On pushing the door, it opened and a man was seen

hanging. The family informed the police who broke open the lock. Rose petals were seen on the staircase. The body of the girl was recovered from the carpet on the floor with an electrical extension cord wrapped around her neck (Photograph 2) while the body of the boy was recovered found suspended from the fan on the roof (Photograph 3). Two candles were found on the opposite corners of the carpet along with one match box and a screwdriver. Two rings were recovered from the pocket of the boy. No suicide note was found.

Photograph 1: Photograph of the outer metallic channel with inner wooden door – entry gate of gymnasium

Photograph 2: Dead body of girl found on carpet with electrical cord wound around neck

Photograph 3: Body of male completely suspended

Autopsy Findings of Boy

The body was of a young adult male with 166 cm length, average built and intact clothing. Bluish discoloration of nails and lips were present. Rigor mortis was present in the passing stage over upper part of the body. Post-mortem staining was present over hands, legs, feet and back, except pressure areas.

A reddish brown parchmentised ligature mark of width 4 cm was present in the anterior midline of neck running obliquely upwards, laterally and backwards merging with the posterior hairline at the nape of neck. The underlying soft tissues were dry, pale, glistening and hard to touch and devoid of any extravasation or hematoma. Thyrohyoid complex, underlying muscles and blood vessels were intact. No other external antemortem injury was present over the body. Internal organs were congested with petechiae hemorrhages present over interlobar fissures of both the lungs. About 50 ml of pinkish liquid material was present in stomach with congestion of mucosal walls. The cause of death was concluded as 'Asphyxia due to Antemortem hanging.'

Autopsy Findings of Girl

The body was of a young adult female with 152cm length, average built and intact clothing. Bluish discoloration of nails and lips were present. Rigor mortis was present in the passing stage over upper

part of the body. Post-mortem staining was present over back except pressure areas. Conjunctivae were congested. The rest of the natural orifices were normal.

A grey colored electrical cable attached to a 3 Pin extension box having a single running knot is found encircling the neck in four loops with a knot present below angle of left side of neck. One free end was attached to a 3 pin box and other free end was terminating in a three pin plug. The circumference of wire was 2 cm and of the whole ligature material on close approximation was 6.5 cm.

A reddish ligature mark of width 2.5 cm was present in the anterior midline of neck running horizontally, laterally and backwards completely encircling the neck. The underlying soft tissues show congestion and a bluish contusion of size 2 cm X 1 cm was present in Sternocleidomastoid muscle on the left side. Thyrohyoid complex, underlying muscles and blood vessels were intact. Trachea was congested. Multiple linear superficial incised wounds were present over both sides of neck (Photograph 4). Internal organs were congested with petechiae hemorrhages present over interlobar fissures of both the lungs. About 20 ml of pinkish liquid material was present in stomach with congestion of mucosal walls. The cause of death was concluded as 'Asphyxia due to ligature compression of neck.'

Photograph 4: Multiple incised wounds with ligature mark over neck of the girl

Discussion

Dyadic death includes both homicide-suicide and suicide-suicide pacts [10]. Many authors have limited this term to involve only Homicide- suicide deaths. However there is no standardized operational definition for these deaths [11]. Mazruk et al [11], have classified dyadic deaths as spousal/ consortial, familial, and extra-familial type with different sub classification based on motive of crime.

Most homicide-suicide episodes can be regarded as extended suicides, where the decision to commit suicide is taken first and the along with that there is a decision to kill associate family members. Suicide in such cases is therefore usually not considered to be crime of remorse as the primary act is their own suicide [12]. In most of Homicide-suicide deaths the perpetrator is the dominant partner and usually a male [10].

In the present case the victim (girl) appeared to be the dependant partner and the male appeared to be the dominant partner. The victim had visited her paramour in his dance studio where the male had strangulated her to death showing his dominance. The boy had stopped his dance classes for about three months prior to the incident. He had told one of his female friends that he was in relation with the deceased girl. The detailed history revealed that the family members of the girl had fixed her marriage. The girl had not objected to the proposed marriage and the family members were not aware of the alleged relationship with the deceased boy. The Girl had been engaged the previous week with another man. On the day of the crime the girl had voluntarily went to meet the boy. She had told her family that she would be going to gym but had not disclosed any other details.

The family waited for the girl and were frantic when they were not able to trace the girl. At the crime scene there showed flower petals on stairs and candles showing the intimacy and love of the couple. It also indicated the pre-planning of the boy who probably wanted to celebrate his last date with his love interest. At the crime scene no other ligature material was recovered. The ligature material used to strangulate the girl was an electric wire which was still attached to the electric box. This could be because he had not initially planned and the crime was committed in the momentary state of mind. It is possible that during their meeting the boy could not bear the possibility of separation from his love interest and strangled the girl with whatever was available at that instance and subsequently

committed suicide. As in the present case most suicides are done within with-in seconds or minutes of the killing [13].

In most cases the suicide and homicide were planned together though in the present case it was not clear whether the girl was a participant of the crime or simply a victim [13].

It has been shown those suicidal ideations are transmitted to the dependent partner [10]. It is possible that in the present case the depressed mental status of the male affected the female, leading to such a gross act. The preparations at the crime scene suggested that the meeting had been pre-planned by both the victims but whether the crime was pre-planned or not was unsure.

Conclusion

With the advent of technology ideas and thoughts are transmitted quickly from one to another. People have better access to each other through social sites and mobile applications. There is no privacy and though there may be physical separation there is no mental separation.

This results in people continuously being influenced by each other. It is possible that young children or young adults who are in relationship are constantly affected by their partner resulting in ideologies being transferred. These may result in such crimes of passion.

Prior to commission of offences, subtle signs are always present. Parents should be more vigilant towards their children. The peers should look for these minor signs/ indications that are left by such individuals before committing homicide-suicide, so that these are timely understood and corrective measures are taken.

Adequate counselling of such persons should be done. The Crime records bureau should maintain records for such crimes as they are easily preventable if timely intervened.

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The methods section should include only information that was available at the time the plan or protocol for the study was written such as study approach, design, type of sample, sample size, sampling technique, setting of the study, description of data collection tools and methods; all information obtained during the conduct of the study belongs in the Results section.

Reports of randomized clinical trials should be based on the CONSORT Statement (http://www.consort-statement. org). When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma.net/e/policy/l 7-c_e.html).

Results

Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. Extra or supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be published only in the electronic version of the journal.

Discussion

Include summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); Strengths and limitations of the study (study question, study design, data collection, analysis and interpretation); Interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now?, What this study adds to the available evidence, effects on patient care and health policy, possible mechanisms)? Controversies raised by this study; and Future research directions (for this particular research collaboration, underlying mechanisms, clinical research). Do not repeat in detail data or other material given in the Introduction or the Results section.

References

List references in alphabetical order. Each listed reference should be cited in text (not in alphabetic order), and each text citation should be listed in the References section. Identify references in text, tables, and legends by Arabic numerals in square bracket (e.g. [10]). Please refer to ICMJE Guidelines (http://www.nlm.nih.gov/bsd/uniform_requirements.html) for more examples.

Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006; 35: 540-7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003; 61: 347-55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone iodine antisepsis. State of the art. Dermatology 1997; 195 Suppl 2: 3-9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000; 71: 1792-801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O, Kidd EAM,

editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. p. 7-27.

No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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