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Suicidal Deaths in Police Lockup / Prison of North Maharashtra Region: A 15 Year Retrospective Study

Ajit G. Pathak*, Ramesh K. Gadhari**, Kapileshwar M. Chaudhari**, M. S. Vasaikar***, Sunil S. Chavan***, Dipak K. Shejwal***

Abstract

Retrospective study of suicidal deaths in prison/police lockup of North Maharashtra region from 01/01/2000 to 31/12/2014 was carried out. Total 12 cases of suicide were studied. Suicide by hanging was the commonest method of committing suicide followed by Head injury and poisoning. 50% of cases were from age group of 20 to 30 years. Based on these findings several measures for prevention of deaths in Police custody are discussed.

Keywords: Custody/Prison Deaths; Custodial Torture; Forensic Pathologist; Postmortem Examination; Manner of Death.

Introduction

Suicide is a complex phenomenon that has attracted the attention of philosophers, theologians, physicians, sociologists and artists over the centuries. As per Webster dictionary, suicide is defined as the act or an instance of taking one's own life voluntarily and intentionally especially by a person of years of discretion and of sound mind.

Premature deaths in custody are always tragic. There is responsibility on the part of custodial authorities and the public to review the cases and rates of death regularly among people in custody and look for ways to prevent deaths [1].

The individual case is enquired in detail with respect to cause of death and any Human right violation by various Governmental agencies but preventable measures are seldom studied and implemented.

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The present study was undertaken to assess the trends of suicide in custody and to identify characteristics that can be utilized to prevent such deaths.

Aims & objectives

1. To know the cause of death
2. To know the manner of death
3. To know whether the injuries which may not have caused death but suspected to be of torture in custody
4. To know whether there is consumption of intoxicating substance prior to death
5. To know whether custodial torture has lead to death/commission of suicide
6. In case of female inmates to rule out sexual torture/offence
7. To know the weapon of offence
8. Homosexuality

Material and methods

This retrospective study is based on postmortem examinations conducted at Shri Bhausaheb Hire Government Medical College and General Hospital, Dhule Maharashtra. In north Maharashtra region,

there are 4 districts viz. Dhule, Nandurbar, Jalgaon and Nashik. As per directions of the National Human Rights Commission, New Delhi and as per circular by govt. of Maharashtra it is necessary that postmortem examination in case of custody/prison deaths should be done at government medical college and hospital of the region by the forensic pathologist and video shooting of postmortem examination should be conducted.

We examined all available files of inquest papers, postmortem reports, toxicological analysis reports, histopathology reports and case papers of death of persons in custody from the period of 15 years from 01/01/2000 to 31/12/2014. A standard pro forma was designed to collect the information to ensure consistency for the whole sample. Information collected included age, sex, type of custody, place of death, presence of any associated disease, history of any psychiatric illness, substance abuse, injuries present,

weapon of offence, manner of death, sexual offence and cause of death.

Only deaths due to suicides were included in the study. Deaths during police action are excluded from this study. Postmortem examination was conducted by a panel of doctors and video shooting of postmortem examination was carried out. Viscera were preserved for chemical analysis and histopathological examination in all cases.

Observations

Table 1: Sex-wise distribution of cases

Sex	No. of cases (%)	%
Male	11	91.66
Female	01	08.33
Combined	12	100

Table 2: Age-wise distribution of cases

Age group (in yrs)	Male	Female	Total cases	%
20–30	06	00	06	50.00
31–40	04	01	05	41.66
41–50	01	00	01	08.33
51–60	00	00	00	00
61–70	00	00	00	00

Table 3: Showing the types of custody

Type of custody	Number of cases	%
Jail	04	33.33
Police lock-up	08	66.66

Table 4: Cause of death

Cause of death	Number of cases	%
Hanging	07	58.33
Head injury	04	33.33
Poisoning	01	08.33

Table 5: Ligature material used by deceased to commit suicide by hanging

Ligature material used	Number of cases %	
	Male	Female
Plastic strip used for packing the cartons	01	00
Jute rope	01	00
Own full sleeves shirt	02	00
Scarf	00	01
Bed sheet	01	00
Towel	01	00

Table 6: Report of chemical analysis in case of death due to cyanide poisoning

Sr. No.	Specimen	Quantity of potassium cyanide
1.	Stomach and loop of small intestine with their contents	6.50 milligrams per 100 grams
2.	Liver along with gall bladder, spleen and kidneys	2.60 milligrams per 100 grams
3.	Blood	0.91 milligrams per 100 grams

Table 7: Presence of associated illness

Presence of associated illness	Number of cases
Fatty liver	01
Anthrocosis	01
Pulmonary edema and pneumonitis	02

Table 8: Year-wise distribution of number of cases of suicidal deaths in police lockup/prison

Year	Number of cases of suicidal deaths in police lockup/prison
2000	00
2001	00
2002	00
2003	00
2004	00
2005	01
2006	03
2007	00
2008	01
2009	03
2010	01
2011	01
2012	01
2013	00
2014	01

Discussion

Our study was restricted to suicidal deaths in police lockup/prison of north Maharashtra region. There was male predominance (11 versus 1 death) in our study. Rarity of crimes by females may be in part explained the lack of female deaths [2]. In our study 50.00% of deaths occurred in the age group of 21–30 years and 41.66% of deaths occurred in age group of 31–40 years. Our findings are consistent with Bardale R et al [2, 3].

We studied 12 cases of suicide. The mean age of suicides is 31.25 years at death. Prisoners between ages 15 and 34 years are at the greater risk for suicide as compared to older inmates [4]. Of 12 cases of suicide 7 were due to hanging (58.33%), 4 were due to head injury (33.34%) and 1 was due to KCN poison (8.33%). Bardale et al, mentioned hanging is the most common method of suicide in prison inmates accounting for 42.85% of suicides [3].

Of the 7 cases of hanging, 6 were male and 1 was female. Out of those 7 cases, 4 cases of hanging occurred at police lockup whereas 3 cases occurred at prison. Items of clothing were the most commonly used objects for committing suicide by hanging (Table 5). Edirisinghe PAS [5] and Bansal et al [6] reported 1 case each of suicidal hanging. Bardale et al [3] reported 6 cases of suicidal hanging. Sonar V [7] reported 3 cases of suicidal hanging. Wobesser WL [1] et al reported 90 cases of suicidal hanging. Agnihotri AK et al [8] reported 17 cases of suicidal hanging.

Out of the 4 cases of suicidal head injury 3 oc-

curred in police lockup while 1 occurred in prison. There were various ways of committing suicide by head injury in our study like (i) forceful self-impact of the head with the wall, (ii) jumping on the road from police vehicle, while police were taking the arrested person to the court, (iii) jumping in the well of a farm land when police had taken the arrested person to the scene of crime to gather the evidence, (iv) ran away from police station lockup, climbed up the nearby building, and committed suicide by jumping on the ground from height. Bansal et al [6] has reported 3 cases of suicides due to fall. Bardale et al [3] reported 1 case of suicide due to jump from third floor resulting in intracranial hemorrhage.

In our study, we encountered an unusual case of suicide due to potassium cyanide poisoning by a male person who was in police custody [9]. Viscera were preserved for chemical analysis. The report of chemical analysis revealed presence of potassium cyanide details of which are mentioned in Table 6. Bardale et al [3] reported 5 cases of suicidal poisoning. Bansal et al [6] reported 2 cases of suicidal poisoning.

Whenever unnatural death in police lockup/prison occurs allegations of custodial torture are always leveled up against the authorities. In our study we specifically looked for injuries to palms soles of feet, genitals, over back, inside the natural orifices but we did not find any injury suggestive of custodial torture. So abetment of suicide due to physical torture in custody was ruled out. Similarly we did not find evidence of sexual torture/offence/homosexuality in our study.

Of the 12 cases of suicidal deaths which we studied, we had preserved viscera for histopathological examination and in 08 cases (66.66%) we did not find any abnormal pathology and in 4 cases (33.33%) we found various diseases like fatty liver, pulmonary edema & pneumonitis and anthracosis (Table 7).

Of the 12 cases of suicidal deaths which we studied, we had preserved viscera for chemical analysis and in 1 case (08.33%) report of chemical analysis revealed KCN poison in the viscera samples. In rest of the cases of suicidal deaths no poison/alcohol/drugs of addiction were detected on chemical analysis.

Photo 1: A case of suicidal hanging in toilet by 47 year old person who was in police lockup

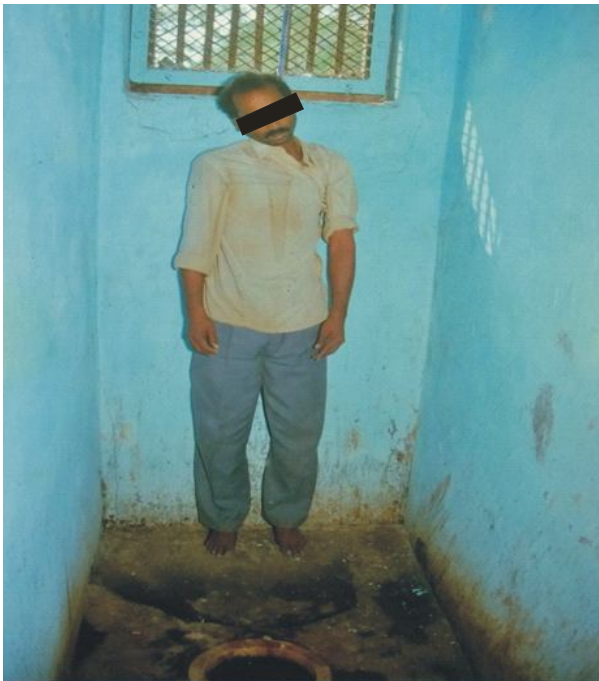


Photo 2: suicide by hanging by a 47 years old male- ligature material (towel) in-situ intact knot



Photo 3: ligature mark around the neck



Photo 4: 36 years old male who was in police custody committed suicide by jumping in the well when brought for inquiry at the scene of crime



Photo 5: 36 years old male who was in police custody committed suicide by jumping in the well, removal of the body in process

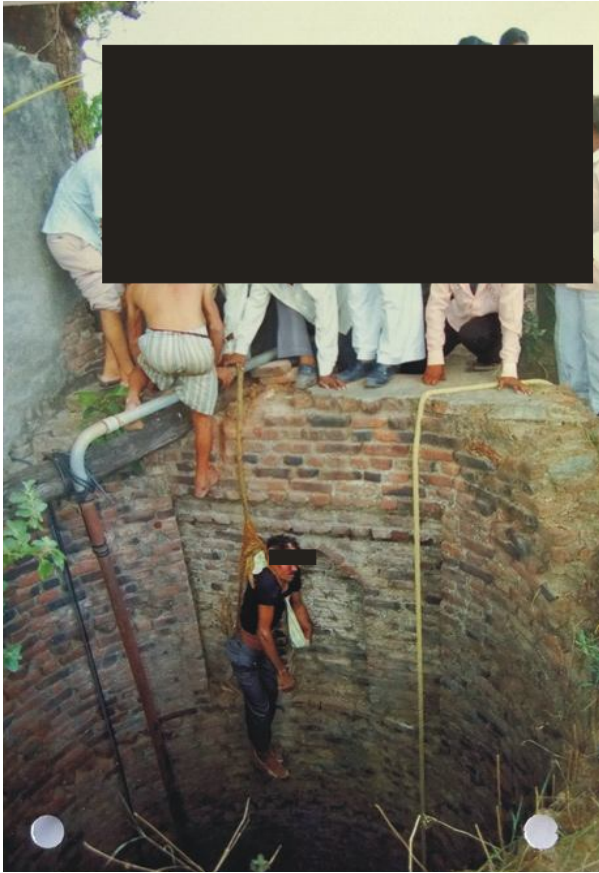
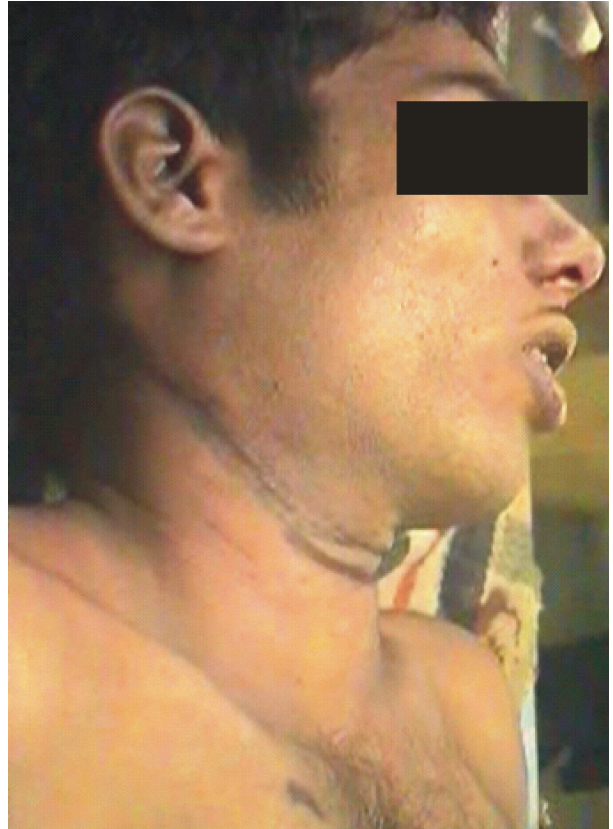


Photo 6: Showing head injury, a 36 years old male jumped in the well of a farm land when police had taken the arrested person to the scene of crime to gather the evidence



Photo 7: Showing ligature mark in a case of suicidal hanging by a 21 years old male person who was in police lockup



Conclusion and Suggestions

Incarceration may represent a loss of freedom, loss of family and social support, fear of unknown, fear of physical or sexual violence, uncertainty about the future, embarrassment and guilt over the offence and stress related to poor environmental conditions.

Intensity of intent may be an important indicator. Study employing the scales to measure the suicidal intents, reported intensity of intent to die as a major predictor of suicide completion in suicide attempter. Despite much research there is no possibility to reliably predict and prevent suicide in any individual. Many studies have identified risk factors associated to suicide completion, such as gender, previous attempts, suicidal ideation, a diagnosis of depressive disorder or schizophrenia but such predictors held to identify the person committing suicide [10].

Training should be imparted to police/jail officers and staff to prevent suicides in custody. Very few suicides are actually prevented by mental health, health care or other professional staff because suicides are usually attempted in inmate housing units and often during late evening hours or on weekends

when they are outside the purview of the program staff.

Formal screening for suicide risk of newly admitted inmates by psychiatrists and counselors should be conducted. To be effective suicide prevention must involve ongoing observation. All staff must be trained to be vigilant during the inmate's entire period of incarceration.

Most inmates commit suicide by using commonly used articles like bed sheets, handkerchiefs, *dupatta*, *saree* etc. A suicide safe environment would be a cell or dormitory that has eliminated or minimized hanging points and unsupervised access to lethal materials.

Installation of CCTV cameras at places without disturbing the inmates' privacy is need of the hour.

Inmates with mental disorders who present a serious suicide risk should be provided with adequate psychopharmacological treatment.

If suicide attempt occurs, correctional staff must be sufficiently trained to secure the area and provide first aid to inmate while they were waiting for external emergency health care staff to arrive [11].

Acknowledgement

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Married Men's Suicide: a Silent Epidemic in India

Nishat Ahmed Sheikh*, Vemula Murali Krishna**, Gunti Damodar***

Abstract

Suicide is the act of killing or harming oneself. Suicide is considered last option of coming out from problems. Suicidal behaviors include suicidal ideation / thoughts, plans, attempts and ultimately death through specific action. Suicidal ideation with a plan to attempt is usually less frequent than having thoughts or contemplation of suicide. Suicide in men has been described as a *silent epidemic* because of its high incidence and substantial contribution to men's mortality, and *silent* because of a lack of public awareness, a paucity of explanatory research, reluctance of men to seek help for suicide related concerns and gender biased laws in India. It is not a surprise that suicide among men is largely invisible. In this present study we aimed and tried to analyze on socio-demographic profile, to rule out causes of committing suicides and evaluate causes of suicide amongst the married men.

Keywords: Suicide; Married Men; Gender Biased Laws in India.

Introduction

Suicide is one of the leading causes of male mortality. Suicide in men has been described as a *silent epidemic*. It is a highly disturbing incidence and a major contributor to men's mortality [1]. The silence surrounding of suicide among men is also striking and warrants comment. Understanding male suicide requires a social lens.

According to World Health Organization around 10–20 million people commit suicide every year. There are wide variations between countries in terms of suicidal mortality with very low rates in some Latin American and Muslim countries, compared with high rates in Eastern Europe. Variations in the way suicide is recorded affect those comparisons, particu-

larly in countries where suicide goes against religious beliefs, but such variations do not fully explain differences between countries [2, 3, 4].

While the ratio of committing suicide between male to female varies among countries [5, 6], but globally more men die through suicide each year [7]. The female to male ratio of committing suicide in Western societies is minimum (1:2), with the highest ratio (1:6) is found in the United States [8]. Female suicide rates exceed male rates only in China [9]. The relationship between suicide and marital status was noted as long ago as 1881 by Morselli [10] and in 1897 Durkheim postulated that marriage reduced the risk of suicide by increasing the social integration of married people [11].

There appears to be an overall lack of public awareness regarding the high rates of suicide among men, especially relating to other more highly publicized threats to men's health, such as HIV/AIDS, that account for fewer premature deaths among males each year. Men's general reluctance to seek help for suicide related concerns [12], and the stigma associated with mental health problems in general; it is no surprise that suicide among men is largely invisible.

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Objectives

To study socio-demographic profile of study sub-

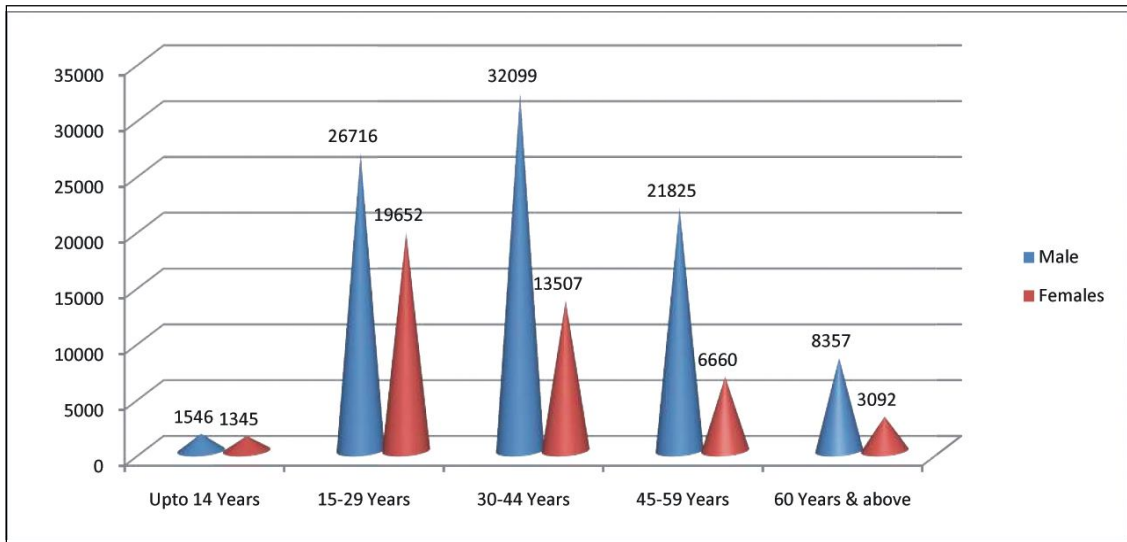
jects, to identify causes of committing suicides in the study subjects and to evaluate causes of suicide among married men.

Material and Method:

The present study was carried out by retrospective

evaluation of suicide data obtained from National Crime Records Bureau, accidental deaths and suicides in India 2013 Ministry of Home Affairs, Government of India New Delhi; 2013. All the cases of consummated suicides reported during the year 2009 to 2013 were selected for the study. The observation are tabulated, figured and discussed.

Fig. 1: Age & Sex Source: NCRB 2013 [22]

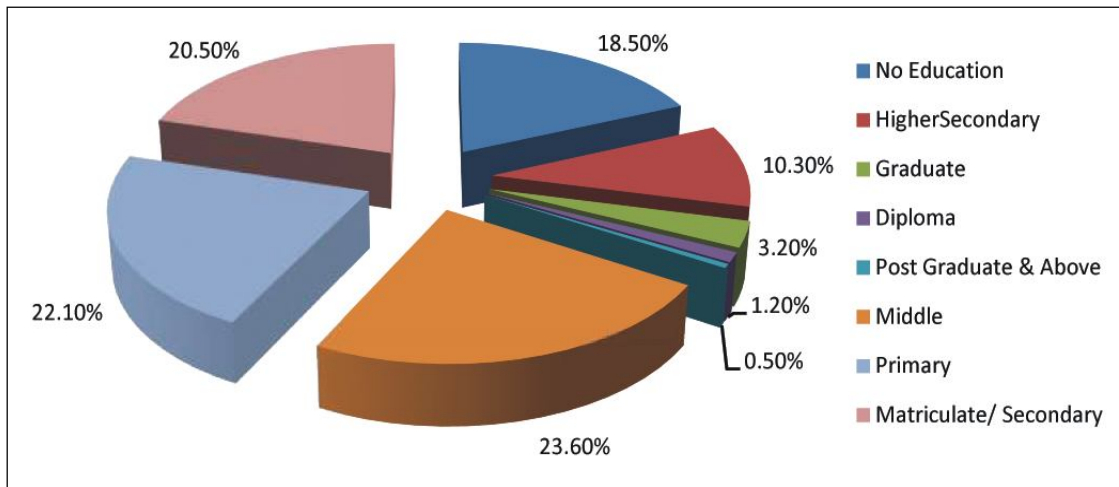


Observation and Discussion

Age group wise distribution of suicides by causes during 2013 is presented in fig.1. The overall male :

female ratio of suicide victims for the year 2013 was 67.2 : 32.8, showing a marginal increase of male and marginal decrease of female as compared to year 2012 (66.2 : 33.8). Youths (15–29 years) and lower middle-aged people (30–44 years) were the prime groups taking recourse to the path of suicides. Around 34.4%

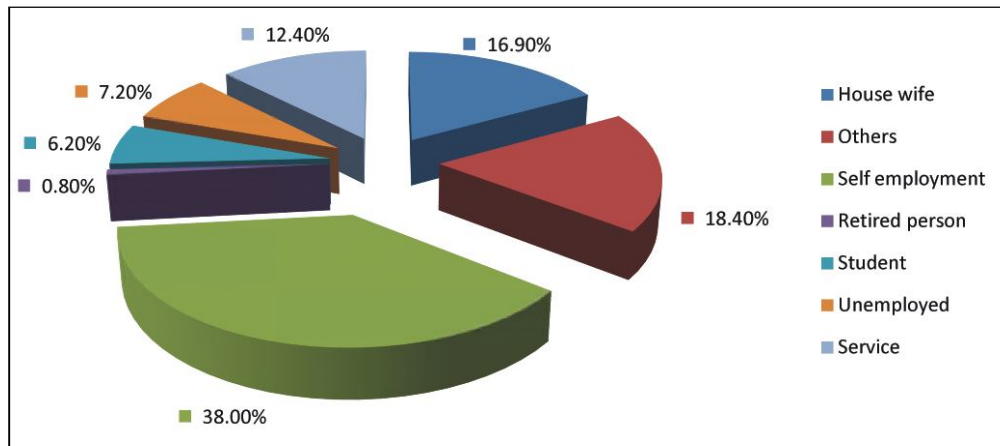
Fig. 2: Educational status Source: NCRB 2013 [22]



suicide victims were youths in the age group of 15–29 years and 33.8% were middle aged persons in the age group 30–44 years.

The maximum numbers of suicide victims were educated up to Primary level (22.1%). Middle level educated and illiterate persons accounted for 23.6%

Fig. 3: Percentage Distribution of Suicide Victims by Profession 2013. Source NCRB [22]

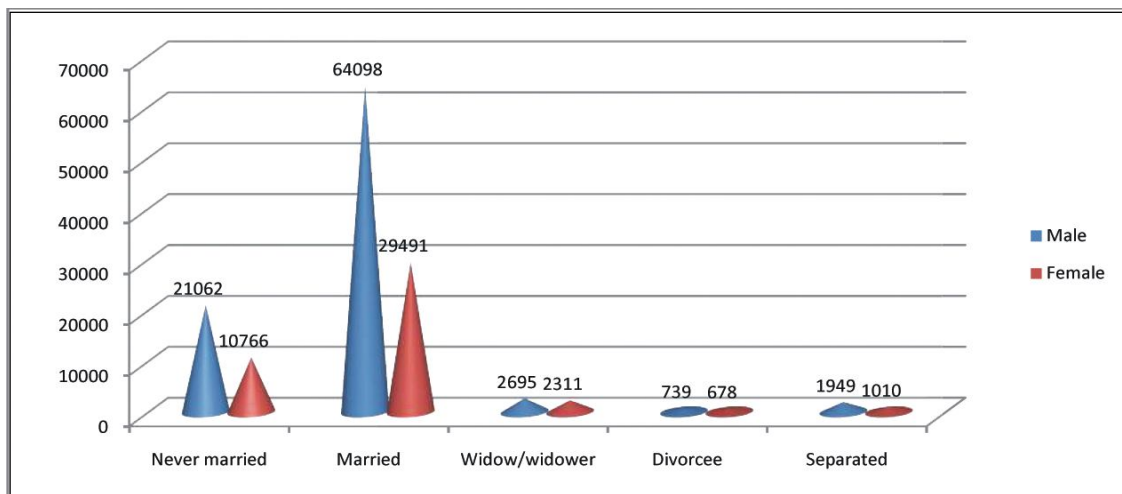


and 18.5% respectively. Only 3.3% suicide victims were graduates and only 0.5% victims were post-graduates.

There is a fairly strong association between unem-

ployment rates and suicide, but the nature of this association is complex. Unemployment may drive up the suicide risk through factors such as poverty, social deprivation, domestic difficulties, and hopelessness [12]. The effects of modernization, specifically in India, have

Fig 4: Marital Status NCRB 2013 [22]



led to sweeping changes in the socioeconomic, socio philosophical and cultural arenas of people's lives, which have greatly added to the stress in life, leading to substantially higher rates of suicide [13].

The information on the marital status of suicide victims has been presented in Fig.3. It was observed that 69.4% of the suicide victims were married while 23.6% were never married/spinster. Divorcees and separated have accounted for about 3.2% of the total suicide victims. The proportion of widowed and widower victims was around 3.7%.

Where male suicide in India has always been increasing in absolute value year by year, just after Cr. P. C. 41A amendment in 2010, suicide of married men reduced by 1.6% after 2010 (only in 1 year), thus di-

rectly correlates the reduction of suicide of married men to arrests under gender biased laws. 2011 onwards, the moment arrests u/s IPC 498A of Men increased by 7.5%, the Suicide of married Men increases by 3% and 4.6% cumulative. For every 100 women committing suicide in India, rate of committing suicide by men has increased from 178.4 to 204.6 (increased 14.7%) in 5 years time. For every 100 married women suicide in India, married men suicide increased from 186 to 217.3 (increased 17%) in 5 years time. A Married Men commits suicide in India in every 8.2 minutes while a man (including Married Men) commits suicide in every 5.8 minutes.

There are important differences between women and men in this association, with higher risks experi-

Table 1: Suicide 2009 to 2013 Source: NCRB [22]

DATA	2009	2010	2011	2012	2013
Men Suicide	81471	86065	87180	88453	90543
Year by Year Change		5.64%	1.30%	1.46%	2.36%
Married men Suicide	58192	62433	61453	63343	64098
Year by Year Change		7.29%	-1.57%	3.08%	1.19%
Women Suicide	45680	46910	47419	46992	44256
Year by Year Change		2.69%	1.09%	-0.90%	-5.82%
Married women Suicide	31300	32582	31754	31921	29491
Year on Year Change		4.10%	-2.54%	0.53%	-7.61%
1 Men suicide in (minutes)	6.45	6.11	6.03	5.94	5.8
1 Married Men suicide in (minutes)	9.03	8.42	8.55	8.3	8.2
1 women suicide in (minutes)	11.51	11.2	11.08	11.18	11.88
1 Married women suicide in (minutes)	16.79	16.13	16.55	16.47	17.82
Men to women Suicide Ratio	1.784	1.835	1.839	1.882	2.046
Married men to women Suicide Ratio	1.859	1.916	1.935	1.984	2.173

Table 2: Cause wise Suicides 2009 to 2013 Source: NCRB [22]

DATA	2009	2010	2011	2012	2013
Men Suicide	81471	86065	87180	88453	90543
Men Suicide coz of Family Problem	18441	20345	19828	19537	21096
Year by Year Change (Family Problems)		10.32%	-2.54%	-1.47%	7.98%
Men Suicide coz of Financial Problem	2308	1732	2390	1804	1420
Year by Year Change (Financial Problems)		-24.96%	37.99%	-24.52%	-21.29%
Women Suicide	45680	46910	47419	46992	44256
Women Suicide coz of Family Problem	11641	12564	12028	11255	11229
Year by Year Change (Family Problems)		7.93%	-4.27%	-6.43%	-0.23%
Women Suicide coz of Financial Problem	679	550	657	487	446
Year by Year Change (Financial Problems)		-19.00%	19.45%	-25.88%	-8.42%

enced by married men compared with married women [14]. Divorce is a significant risk factor for committing suicide by men, but not in the case of women [15]. Widowerhood is also a greater risk factor for committing suicide by men, especially the young and the very old widower [16, 17].

Family problem has been the biggest reason for Men and Married Men's committing suicide for many years. Whereas, suicide of men because of financial reasons have come down by almost 23% after Cr. P. C. 41 implementation, suicide due to family problems have increased by 6.5% this showing the clear violation of Cr. P. C. 41 with false arrests. Many of the factors used to explain suicide are similar for women and men (e.g. mental illness and employment status), arguments about these factors might be experienced dif-

ferently as a result of gender constructions and might operate in different ways in terms of their effects.

Constructions of gender mean that marriage, which offers emotional and social integration, is particularly important for men who have fewer alternative close relationships [18]. Men are more vulnerable to commit suicide following the break-up of a marriage or death of a spouse because they are less likely to be socially connected, while negative emotions such as pessimism, anxiety, uncertainty and sadness following a personal setback such as a relationship break-up have a more marked effect [19].

It is clear that suicide is the result of complex interactions of a number of precipitating factors, focused on the social determinants of suicide. An interview-

based study of men who had attempted suicide suggested that social stress, family breakdown, overwork, employment insecurity often combined with alcohol or drug abuse are understudied contributors to male suicide.

Men facing divorce may be particularly devastating because they are mainly the ones who lose their home, children and family, leading to feelings of resentment and anger while reducing their self-esteem. Being a parent also has an association with suicide risk but again this association is gendered. A number of studies have reported that having a young child protects women against suicide, but that the effect is less marked for men [20]. This may be because family roles within hegemonic masculinity focus on economic success and the status of a good breadwinner rather than caring responsibilities [21].

For women social constructions of femininity include family roles and a caring orientation and this may offer women benefits when they fulfill such stereotypes. Conversely, rates of suicide among women may increase if childlessness is viewed as a transgression of perceived gender roles or if pregnancy outside marriage is stigmatized [21].

For men, an important aspect of their gender role concerns their status as bread winners. Women's increasing participation in the labor market and the public sphere may have improved their mental health and reduced suicide risks, while threatening men's gender roles and increasing rates of suicide among men. The entry of women into the public sphere may be associated with a loss of control or self esteem, and feelings of anomie among men.

The whole issue in India is because men are subject to inhuman and unconstitutional gender biased laws of the Indian Penal Code wherein an uninvestigated complaint by a wife against her husband and his family can land the entire family in jail or the Domestic Violence Act, wherein the husband can even lose his hard earned property owing to a simple complaint of domestic violence, even without a fair trial. This law has been misused to harass men and their families rather than protect genuine female victims of harassment. The Supreme Court of India itself has labeled the misuse of Gender biased law as "legal terrorism" [23].

Conclusion

Focus is needed on developing and testing explanatory theories of male suicide, and using this evidence to tailor prevention and intervention pro-

gramming toward men. In order to respond to these differences we need public health policies that acknowledge the myriad of ways in which gender can influence health related behavior, including both positive and negative effects. Frameworks of analysis that include gender as a core component, rather than an incidental factor, will not be easy to construct, although there are a number of valuable recent contributions.

Strategy must involve a deconstruction of the power structures that give rise to inequalities between men and women. Doing so will benefit both women and men when it comes to reducing suicidal behaviors. The epidemic of male suicide has been silent, but it cannot remain so. Only by breaking the silence building public awareness, refining explanatory frameworks, implementing preventive strategies, and undertaking research will we overcome this epidemic.

No man wishes to end his life but he is left with little option when all he sees around himself are expectations from him and a complete reluctance to accept his limitations. Every nine minutes a married man commits suicide in India due to alleged misuse of gender biased laws against them. Indian government need on urgent basis to have men's welfare ministry and a national commission for men to study the problems faced by men and married men and provide solutions for them, a specific budget should be allotted for men's welfare, to form a study circle formed of people from different walks of life especially citizens, retired judges to study the problem of men, married men's and propose alternative solutions, provide shelter home to men trapped in domestic / partner violence and by making all marital laws civil and gender neutral in nature.

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Conflict of Interest

This study is an insight and eye-opener of scenario in India and there is no conflict of interest involved so ever.

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The articles do not violate any ethical, moral or legal guidelines pertaining to original scientific work.

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A Study of Pattern of Abdominal Injuries in Cases of Railway Traffic Accidents Brought To The Post Mortem Centre

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Abstract

Post mortem examination has important value in case of railway accidents when the thoracic injury are incorporated. There were so many statistical data present which had defined the thoracic injury but no statistical data is observed regarding the traumatic lesion of the vital organs in thoracic region in cases of Railway traffic accident deaths. This significant oversight can lead to find out the exact cause of death in cases of railway traffic accidents. It can help to improve the hospital emergency centre as far as concerned to abdominal injuries victims in case of Railway traffic Accidents. Observations made were compared with the previous studies. The study period extended from the 1st JUNE 2012 to 31st OCTOBER 2014. During this two (2) years period, a total number of 867 Autopsies were carried out in the department of Forensic Medicine, out of which, 74 cases of railway accident were selected for evaluation in the present study. Approval of local institutional ethical committee has been taken. It has been observed that abdominal fatalities are quite common and their correlation done with other authors.

Keywords: Indian Railways; Contusions; Lacerations; Thoracic Injuries; Fatalities.

Introduction

Railways being one of the most comfortable means of transportation have a long history and an unprecedented contribution to the human civilization. The basic design if the Railway consists of a locomotive or a self- propelled motor- unit drawing a train of cars over a track of two parallel rails placed together on a permanent stretch of road-way or railway. The flanged wheels rolling on iron or steel ribs, causes minimal friction thereby

allowing a smooth and comfortable journey with the added advantage of being cheap, safe and reliable means of transport for everyone [7].

With increasing advantage of the railway it has been observed that as the day progresses the railway also causes misadventures disadvantages in terms of injury with deaths of the passengers. In India as per the report from the Railway Year book 2011-12, in the year of 2011-12, there were 235 passengers were killed and 358 injured and about 585.89 Lakhs Rs compensation has paid by the railway. An autopsy surgeon usually encounters isolated cases where death results from some kind of railway track incident. While in most cases, an opinion regarding the nature of death can be provided by a close observation of the injury pattern alone, but in some cases, it becomes almost impossible to form an opinion about the nature of death. A correct opinion regarding the cause and nature of death becomes important in view of the increasing number of railway injuries and fatalities, which mount to a high number of compensation cases. The correct opinion helps the Railway to verify the cases liable for compensation and also helps in formulating ways for prevention of the same.

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Aims and Objectives

1. To study the causative factors.
2. To study external and internal injuries peculiar to railway fatalities.
3. To study cause and manner of death
4. To assess and evaluate the difference and pattern of thoracic injury on the basis of previous studies.

The present study was carried out in the post mortem center situated of a medical college situated at Central India. It is prospective study. The post mortem center conducts autopsies on following railway accident victims: 1. Cases brought dead by any of the nearby police station. 2. Cases of Railway accidents admitted to this hospital (Either directly or as a transfer from any other hospital) who succumb to the injuries. The study period extended from the 1st JUNE 2012 to 31st OCTOBER 2014. During this two (2) years period, a total number of 867 Autopsies were carried out in the department of Forensic Medicine, out of which, 74 cases of railway accident were selected for evaluation in the present study. Approval of local institutional ethical committee has been taken. Criteria for selection or exclusion of cases: 1. Victims of railway accidents that took place outside the train (Running or stationary), or on the railway track. Or on the railway platform and brought to the post-mortem center with history of railway accidents as per the police inquest. 2. Non- train accidents: Accidents to people on railway premises but not connected with the movement of railway vehicles, were excluded. 3. The natural deaths which occurred in train, railway track, railway platform, railway premises and brought by railway police were not included in the current study. It was observed that that liver was the most common injured organ 22.69%, spleen was next with 14.02%. Injury to kidney was observed in 7.75% cases.

Materials and Methods

Collection of data: Information that provided the primary data in each case was collected from different sources. They were as follows:

1. Examination of the inquest report and history from the relative if available.
2. In case of hospitalized victims, records of the treatment were perulstrate

3. Finding of the autopsy reports.

All data collected from different sources were recorded in specially designed proforma for each case for further collective evaluation.

The information was collected and studied mainly under the following headings.

- a. Brief history
- b. Causal factors
- c. Post mortem examination
- d. Cause of death History and causal factors.

A compendious picture about the back ground of the victims was elicited after taking history from investigating police and relatives of the victims. This included detailed particulars such as name, age, sex, address, religion, educational status, socio economic status, occupation, marital status. Similarly an idea about the circumstances of the event leading to death was made out by other epidemiological data such as place of incident, nature of incident leading to death, time of occurrence, weather conditions; and survival period, etc. very importantly Evidence of suicide notes along with body also noticed.

Post Mortem examination

The detailed post mortem examination carried out in each case comprised of an external and an internal examination.

- a. External examination included general condition of the body, including external orifices, injuries sustained, etc.
- b. Internal examination is carried out systematically by opening the three principles body cavities viz. the chest, abdomen and cranium and dissecting the contents by Letulle's method. The location and the extent of the injury were specially observed to note any pattern if any.

Result

Distribution of injuries to the abdominal organs is summarized in the following table.-

Discussion

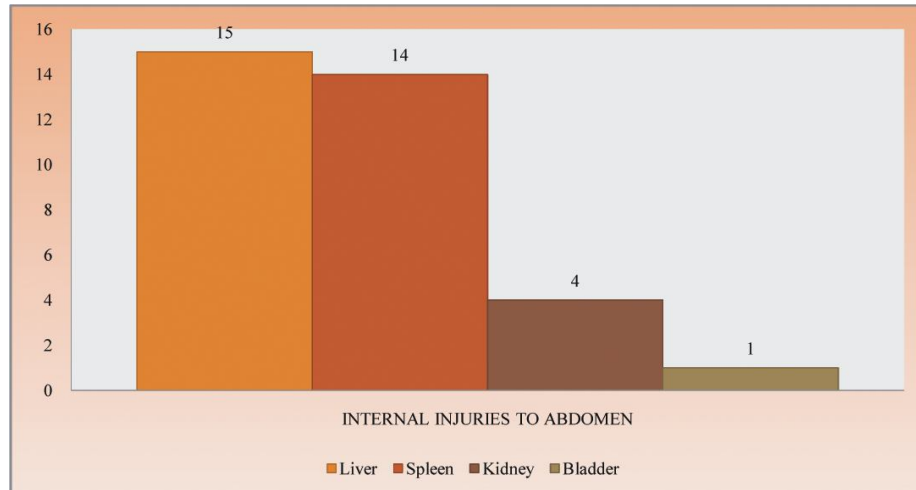
Injuries to the internal organs in the abdominal

Table 1:

Organ involved	No of cases	Percentage
Liver	15	20.27%
Spleen	14	18.91%
Kidney	4	5.40%
Bladder	1	1.35%

Liver was the most commonly injured organ seen in 15 (20.27%) cases. Spleen was next with 14 (18.91%) cases. Injury to kidney was observed in 4 (5.40%) cases. Bladder was involved in 1 (1.35%) cases.

Fig. 1: Distribution of internal injuries to abdomen.



Injuries to Abdomen observed either in combination or in isolation. The pattern of internal injuries to abdomen is summarized in following table-

Table 2:

Pattern of injuries to internal organs	No of cases	Percentage
Only Liver	6	8.10%
Only Spleen	2	2.70%
Only Kidney	0	0%
Only Bladder	0	0%
Liver+ Spleen	6	8.10%
Liver +Spleen+ Kidney	3	4.05%
Liver+Kidney	0	0%
Kidney+Bladder	0	0%
Spleen+ Kidney	2	2.70%
Spleen+Kidney+Bladder	1	1.35%
Total abdominal injuries	20	27.02%
No internal injuries to organs	54	72.97%

Injuries to the internal organs in the abdominal cavity were observed in 20 (27.02%) victims. Injuries to liver alone and combination of liver with spleen were observed in 6 (8.10%) victims respectively. Combination of liver +spleen + kidney was observed in 3 (4.05%) victims. Combination of spleen+ kidney and only spleen injury was observed in 2 (2.70%) cases each. Injuries to abdominal organs were not observed in 54 (72.97%) victims.

Fig. 1: Pattern of injuries to abdomen

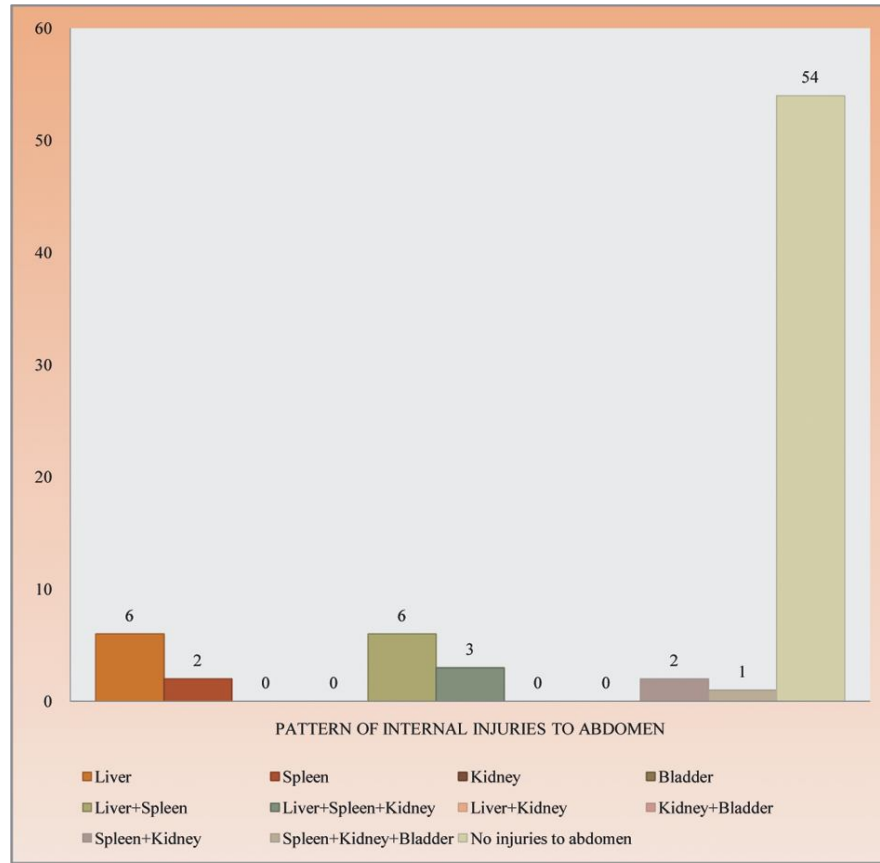


Photo 1: Risky Behaviour of peoples while travelling



Photo 2: Crush injury involving abdominal region



cavity were observed in 20 (27.02%) victim.

Liver was the most commonly injured organ in 20.27% cases. Spleen was next with 18.91% victims. Injury to kidney was observed in 4 (5.40%) victims. Bladder was involved in 1 (1.35%) victim.

In the study done by *Patil Ajay et al (2000)* [11] where injury to liver was present in 36% cases. The Study done by *Sabale PR and Mohite SC (2005-2008)*¹⁷, observed that liver was the most common injured organ 22.69%, spleen was next with 14.02%. Injury to kidney was observed in 7.75% cases. Both author's observation was similar to our study as far as injury to our liver is concern. It is clearly stated by *V. V. Pillay* in his text book that liver is an organ which is very vulnerable to injury [20].

As far as concern to combination of injuries to internal vital organs in our study it is observed that Injuries to liver alone and combination of liver with spleen were observed in 8.10% victims. Combination of liver, spleen with kidney was observed in 4.05% victims. Combination of spleen with kidney and only spleen trauma was observed in 2.70% cases each.

No other author described this type of observation except *Sabale PR and Mohite SC (2005-2008)* [17], their observation point out that injuries to liver alone was observed in 11.44% cases, followed by Combination of liver, spleen and kidney, observed in 4.24% cases.

Summary & Conclusion

- ❖ Liver was the most commonly injured abdominal organ followed by spleen.
- ❖ Out of 74 victims of railway accident deaths, 68(91.89%) were identified and in 6 (8.10%) cases the identity could not be establish.

- ❖ Liver was the most common injured organ 22.69%, spleen was next with 14.02%. Injury to kidney was observed in 7.75% cases.
- ❖ Highest number of cases showed injuries to the all over body.
- ❖ Laceration was the commonest type of injury.
- ❖ On external examination combination of abrasion, contusion and laceration was observed most commonly.

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Trends of Agriculture & Industrial Chemicals Poisoning Cases in Rural Hospital of Central India

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Abstract

In present times, due to an advancement of synthetic chemistry and the fast changing scenario have placed an ever increasing number of highly poisonous substances within the reach of common men. Thousands of man-made chemicals are currently in common use throughout the World, and one to two thousand new chemicals appear in the market each year. In industrialized countries, there are at least one million commercial products that are mixture of chemicals, and the formulations of up to one third of these may change every year [18]. With the advent of newer technologies in the field of agriculture and partly due to the effects of Green Revolution which took place in India in late 60's, there has been a rise in cases regarding poisoning due to agricultural & industrial chemicals. The increased use of fertilizers & agrochemicals chemicals have become one of the leading the cause of deaths in Modern India which is still an agrarian economy.

Keywords: Agricultural and Industrial Chemicals; Poisoning; Mortality; Developing Countries.

Introduction

India is one of the oldest civilization as Egyptian and Chinese civilizations. The secret of their survival is somewhat based in their agriculture [6]. India being an agrarian economy, around 70 % of the economy is based on one sort or another agricultural produce. As in late 60's there was Green revolution in India to increase the agricultural production. It involved a lot of fertilizers as well as a lot of insecticides. With due course of time it was found that, there has been a steep rise in poisoning cases due to use of Agricultural or industrial chemicals. Insecticide poisoning is commonly reported all-over India. Numbers of agrochemicals were identified by WHO

and they are banned in many countries. Indonesia banned 57 pesticides used for rice crops as they saved less crops and damage life of human beings [4].

The insecticides, pesticides and rodenticides registered for use in India under section 9 (3) of insecticide act 1968 are 143 in number. Crops are attacked by insects, pet, weeds, nematodes and rodents. To save crops insecticides and rodenticides are widely used. Drinking water from river Cauvery and Yamuna is reported to be contaminated by pesticides. Poverty, family dispute, marital conflicts, failure in love and depression are common reasons for suicide by poisoning.

The poison commonly encountered in India and other developing countries is pesticide. The reason behind this is agriculture based economics, poverty, and easy availability of highly toxic pesticides. Apart from these reasons, developed countries are producing toxic chemicals which are increasingly exported to developing countries where they are used extensively leading to health hazards.

Changing social values like unemployment, poverty, family disputes, marital conflicts, failure in love, and examination depression are common reasons for suicide by poisoning.

Among all pesticides, organophosphate is the largest bulk of poisoning in India. Since 1985 the problem of aluminium phosphide poisoning, a grain fu-

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migant is reported as the commonest cause in Northern parts of India viz. Haryana, Punjab and Rajasthan [21].

When the patient is brought to hospital for treatment of poisoning relatives are not ready to tell the reason behind the consumption of poison. Doctor has to diagnose and treat patient by his own knowledge symptomatically. Number of patients is not brought to hospital due to fear of police interrogation. They are treated in house by household remedies, and unfortunately they die.

Organophosphorus, organochlorus compounds and zinc phosphide are commonly used poisons to commit suicide. Zinc phosphide due to its odourless and tasteless character is commonly used for homicide.

Aims and Objectives

Present study entitled for the "Trends of agricultural & industrial chemicals poisoning cases in rural hospital of Central India" with following aims and objectives:

1. To study agricultural & industrial chemicals poisoning cases admitted in our Hospital and poisoning cases brought for post-mortem in mortuary of our Hospital in Department of Forensic Medicine and Toxicology, situated in rural part of Central India during the period from August 2012 to October, 2014.
2. To study the type of poisons consume and mode of poisoning.
3. To study incidence of poisoning in different age groups.
4. To study incidence of poisoning according to sex.

Material and Methods

After approval of local institutional ethical committee has been taken this study was done. Cases of poisoning were studied in 1038 cases of poisoning reported in our Hospital situated in rural area of Central India during the period from August 2012 to October 2014. 804 cases were admitted in hospital out of which 588 cases were admitted with history of consumption of poison and 216 cases were admitted with history of snake bite. Out of them 147 expired during treatment of which 135 were of poisoning and 12 with history of snake bite. History of incidence of poisoning was taken from patient or their relatives when-

ever possible. When patient was unconscious, history was taken from relatives. Analysis of gastric contents, blood, and urine was done in Toxicology laboratory of Forensic Medicine Department by T.L.C. (Thin Layer Chromatography) method.

Material and methods used were as follows:

- ❖ History and examination of living poisoning cases admitted in hospital.
- ❖ Post-mortem findings in cases of death due to poisoning.
- ❖ Analysis of gastric content, blood and urine in Toxicology laboratory in Department of Forensic Medicine & Toxicology and Regional Forensic Science Laboratory.

Post-mortem Cases

Total 381 post mortem cases of poisoning were studied for the period from August 2012 to October 2014, in the mortuary of Department of Forensic Medicine and Toxicology, in our Hospital.

Out of 381 cases 147 cases died in the hospital on which post-mortem were done. Total 234 cases were directly brought dead from spot or died while bringing to hospital.

Careful post-mortem examination was done in the mortuary of the Department of Forensic Medicine in our Hospital. Main features observed during post-mortem examination were for evidence of poisoning like:

- ❖ Cyanosis
- ❖ Frothing from mouth & nostrils and its nature
- ❖ Congestion of lungs, liver, spleen, kidneys and other organs
- ❖ Congestion of stomach mucosa and state and nature of stomach contents
- ❖ Conditions of pupils
- ❖ Conditions of heart
- ❖ Post-mortem lividity
- ❖ In case of snake bite fang marks and swelling around fang marks
- ❖ Smell if any
- ❖ Rigor mortis

Study of incidence, age, sex, occupation, education, and religion, and socioeconomic status, suicidal, homicidal or accidental, period of survival after consuming poison was done.

Samples of blood, urine and gastric contents of poisoning cases admitted in hospital and cases brought for post-mortem were analysed in Toxicology Laboratory in Department of Forensic Medicine, in our Hospital and sent to Regional Forensic Science Laboratory for chemical analysis.

Techniques used for preservation of samples for chemical analysis in Departmental Clinical Toxicology Laboratory

The common materials preserved for chemical analysis in cases of suspected poisoning, was stom-

ach wash, vomitus, blood and urine. The sample were collected in thoroughly cleaned glass bottles of 100ml capacity which were properly closed with rubber cock and labelled containing details as name, age, sex, poison suspected date and time of sample collected. Preservative used, treatment being given at the time of sample collection, name and signature with designation of treating physician, were properly noted.

Preservative used for material preservation

Type of material	Type of preservative used
Stomach wash fluid/vomitus	Saturated solution of common salt. (Sodium chloride)
Blood	Mixture of sodium fluoride and potassium oxalate
Urine	Thymol

A parted form required preservative each and every careful step was used to ensure that the samples

were send to Toxicology Laboratory without undue delay, for minimizing the time gap between sample collection, preservation and chemical analysis.

Agricultural and industrial chemical poisons and mortality

Types	Cases	Mortality	Survival
Allethrin	1	0	1
Alum	1	0	1
Aluminium phosphide	138	80	58
Arsenic	1	0	1
Barium carbonate	5	0	5
Carbon monoxide	2	0	2
Chlorine gas	1	0	1
Copper sulphate	26	2	24
Corrosives	19	4	15
Lead	2	1	1
Liquid Ammonia	1	1	0
Mercury chloride	4	1	3
Methyl alcohol	12	4	8
Methyl iso-cyanide	1	0	1
Nitrobenzene	2	0	2
Organophosphorus compound	19	1	18
Phenol	7	1	6
Potassium carbonate	1	0	1
Sulphur	1	0	1
Zinc phosphide	2	0	2
Total	246	95	151

Discussion

Poisoning was more in rural area than urban area. Common poisons in rural area were Insecticides than industrial poisoning.

Poisoning was more common in people having low socio-economic status, poisoning was rare in people having higher socio-economic status.

Poisoning was common in uneducated and poor people. Poisoning was rare among educated people.

Period of survival was 0-6 hours in most of the cases. Poisoning was suicidal in most of the cases followed by accidental while homicidal poisoning was rare.

Insecticides poisoning were more commonly reported and amongst them organophosphorus poisoning was more fatal. Majority of cases were from rural areas.

Allethrin poisoning was reported in 1 case which were from urban area and due to consumption of a packet of "kachhuwa chhaap agarbatti" by young males.

It was observed that, though the number of agricultural & industrial chemical poisoning was high, the mortality was very low as compared to other type of chemical poisons. Out of 102 cases reported to the hospital, only 9 died & 93 survived.

Summary & Conclusion

Prevention of Accidental poisoning

Preventive measures can be tried to control accidental insecticide poisoning as given below:

1. Pesticide will used only if it needs after all other simple means of pest controls like neem tree extract, dusting of ash, etc. are useless.
2. Before opening the bottle read label carefully, study all warning and follow directions given strictly.
3. Using protective clothing (gowns), masks, gloves, shoes while handling pesticides to prevent inhalation and skin absorption of poison.
4. Discard pesticides or its container or equipment used, by deeply burying under the earth.
5. Keep away remaining pesticides away from the reach of children and pets.
6. Clean spraying equipment by rinsing it with at least three changes of water.
7. Wash hands and other exposed area of the body

immediately after spraying pesticides and before eating and eatables.

8. Spraying in fields should not be done for more than two hours a day and not more than six days per week. The edible commodities particularly fruits and vegetables should not be made available to consumers by the producers at least within one week after spraying as they are loaded with substantial quantities of pesticides.
9. Persons suffering from lung, liver and kidney diseases should not be engaged in spraying pesticides.
10. No smoking, drinking or eating should be allowed during spraying.
11. Spraying should be done towards the current of wind.
12. Proper storage of pesticides to avoid contamination and leakage of these chemical to edible commodities.
13. Government should take necessary steps to prevent poisoning by educating people by various modes of propaganda and practical demonstration to use the pesticides.
14. Exporting firms and manufacturing countries should provide detailed information on the labels of these chemicals.
15. International organisations like WHO, FAO (Food and Agriculture Organization) should form a uniform code of practice towards strict control on imports and exports as well as distribution and use of hazardous pesticides and chemicals.

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Death is Due to Poisoning but Viscera Report is Negative

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Abstract

The conclusion of cause of death in a case where the death is due to poisoning but viscera report give negative result, pose a confusion to law and public. The intricacy of failure to find poison in viscera of the individual whose death is due to poisoning is a routine problem in India and the reasons of it are delay in examination of the viscera, improper preservation of the viscera, use of wrong analytical technique, early disintegration of poisons, complete metabolism of poisons in the body, the amount of poison in the viscera being negligible, lack of suitable chemical test for certain poisons, tempering of preserved viscera, and the biggest issue is only common poisons are screened, residual analysis of poisons, which are limited to common poisons available in the area. The other major poisons/chemicals like insulin, KCl, Adrenaline can't be detected. The salient points covering various aspects of viscera analysis in various Forensic Science Laboratories have been discussed with especial reference to the false positive or false negative results and interpretation of viscera report when it is negative in truly positive cases and vice-versa.

Keywords: Toxicology; Poisoning; Viscera; Autopsy; Collection; Preservation; Analysis; False negative Report.

Introduction

Poisoning is a significant contributor to mortality and morbidity throughout the world. More than three million poisoning cases have been reported out of which, 99% of fatal poisoning occur in developing countries, predominantly among farmers due to poisoning; including poisonous toxins from natural products are handled [1]. Suicidal self poisoning is the commonest form of poisoning in adults and accounts for at least 95% of all poisoning admission to hospital. In India majority of death due to fatal poisoning are of married males of 10–35 years of age belong to low socioeconomic status from a rural area

[2–4].

Incidences are common where no trace of poison was detected on chemical analysis of viscera, while from history and other circumstantial evidences it is almost certain or quite certain that poison was the cause of death. It may be due to many reasons, but commonly observed in hospitalized patients in which either the poison has been removed from the stomach and intestines, or detoxified, conjugated and eliminated by the kidneys and other channels or the quantity present is below the detection limits which makes its detection difficult or even impossible by the present methods of chemical analysis. In present study we tried to find out the causes of false negative in routine viscera analysis [5–9].

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Common terms used

Toxicology

It deals with properties, action, toxicity, fatal dose, detection, estimation or interpretation of the result of chemical analysis and management of Poisons.

Clinical Toxicology

It deals with human diseases caused by or

associated with abnormal exposure to chemical substances.

Acute toxicity

Acute toxicity is that property of a substance which causes adverse effect in an organism through exposure to the substance in a single short term dose.

Chronic toxicity

Chronic toxicity is that property of a substance which causes adverse effects in an organism through repeated or continuous exposure to the substance.

Oral toxicity

Oral toxicity is that property of a substance which causes adverse effects in an organism by the swallowing of that substance.

Dermal toxicity

Dermal toxicity is that property of a substance which causes adverse effect in an organism, if the substance is absorbed through the intact skin of the organism.

Inhalation toxicity

It is that property of a substance which causes adverse effects in an organism by the substance being absorbed during respiration of the organism.

Toxicity

Toxicity is that property of substance which causes any adverse effect to an organism.

Hazard

Hazard is the probability of an adverse effect to occur.

Lethal Dose (LD50)

It is measure of toxicity and represents that dose of a substance which when administered kills 50% of the test population of animal.

Subacute poisoning

It shows features of both acute and chronic poisoning.

Fulminant poisoning

It is produced by a massive dose. In this death occurs rapidly, sometimes without preceding symptoms.

What is poison? [7,15]

A Poison may be generally described as any substances which when administered or taken in small quantity is capable of producing deleterious symptoms on the body.

Or

A substance may be termed a poison that has cumulative effect if administered for a length of time so that ends fatally.

Or

A substance that is capable of causing the illness or death of a living organism when introduced or absorbed.

Or

A substance that can cause people or animals to die or to become very sick if it gets into their bodies especially by being swallowed.

Or

A substance that through its chemical action usually kills, injures, or impairs an organism.

Or

A substance with an inherent property that tends to destroy life or impair health.

Or

Poisons are substances that cause disturbances to organisms, usually by chemical reaction or other activity on the molecular scale, when a small quantity is absorbed by an organism.

Or

Any substance that can cause severe organ damage or death if ingested, breathed in, or absorbed through the skin.

Sources of poisons [7,8,14]

1. Domestic or household sources

In domestic environment poisoning may more commonly occur from detergents, disinfectants, cleaning agents, antiseptics, insecticides, rodenticides etc.

2. Agricultural and horticultural sources

Different insecticides, pesticides, fungicides and weed killers.

3. Industrial sources

In factories, where poisons are manufactured or poisons are produced as by products.

4. Commercial sources

From store-houses, distribution centers and selling shops.

5 Uses as drugs and medicines

Due to wrong medication, overmedication and abuse of drugs.

6. Food and drink

Contamination in way of use of preservatives of food grains or other food material, additives like coloring and odouring agents or other ways of accidental contamination of food and drink.

7. Miscellaneous sources

Snake bite poisoning, city smoke, sewer gas poisoning etc.

8. Animal poisons

Snake, scorpion and insect bite etc.

Restricted list of common poisons [9]

Poisons may be classified in many ways. However, As per Forensic sera laboratory in India, list of common poisons include the following¹⁰⁻¹⁴.

1. Gaseous poisons: Carbon monoxide, phosphine, cyanide etc.
2. Volatile poisons: Ethanol, methanol, ethylene dibromide, chloral hydrate, ethylene glycol etc.
3. Non-volatile poisons: Drugs such as Barbiturates, Benzodiazepines, Phenothiazines salicylates, Amitryptaline, Opiates and Narcotics, Amphetamines etc.
4. Metallic poisons: Lead, mercury, arsenic, antimony etc.
5. Pesticides: Organochloro, Organophosphorus,

Carbamates & pyrethroids etc.

6. Anions: Bromides, chlorates, fluorides, nitrates etc.

7. Miscellaneous: Kaner, Dhatura, fertilizers, etc.

What is viscera test?

The analytical toxicology compels the determination of the poisonous substances found in the body and its excreta. Methods vary to enable the toxicologist to choose the procedure that best fit to the particular laboratory facilities, personal preferences and the conditions of that moment.

Concepts of viscera test

Forensic toxicology concern analytical checking of statements made by witnesses during the course of police inquiry. So it needs a high degree of perfection right from the collection and preservation of the test samples to the analysis, result and interpretation with due consideration to the artifacts which may develop during this course due to one or the other reasons like improper collection, preservation, handling, decomposition and interpretation of results.

Collection, preservation and forwarding biological materials for toxicological analysis [7-9, 14]

1. The quantity of viscera/body fluids to be preserved in all cases of death due to poisoning or suspected poisoning
 - a. Stomach: Whole with its full content
 - b. Liver: Half or 500 gms
 - c. Small intestine: 30 cms
 - d. Kidney: One half of each Kidney
2. In all cases of suspected poisoning including carbolic acid, saturated solution of common salt should be used as preservative for viscera.
3. Blood is preserved in all cases and quantity of blood should be about 100 ml.
4. Blood is preserved in Sodium fluoride, oxalate, EDTA, mercury chloride, gold chloride citrate etc.
5. Some recommend preservation of spleen as a

- routine measure. But, when other organs are preserved, preservation of spleen does not add much to the advantage.
6. In cases where poisoning by acids is suspected (except carbolic acid), rectified spirit should be used as preservative. Denatured alcohol or formalin should not be used while preserving the samples for toxicological analysis.
 7. For determining the alcohol levels in living persons suspected to have consumed alcohol, 5 ml of blood using sodium fluoride as preservative, and minimum of 10 ml of urine without preservative should be collected and forwarded.
 8. In case of road accidents and where the death is suspected due to influence of alcohol 5 ml of blood should be collected and similarly in case of alcohol poisoning or drunkenness cases 5 ml blood and 10 ml urine samples should be collected and preserved properly.
 9. In case of burn victims to determine the levels of carbon monoxide, 10 ml of blood sample preserved by putting a liquid paraffin layer above it should be collected in a glass bottle and forwarded for analysis.
 10. Urine should be preserved, if urine is available in the bladder. While collecting urine it should not get contaminated with blood. Urine can be syringed out or spooned out after dissecting the anterior wall of the bladder. Quantity collected 100 ml or whole amount in the bladder.
 11. No useful purpose will be served by chemical analysis of viscera in case of electric shock victims and persons known to have died due to diseases like TB, cancer, hepatitis, AIDS etc.
 12. It will be of no consequence if chemical analysis of viscera is carried out in case of natural deaths due to starvation, sunstroke, old age, lightning, extreme cold etc.
 13. In case of drowning where death is due to drowning, no additional purpose will be served by chemical examinations.
 14. Testing for diatoms in visceral organs, spleen and bone marrow may be most useful in cases of drowning. In such case control sample of the water in which body was recovered should be collected.
 15. In case of snake bite or other insect bites, samples of skin bites of affected area should only be collected.
 16. In cases of deaths due to administering injections, the sites of injections, subcutaneous tissues of skin (along with the needle tract) weighing about 100 gms should be collected.
 17. In case of inhalation of gaseous inhaled poisons like carbon monoxide, coal gas, hydrocyanic acid, chloroform or other anesthetic drugs, the lung tissues, brain and blood from the cavity of the heart should be preserved.
 18. Shaft of long bones, a tuft of head hair, finger and torn nails and some muscles should be preserved in case of chronic poisoning by heavy metals like mercury, arsenic, lead etc.
 19. In cases of prolonged use of drugs like barbiturates, samples like hair, nails are to be collected for chemical analysis.
 20. A piece of heart, portion of brain and spinal cord should be preserved if poisoning is by nuxvomica or strychnine.
 21. Brain and urine should be preserved in suspected cases of poisoning by barbiturates, opium or anesthetics.
 22. In highly putrefied bodies, larvae, maggots, pupa and the other entomological samples should be preserved and forwarded.
 23. In cases of embalmed bodies vitreous humour from eye balls usually remains uncontaminated by the process and may serve the purpose of analyzing urea, creatinine and ethyl alcohol, hence such samples should be collected and forwarded.
 24. Fatty tissue should be taken from abdominal walls in case of pesticide poisoning.
 25. Soil samples from above, beneath and sides of the dead body and control soil samples away from the dead body should be taken in cases of exhumed or skeletalised dead bodies.
 26. Parts of both lungs should be preserved in all cases of poisoning with volatile poisons or poisons partly excreted with the expired air.
 27. Whole of the heart is preserved in cardiotoxic poisoning.
 28. Whole of the brain is preserved in suspected cerebral poisoning.
 29. In suspected heavy metals like lead poisoning cases, blood is preserved.
 30. Hair should be preserved in case of poisoning with arsenic or copper.
 31. Hair and Nails should be preserved in case of poisoning with arsenic.

32. Uterus and vagina are preserved if abortifacient drug was used, locally or systematically, when the drug has direct action on the uterus.
33. Skin scrap from an area stained with a suspected poison.
34. Suspected stained area of the dress, suspected packet of poison, strips of tablet recovered from the pocket of the dress of deceased.

Analysis report and its meaning [9-12]

Chemical analysis reports are usually expressed in different ways by different laboratories which are discussed below:

1. Article does not contain any chemical poison

It indicates that the viscera have been examined for all the common poisons and none found positive.

2. No chemical poison could be detected

It means, if the case history is given as suspected poisoning and during analysis no positive result is found.

3. Sample is not fit for analysis

Sometimes sample received for analysis are in the putrefied decomposed and dried form. Moreover, quantity of viscera sent for analysis is very less to carry out all the possible analysis. In such condition it is reported like this.

Different causes of false negative viscera report [7, 15-21]

In some cases, the history, circumstance and the postmortem findings may clearly suggest that poisoning is the most likely cause of death but the toxicology report may be still negative which is called false negative report. The possible explanations of false negative reports are:

1. In the case where the victim/deceased was admitted to the hospital for a considerable time, the possibility of detecting poison in the viscera gets lesser. In such conditions often viscera report may be negative. In real poisoning cases and some other substances other than the poison may come positive which was taken in the hospital for therapeutic

reason like promethazine etc. The medication itself may alter the poisonous substance and make its detection difficult or even impossible. Hence, it is Important to know about the treatment records. Ask for treatment notes, PM notes since the patient is hospitalized.

2. In postmortem decomposition, many poisons present in the tissue undergo chemical changes which cannot be detected. Putrefaction of normal tissue may produce substances, which may give chemical reaction similar to those obtained from toxic compounds. Most volatile compounds are lost due to putrefaction.
3. The whole poison may disappear from the lungs, in case of volatile poison by evaporation or oxidation due to faulty preservation like dried up blood sample, organic solvent poison gets evaporated during extraction and concentration. Due to lack of preservatives the blood clots. We cannot determine volatile poisons like alcohol, acetone, aldehydes, etc. For gas poisoning the blood should be adding paraffin oil layer over blood sample.
4. The poison might have been vomited out, excreted, neutralized, metabolized, detoxified to such a quality that it cannot be detected by general chemical analysis. The poison after absorption may be detoxified and eliminated. Vomit of persons should be sent also stomach as per it should be collected by I.O. from the scene of crime even if it is dried. Before giving the treatment the M.O. should collect the stomach aspirate of the patient admitted due to poisoning.
5. It is well known that usual routine toxicological screening procedures may not detect hemoglobin like carboxyhaemoglobin, sulphamethemoglobin and methemoglobin, diuretics, solvents, radioactive compounds, antibiotics, non-steroid anti-inflammatory substances except aspirin and paracetamol, calcium channel blockers, beta blockers etc.
6. Some drugs are rapidly metabolized and there may be complete metabolism of the poison in the body. Drugs like haloperidol and oxycodone are rapidly metabolized and only metabolite can be detected. Early disintegration of poison like narcotism, the substances are rapidly metabolized and create difficulty in analysis. Some drugs have short half life and are rapidly metabolized. In delayed death cases poison may be excreted or detoxified completely.
7. Biological toxins and snake venom are protein and cannot be separated from the body tissues.

- Immunoassay method may detect these poisons but this facility is not easily available in all Forensic science laboratories.
8. Some insecticides, fungicides which are highly soluble in water and they are not extracted in diethyl ether common solvent for extraction of poison in toxicological work.
 9. Some organic poisons decompose due to improper preservation. Drugs which have been found to decompose during the storage at 40°C are clonazepam, cocaine, isoniazid, methadone, morphine and nitrazepam. Cocaine gets hydrolyzed in alkaline medium. Alkaloids and phenothiazines like L.S.D and psilocybin are photo labile. Catecholamines are easily oxidized if container is not airtight.
 10. Some drugs are in very small amount and need considerable amount of viscera and sensitive analysis procedures. For example, Amphetamines may be undetected in the blood owing to the very low concentration present, even after fatal dose. Many potent drugs like clonidine, ergot alkaloids, dioxin, digoxin, THC pose such problems.
 11. Diacetylmorphine (Heroin) is rarely detected as it gets rapidly hydrolyzed to monoacetyl morphine which is present in urine in small concentration.
 12. Anaesthetics are mostly esters and get hydrolyzed at room temperature. Many highly volatile substances like aromatic and halogenated hydrocarbons, solvents, anesthetic agents, and noxious gases as H₂S, CO, NO₂ behave in this manner.
 13. Some substances like fentanyl may have structural dissimilarity from their drug class prototype and give negative results for that particular group.
 14. Tampering of viscera during preservation and in preserved bottles with vested interests or wrong motive. Addition of strong chemicals like soap, bleach powder or glutaraldehyde alters the results in immunoassay. Sometimes the paper label of the bottle after few years is torned/falls in storage room and a wrong level is put on viscera bottles by store in-charge/ M.O.
 15. Poor laboratory quality assurance, defective analysis, as many laboratories are not upgraded with modern facilities.
 16. As a protocol, substances detected may not be reported as these are naturally occurring substances or constituents of the human body like phosphates.
 17. It has been observed by many researchers in routine practice that too polar like iron, lead and ethyl glycol, volatile like solvents, aromatic or halogenated hydrocarbons gases, non- volatile like plant or fungal alkaloids, low concentration like very potent drugs and substances, toxic anions like thiocyanate, cyanide, fluoride and nitrites and new substances like busiprone are not detected by conventional toxicological screening.
 18. In burn cases if the blood is completely charred and dried, in the cases of alcohol intoxication if the sample is not preserved properly in sodium fluoride and potassium oxalate and analyzed after some time gap. It is decomposed and results are never dependable in such cases. Blood sample should be kept in refrigerator till the time of analysis. All biological specimens received in the laboratory are stored in cold room till taken for their analysis.
 19. It is well known that usual routine toxicological the screening procedures in FSL's include limited poisons called as common poisons such as volatile poisons, non volatile poisons, pesticides (most commonly used in that region by farmers for crop protection), metallic poisons, cyanides, alcohol etc. may not be detect other than common poisons.
 20. Forensic science laboratory doing only residual analysis of chemical compounds, not metabolites. For complete screening metabolic study is also important. For that advanced technique like GC-MS should be used as in USA.
 21. Sending insufficient biological material by M.O. such as tissue, blood, urine etc. may also affect the result.
 22. Some vegetable alkaloids cannot be detected by chemical analysis. As they are highly water soluble and cannot be extracted in ether or other organic solvents.
 23. Use of wrong analytical techniques/methods.
 24. Non availability of sophisticated instrument like GC-MS, GC-MS/MS, LC-MS, LC- MS/MS.
 25. Lack of expertise, qualified and experienced toxicologists / scientists / experts / purity of chemicals and availability of poor control insecticide / drugs / alkaloids / planed poisons / animal toxins. A negative screen does not necessarily mean that a toxin is not present. It says only that none on the list of those that were screened has been found.

Different causes of false positive viscera reports

1. When the viscera is not properly preserved and sent for analysis after a lapse of time there is every possibility of postmortem production of ethyl alcohol, cyanide, carbon monoxide, ketones, sulfides etc, which can give false positive result.
2. If viscera is preserved in formalin or denatured spirit, it may give false positive test for methanol and ethanol poisoning.
3. False positive results in immunoassays are mainly due to cross reactivity and structural similarity.
4. False positive reaction for opiate group can be seen on consumption of poppy seeds, chlorpromazine, dexamethorphan and diphenylxylate tablets.
5. There may be false positive reaction for amphetamine due to cross reactivity on account of consumption of ephedrine nasal drops, pseudoephedrine in cough syrups, chloroquine and procainamide.
6. Phencyclidine is falsely represented by dextromethorphan, diphenhydramine, doxylamine and thioridazone.
7. Faulty instruments and lack of their standardization may lead to false positive or false negative results.
8. Faulty figures of substances in reporting due to human error on viscera examination from laboratories. It is suggested that chemical examination report should not be taken as a gospel truth in each and every case.
9. Tampering of viscera during preservation and in preserved bottles with vested interests or wrong motive.

Conclusion

The salient points covering various aspects of viscera analysis have been discussed with special reference to the false negative result. Finally more research needs to provide better understanding in analysis of viscera due to poisoning. It is also necessary to know how we can reduce the incidences of false negative chemical report. The policy maker should take the help of Forensic experts for better results and possible substitution of methods.

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