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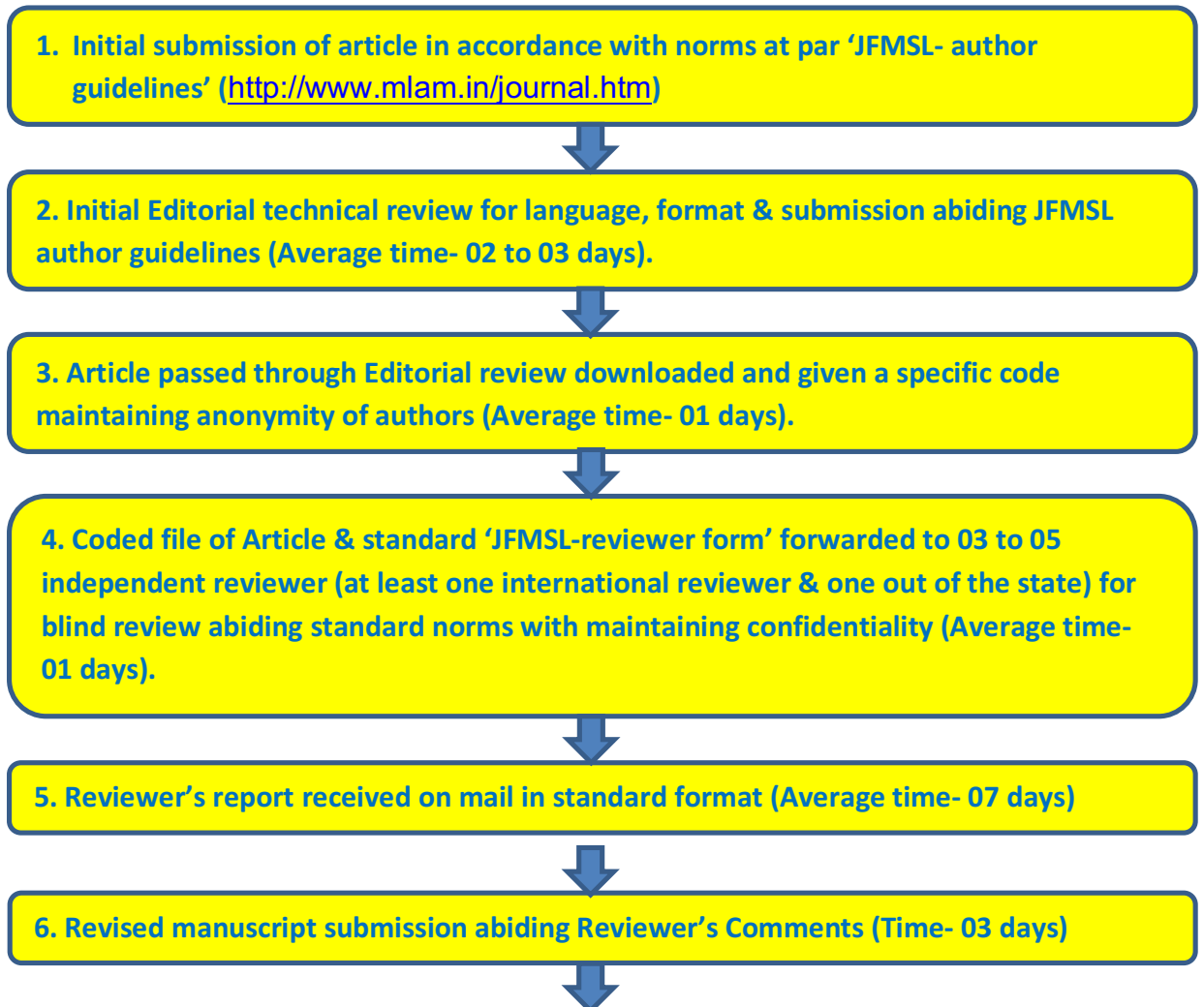
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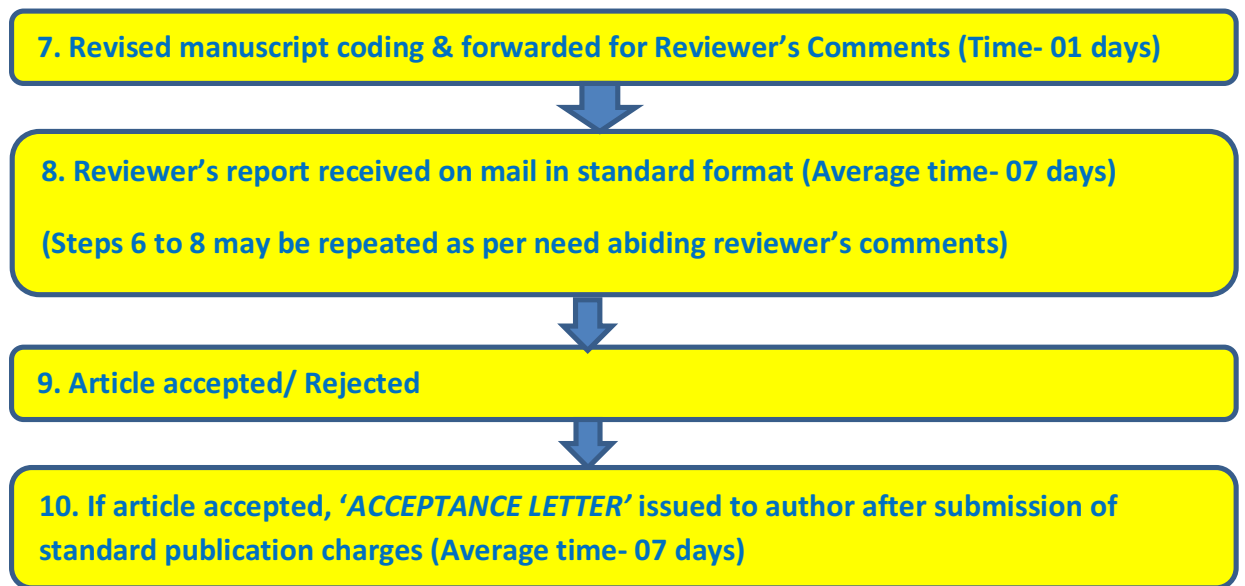
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a. **Journals:** Jain R, Awasthi A, Basappa A. Hematological profile of leukemias, Int J of Hemat 2006; 10:104-106. Kurien D, Khandekar LL, Dash S et al. Cytodiagnosis of hydatid disease presenting with Horner's Syndrome A case report. Acta Cytol 2001; 45: 74-78.

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c. **Conferences Proceedings:** Vivian VL, Editor. Child abuse and neglect; A medical community response. Proceedings of the First AMA National Conference on child Abuse and Neglect 1984; Mar 30-31; Chicago: American Medical Association, 1985.

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Editorial

Competency based Medical Education Curriculum for Undergraduates- Forensic Medicine Perspectives

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A new competency based medical education curriculum is being implemented in all medical colleges in India since August 2019 for first year undergraduates' batch. It is an outcome driven medical curriculum conforming global trends aiming to make medical education more outcome-oriented, learner-centric, patient-centric, gender-sensitive and environment appropriate. It aims to create competent, trained healthcare professionals to address the healthcare need of country with changing health needs of society. The competent medical graduate should able to fulfill the societal obligation recognizing the national goal of 'Health for All' and should able to provide preventive, promotive, curative, palliative and holistic care to the needy.¹

It provides competency-based teaching framework for the effective outcome-based strategy involving various domains of teaching including teaching learning methods, assessment based on competencies. The Indian Medical graduate should able to communicate with patients and their relatives adequately, effectively, respectfully, empathetically, sensitively, valuing the rights of patients including confidentiality, privacy, safety, security and should able to build a positive, understanding, humane, ethical, empathetic, and trustworthy relationship with the patients and their families.¹

The new curriculum encourages the integrated teaching in various traditional subjects with special emphasis on problem based learning using clinical or community cases for in depth understanding and resolving the problem.

The course is extended over four and half years with one year of internship. The detailed course & examination schedule is given in **table no. 1.**²

Table no. 1: MBBS course & Examinations schedule²

Phase	Calendar Year (Yr)	Month	Time period (month/s)
Foundation Course	1	August (Yr1)	1
I MBBS	1-2	September (Yr1) to August (Yr2)	12
Exam- I MBBS	2	September (Yr2)	1
II MBBS	2-3	October (Yr2) to August (Yr3)	11
Exam- II MBBS	3	September (Yr3)	1
III MBBS- (Part I)	3-4	October (Yr3) to September (Yr4)	12
Exam- III MBBS (Part I)	4	October (Yr4)	1
Elective & Skills	4	November (Yr4) & December (Yr4)	2
III MBBS- Part II	5	January (Yr5) to December (Yr5)	12
Exam- III MBBS (Part I)	6	January (Yr6)	1
Internship	6-7	March (Yr6) to February (Yr7)	12

Broad competencies for the Indian Medical Graduates is given in section 1 of the volume 1 document.¹ The sub-competencies for each subject organized in tables are given in section 2 with two different parts containing 'core subject outcome' in first part and outcome/competencies which needs alignment with other subjects placed in second part under title 'integration'. Outcomes (competencies) for the given subjects are grouped in topic with number. The expected level of achievement by learner for each subject is identified as – [knows (K), knows how (KH),

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Table no. 2: Topic-wise outcomes in Forensic Medicine & Toxicology (FMT).

S. No.	Topic Name	Number of competencies	Suggested Teaching Learning method	Suggested assessment method	Vertical Integration (Subject-number of outcomes)
1	General Information	11	Lecture, Small Group Discussion	Written/ Viva voce	
2	Forensic Pathology	35	Lecture, Small Group Discussion, Autopsy, DOAP session, Moot Court, Court visits, Role Play	Written/ Viva voce, OSPE	Human Anatomy- 1, AETCOM-4, Pathology -7, Community Medicine-1, General Medicine-1, Pediatrics-2, General Surgery-2, Anesthesiology-1, Psychiatry-1
3	Clinical Forensic Medicine	33	Lecture, Small group discussion, Bedside clinic, DOAP session	Written/Viva voce/ skill assessment, OSCE, OSPE	Human Anatomy- 1, AETCOM-3, Pathology-1, General Medicine-1, Pediatrics-1, General Surgery-9, Orthopedics-6, Obstetrics & Gynaecology- 16.
4	Medical Jurisprudence (Medical Law and ethics)	30	Lecture, Small group discussion	Written/ Viva voce	AETCOM-30, Pharmacology-7
5	Forensic Psychiatry	6	Lecture, Small group discussion	Written/ Viva voce	General Medicine-1, Psychiatry-6
6	Forensic Laboratory Investigation in Medical Legal Practice	3	Lecture, Small group discussion, DOAP session	Written/ Viva voce, OSPE	Pathology-1
7	Emerging technologies in Forensic Medicine	1	Lecture, Small group discussion	Written/ Viva voce	-
8	Toxicology: General Toxicology	10	Lecture, Small group discussion, Bedside clinic, DOAP session	Written/Viva voce, OSCE/ OSPE	Pharmacology-8, General Medicine-2
9	Toxicology: Chemical Toxicology	6	Lecture, Small group discussion, Bedside clinic, autopsy, DOAP session	Written/Viva voce/ OSCE	Pharmacology-6, General Medicine-6
10	Toxicology: Pharmaceutical Toxicology	1	Lecture, Small group discussion, Bedside clinic, autopsy, DOAP session	Written/Viva voce/ OSCE	Pharmacology-1, General Medicine-1
11	Toxicology: Biotoxicology	1	Lecture, Small group discussion	Written/Viva voce	General Medicine-1
12	Toxicology: Sociomedical Toxicology	1	Lecture, Small group discussion	Written/Viva voce	General Medicine-1
13	Toxicology: Environmental Toxicology	2	Lecture, Small group discussion	Written/Viva voce	General Medicine-1
14	Skills in Forensic Medicine & Toxicology	22	Bedside clinic (ward/casualty), Small group discussion	Log book/ Skill station/ Skill lab/ Viva voce / OSCE/ OSPE	Physiology-2, Pathology-2, General Medicine-2,
Integration under other subjects & number of competencies: Human Anatomy-1, Pharmacology-1, Radiodiagnosis-1, Psychiatry-1, General Medicine-11, General Surgery-3, Obstetrics & Gynaecology- 5.					
OSCE- Objective Structured Clinical Examination; OSPE- Objective Structured Practical Examination; DOAP session – Demonstrate, Observe, Assess, Perform; AETCOM- Attitude, Ethics, Communication.					

shows how (SH), perform (P)]. The outcome is a core (Y - must achieve) or a non-core (N - desirable) outcome. There are total 167 topics in Pre-clinical and Para-clinical subjects (7 subjects viz. Human Anatomy, Physiology, Biochemistry, Pharmacology, Pathology, Microbiology, Forensic Medicine & Toxicology) divided over 1118 outcomes. There are total 14 topics in Forensic Medicine & Toxicology divided in 162 outcomes. The detailed topic-wise distribution is given in **table no. 2**.

Major changes are being done for Forensic Medicine & Toxicology teaching-learning and

assessment pattern. The teaching-learning period is spread over phase II & phase III- part I. The final assessment will be taken at the end of III MBBS-part I with the subjects viz. Community Medicine, Ophthalmology & Oto-rhino-laryngology.²

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Original Research Article

Autopsy Study of Death In Pregnancy: Ten Years Retrospective Study

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Article Info

Key words

Maternal Death,
Pregnancy related
Death (PRD),
Pregnancy Unrelated
Death (PUD),
Death Records.

Abstract

Over 100,000 Indian women dies annually from pregnancy and child birth related causes, thus accounting for one-quarter of maternal death worldwide. Death records remain an important source of maternal deaths. Deaths in pregnancy may be due to conditions directly related to pregnancy (PRD), conditions exacerbated/ associated with pregnancy (PAD), or conditions unrelated to pregnancy (PUD). Death may occur during any trimester, during labour/ birth, or postpartum due to any cause. So the present study was undertaken with a view to include all deaths in pregnancy irrespective of the cause of death to discuss the utility of autopsy record as an additional data source for ascertainment of maternal death. In this study, we review deaths in pregnancy (maternal deaths) that were investigated and autopsied at the Apex Medical Centre between 1999 and 2008 to discuss. A total of 158 deaths in pregnancy occurred out of the total 8550 medicolegal deaths with maternal death rate of 7.1 per 100,000 populations per year. Pregnancy Unrelated Death (PUD) was the commonest group in pregnancy death followed by PRD and PAD, with poisoning as the commonest cause of death followed by burns and postpartum haemorrhage. The age of victims ranges from 14 years to 46 years with peak at 21-30 years. Married outnumbered unmarried in maternal death. Most of the death was found in first trimester followed by second trimester and postpartum period. Natural death was the commonest manner in pregnancy death followed by suicidal and accidental death.

1. Introduction

According to 10th revision of the International Statistical Classification of Diseases and Related

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Health problems (ICD), maternal death means death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.^{1,2} Few studies on pregnancy death have included suicides³ or motor vehicle traffic accidents⁴ or homicides.⁵ Death records remain an important source of maternal deaths. Many studies of maternal deaths in India based their statistics on clinical cause of death without reference of autopsy reports.⁶⁻⁹ This is because the autopsy is not performed routinely in such maternal deaths due to socio-religious reasons and hence autopsy reports to confirm cause of death were not available for such cases.¹⁰ Thus, review of autopsy reports may prove to be useful approach in increasing the ascertainment of maternal deaths. Against this background present study of maternal deaths was undertaken with a view to include all deaths in pregnancy irrespective of the cause of death.

2. Material and Methods:

The study attempted to review all medicolegal deaths during the period from January 1999 to December 2008. All the autopsies had been performed in the mortuary of Government Medical College at Yeotmal, a rural district of Maharashtra, India. The district has a population of 24,58,271 has spread in an area of 13,582 km². The centre is an Apex Medical Centre, where about 70% of the total medicolegal autopsies done across the district are performed here. In India the police department is legally bound to arrange autopsies in all medicolegal deaths. We included all cases of maternal deaths irrespective of the cause of death i.e death during pregnancy and postpartum period (up to 42 days postpartum), where medicolegal autopsy was conducted. Out of a total of 8550 medicolegal deaths during the study period of 10 years, 158 cases (1.8%) were the deaths in pregnancy. The deaths in pregnancy may be due to conditions related to pregnancy, conditions associated with pregnancy or conditions unrelated to pregnancy.

3. Results:

3.1. Incidence of death in pregnancy

The incidence of death in pregnancy out of the total medicolegal deaths is shown in [table 1](#). Of the total 8550 medicolegal deaths during the period 1999 to 2008, only 158 victims (1.8%) were the death in pregnancy. The rate of death in pregnancy in the region is 7.1 per 100,000 populations per year.

Year	Total Medicolegal autopsies	Death in Pregnancy	
		No	%
1999	840	10	1.2
2000	843	14	1.7
2001	892	16	1.8
2002	813	18	2.2
2003	761	25	3.3
2004	801	19	2.4
2005	788	19	2.4
2006	967	20	2.1
2007	940	8	0.9
2008	905	9	1.0
Total	8550	158	1.8

3.2. Groups and causes of death in pregnancy.

The different groups and cause of death in pregnancy are shown in [table 2](#). The deaths in pregnancy are grouped as Pregnancy Related Death (PRD) in which the death is directly related to the pregnancy and its complication. Second group is Pregnancy Associated Death (PAD) in which death is indirectly related or associated to the pregnancy and death is due to exacerbation of the pathological condition. Third group is Pregnancy Unrelated Death (PUD) in which the death is due to other causes not related with the pregnancy; however, pregnancy may be the reason for terminating one's own life.

PUD (84 cases) was the commonest group in death during pregnancy followed by PRD (43 cases) and PAD (31 cases). In PUD, the commonest cause of death was poisoning (36 cases) followed by burns (31 cases). The other cause of death like drowning, hanging, electric shock, mechanical injury, snake bite and natural illness were not common. In PRD, the commonest cause of death

was PPH (18 cases) followed by puerperal sepsis (8 cases). In PAD, hepatic failure with anaemia/consolidation (12 cases) was the commonest cause of death followed by consolidation (6 cases).

Table 2: Groups and cause of death in pregnancy

Groups and Cause of death	Number	%
I. Pregnancy Related Death (PRD)		
Antepartum haemorrhage	3	1.9
TOP	1	0.6
Ectopic Pregnancy	3	1.9
Obstructed Labour	1	0.6
Perforation of Uterus	1	0.6
PPH	18	11.4
Puerperal Sepsis	8	5.1
Pulmonary embolism	2	1.3
Amniotic fluid embolism	1	0.6
DIC	3	1.9
Undetermined	2	1.3
Total	43	27.2
II. Pregnancy Associated Death (PAD)		
Hepatic failure and Anaemia/ Consolidation	12	7.6
Meningitis	3	1.9
Sickle cell disease	3	1.9
Consolidation	6	3.8
Brain Infarct	1	0.6
Gastroenteritis	1	0.6
Heart Disease	3	1.9
Tuberculosis	2	1.3
Total	31	19.6
III. Pregnancy Unrelated Death (PUD)		
Burns	31	19.6
Drowning	4	2.5
Poisoning	36	22.8
Hanging	2	1.3
Electric shock	2	1.3
Mechanical Injury	4	2.5
Snake Bite	2	1.3
Natural disease - Malignancy	3	1.9
Total	84	53.2
Sum Total	158	100.0

3.3. Age distribution

The distribution of age is given in [table 3](#). The age of death in pregnancy ranges from 14 years to 46 years. 89.9% of the deaths were between the ages of 11-30 years with peak at 21-30 years (66.5%) followed by 11-20 years (23.4%). In PAD group, the age ranges from 19 years to 45 years with peak at 21-30 years (64.5%) followed by 31-40 years (19.4%). In PRD, the age ranges from 19 years to 35 years with peak at 21-30 years (81.4%) followed by 31-40 years (11.6%). In PUD, the age ranges from 14 years to 46 years with peak at 21-30 years (59.5%) followed by 11-20 years (38.1%).

3.4: Marital status:

The distribution of marital status of the death in pregnancy is given in [table 4](#). In death during pregnancy, 87.3% of the cases were married and 12.7% were unmarried with married unmarried ratio of 0.14:1. In PAD and PRD group, almost all pregnant women were married. Thus, most of the unmarried women belonged to PUD group with almost 17 out of 20 unmarried women committed suicide due to unwanted pregnancy before marriage.

3.5. Duration of pregnancy:

As shown in [table 5](#), most of the death in pregnancy was observed in first trimester (50 cases). 40 deaths (25.3%) occurred in second trimester and 24 deaths (15.2%) occurred in third trimester, prior to labour. Only 1 death (0.6%) occurred during labour and 43 deaths (27.2%) occurred in the postpartum period. Thus, 72 % of deaths occurred during pregnancy, 0.6% during labour and 27.2% during postpartum period. In PAD group, most number of death in pregnancy occurred in 3rd trimester (12 cases) and postpartum period (13 cases). Whereas in PRD, maximum death in pregnancy occurred in postpartum period (26 cases). In PUD, most number of death was found in 1st trimester (40 cases) followed by 2nd trimester (33 cases).

3.6. Pregnancy outcome and mode of delivery:

Analysing the pregnancy outcome, live birth was delivered in 39 cases (26 in PRD and 13 in PAD) and abortion in 4 cases. Remaining cases were undelivered. ([Table 6](#)).

Table 3. Age distribution of death in pregnancy

Age	PAD	%	PRD	%	PUD	%	Total	%
11-20	3	9.7	2	4.7	32	38.1	37	23.4
21-30	20	64.5	35	81.4	50	59.5	105	66.5
31-40	6	19.4	5	11.6	1	1.2	12	7.6
41-50	2	6.5	1	2.3	1	1.2	4	2.5
Total	31	100.0	43	100.0	84	100.0	158	100.0

Table 4: Distribution of marital status

Marital Status	PAD	%	PRD	%	PUD	%	Total	%
Married	1	3.2	2	4.7	17	20.2	20	12.7
Unmarried	30	96.8	41	95.3	67	79.8	138	87.3
Total	31	100.0	43	100.0	84	100.0	158	100.0

Table 5: Distribution of victims in relation to duration of pregnancy

Duration	PAD	%	PRD	%	PUD	%	Total	%
1st Trimester	3	9.7	7	16.3	40	47.6	50	31.6
2nd Trimester	3	9.7	4	9.3	33	39.3	40	25.3
3rd Trimester	12	38.7	5	11.6	7	8.3	24	15.2
Labour	0	0.0	1	2.3	0	0.0	1	0.6
Postpartum	13	41.9	26	60.5	4	4.8	43	27.2
Total	31	100.0	43	100.0	84	100.0	158	100.0

Table 6: Distribution of pregnancy outcome and mode of delivery

Groups	Pregnancy Outcome			Type of delivery		Place of delivery	
	Live birth	Abortion	Undelivered	Vaginal	Caesarean	Home	Hospital
PAD	13	0	18	12	1	3	10
PRD	26	0	17	24	2	7	19
PUD	0	4	80	0	0	0	0
Total	39	4	115	36	3	10	29
%	24.7	2.5	72.8	92.3	7.7	25.6	74.4

Table 7: Distribution of Manner of Death

Groups and Cause of death	Manner of Death				Sum Total	%
	Natural	Accident	Suicidal	Homicidal		
I. Pregnancy Related Death (PRD)						
Antepartum haemorrhage	3	0	0	0	3	1.9
TOP	1	0	0	0	1	0.6
Ectopic Pregnancy	3	0	0	0	3	1.9
Obstructed Labour	1	0	0	0	1	0.6
Perforation of Uterus	0	1	0	0	1	0.6
PPH	17	1	0	0	18	11.4

Puerperal Sepsis	8	0	0	0	8	5.1
Pulmonary embolism	2	0	0	0	2	1.3
Amniotic fluid embolism	1	0	0	0	1	0.6
DIC	3	0	0	0	3	1.9
Undetermined	2	0	0	0	2	1.3
Total	41	2	0	0	43	27.2
II. Pregnancy Associated Death (PAD)						
Hepatic failure and Anaemia	12	0	0	0	12	7.6
Meningitis	3	0	0	0	3	1.9
Sickle cell disease	3	0	0	0	3	1.9
Consolidation and Anaemia	6	0	0	0	6	3.8
Brain Infarct	1	0	0	0	1	0.6
Gastroenteritis	1	0	0	0	1	0.6
Heart Disease	3				3	1.9
Tuberculosis	2				2	1.3
Total	31	0	0	0	31	19.6
III. Pregnancy Unrelated Death (PUD)						
Burns	0	20	6	5	31	19.6
Drowning	0	0	4	0	4	2.5
Poisoning	0	0	36	0	36	22.8
Hanging	0	0	2	0	2	1.3
Electric shock	0	2	0	0	2	1.3
Mechanical Injury	0	2	0	2	4	2.5
Snake Bite	0	2	0	0	2	1.3
Malignancy	3	0	0	0	3	1.9
Total	3	26	48	7	84	53.2
Sum Total	75	28	48	7	158	100.0
%	47.5	17.7	30.4	4.4	100.0	

Out of the total deliveries, vaginal delivery occurred in 36 cases and caesarean delivery in 3 cases. 29 deliveries were conducted in the hospital and 10 were occurred at home.

3.7. Manner of death:

As per [table 7](#), the commonest manner of death was natural (47.5%) followed by suicidal (30.4 %), accidental (17.7 %) and homicidal (4.4%). The manner of death in PAD and PRD group was natural in all cases except two cases in PRD due to perforation of uterus during criminal abortion. In PUD group, the manner of death was unnatural in all cases except three cases. Suicidal death was present in 48 cases, accidental in 26 cases and homicidal in 7 cases.

4. Discussion:

Over 600000 maternal deaths occur each year worldwide.¹¹ In India, many women dies due to pregnancy-related complications and those who survive suffer from severe maternal morbidity.¹² Over 100,000 Indian women dies annually from pregnancy and child birth related causes, thus accounting for one-quarter of maternal death worldwide.¹³ In the present study out of total 8550 medicolegal autopsies reported over a period of 10yrs, 158 cases (1.8%) were the death in pregnancy with rate of 7.1% death in pregnancy per lakh population per year. Fubara et al.¹⁴ reported 6.1% maternal death out of the total medicolegal autopsies performed.

PUD was the commonest group seen in almost 62.5% death in contrast to PRD in 20.8% and PAD in 16.7%. Poisoning (27.5%) was the commonest cause of death followed by burns

(24.2%) in PUD. PPH (11.7%) and puerperal sepsis (4%) were the major cause of death in PRD and hepatic failure with Anaemia/consolidation (10 %) in PAD. Thrombo-embolism remains the leading cause of maternal death in developed countries followed by pregnancy induced hypertension or pre-eclampsia and eclampsia (15,16). In India, hypertensive disease, haemorrhage and sepsis are the major cause of maternal death.¹⁷⁻¹⁹ Bhattacharyya et al.⁸ and Jadhav et al.⁷ also reported haemorrhage, hypertensive disorder and sepsis as the major cause of maternal mortality in India. However, Bardale et al.²⁰, Khosla et al.¹² and Shah et al.¹⁰ reported haemorrhage as the commonest cause of death in pregnancy followed by indirect cause and sepsis. All these studies do not include unintentional accident or intentional injury. Ghaffar et al.²¹ reported 32 cases of pregnant burn females with 23 maternal and 26 foetal deaths. Anandalakshmy and Buckshee²² reported 55.2% maternal deaths were due to direct causes, 43.1% were due to indirect causes and remaining 1.7% was due to unrelated causes. Among the direct causes, death due to sepsis (35.3%) was the leading cause followed by toxemia (16.4%) and haemorrhage (2.6%). In the present study, some of the causes of death like sepsis, anaemia and hepatitis were common but are preventable. Ignorance and lack of awareness of the patients regarding MTP and contraceptives devices, untrained personnel performing illegal and unsafe abortion, deliveries under unsafe conditions and referring the patients late in tertiary care centre are still the root causes of deaths due to sepsis.⁸ Deaths from anaemia are also high due to fact that prevalence of anaemia is still high in developing countries. It also reveals the failure of anaemia prevention programs. A significant number of mother die due to infective hepatitis which indicates the lack of proper sanitation and that of universal precaution in poor resource countries.⁸

In present series, the age of victim in pregnancy death ranges from 14yrs to 46yrs with peak at 21-30yrs. In 25.8% deaths, the age of victims were between 11-20yrs and 12.5% were unmarried. In PUD, 37.3% of the victims were between the age of 11-20 yrs in contrast to 10%

and 4% in PAD and PRD respectively. Thus younger age were more commonly involved in PUD. Similarly all unmarried victims belonged to PUD group usually committed suicide due to unwanted pregnancy before marriage. Kausar²³ reported that despite the Child Marriage Restraint Act (1978), 34% of all women are married below 18yrs and are facing considerable health risks during pregnancy & child birth. Girls below 20yrs are twice as likely to die from child birth as women in their twenties. Shah et al.¹⁰ reported peak age at 25-35 years. Anandalakshmy and Buckshee²² reported 80% of the deaths during pregnancy in age group of 20-29 years.

In the present study, 72% deaths were noted during pregnancy period before labour, 0.6% during labour and 27.2% in postpartum period. In PAD, maximum death was noted in post partum period and third trimester, whereas postpartum period in PRD and first trimester in PUD. Thus unnatural deaths occurred most commonly in first trimester. Anandalakshmy and Buckshee²² reported 58.6% death in post partum period, 35.3% during pregnancy but prior to delivery and 6.03% during labour. Prahlow et al.²⁴ noticed 20% deaths in first trimester of pregnancy, 15.6% in second trimester and 11.1% in third trimester prior to birth, 28.9% during labour/ birth, 24.4% in postpartum period.

The commonest manner of death in pregnancy was natural followed by suicidal and accidental death. The manner of death in PAD and PRD group was natural in almost all cases whereas in PUD group it was unnatural namely suicidal (30.4%), accidental (17.7%) and homicidal (4.4%) cases. Thus it is evident that homicides, suicides and accident account for a large proportion of death in pregnancy. In US, it was found that the risk of being physically attacked or murdered was three times greater among women with unwanted pregnancies.²⁵ However, a study in Maryland showed that the homicide rate was nearly double in all women who were pregnant.²⁶ A different study showed that the leading cause of death among pregnant women in Maryland was homicide (20%), followed by cardiovascular disease (19%).⁵ Adolescent homicide victims were 3.7 times more likely to be pregnant compared with adult homicide victims.²⁶ Krulewitch et al.²⁷

found that pregnant women were significantly more likely than non-pregnant women to have died of gunshot trauma. Fubara et al.¹⁴ reported homicide in 3.3% and accidental death in 5%. A study performed in the state of New Mexico showed that motor vehicle crashes accounted for 70% of injury related death during pregnancy. Of these deaths, 45% of the crashes involved alcohol, and 77% of the pregnant women killed were not wearing seatbelts at the time of the crash.⁴

Walker et al.²⁸ reported that 15% of violent death of pregnant women has been attributed to unwanted pregnancy. Moreover the adolescents committed suicide after realizing they were pregnant. In Bangladesh, pregnant adolescents had a greater risk of suicide death than non-pregnant adolescents.²⁹ Other studies have shown that death from suicide was leading cause of maternal death, overall accounting for 28% of maternal deaths. The majority of suicides died violently in contrast with the usual findings that women are more likely to die of an overdose of medication. Studies are ongoing that investigate the relationship of pregnancy to depression, eating disorders, and pathologic fear of childbirth (tocophobia).^{30,31}

In India, death records remain an important source of maternal deaths. Using death certificate as sole source suffers various draw back because many times in medicolegal deaths, the cause of death is not mentioned in association with the pregnancy.²⁰ Other studies had shown that physicians completing death certificate (records) following a maternal death fail to report that the woman was pregnant or had recent pregnancy in 50% or more of these cases.³² Such mistakes may result in misclassification of the underlying cause of death. If such deaths are not identified as maternal deaths, then they may not be included in the calculation of maternal mortality rates. Therefore, traditional system of collecting data on maternal mortality cannot identify all pregnancy related deaths. Moreover, almost all studies of maternal deaths in India based their statistics on clinical cause of death without reference of autopsy reports.⁶⁻⁹ This is because the autopsy is not performed routinely in such maternal deaths

due to socio-religious reasons and hence autopsy reports to confirm cause of death were not available for such cases.¹⁰ The Maryland study showed that only a small proportion of pregnancy associated deaths can be identified from death certificates alone and that comprehensive identification of pregnancy associated death requires collection of data from additional sources, including autopsy records and linkage of death records with birth and death record.⁵

5. Conclusion:

The use of multiple data sources substantially enhances pregnancy mortality surveillance. Review of autopsy report is one of the important source to identify pregnancy related/ associated death and thus may prove to be useful approach in increasing the ascertainment of maternal death.

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Original Research Article

Deaths Associated with Anaesthetic Procedures: An Autopsy Based Study

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Article Info

Key words

Anaesthetic Death,
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Abstract

The performance of a surgical operation and the administration of an anesthetic are never without risk to the life of a patient. In all such cases a careful and complete medico-legal autopsy should be undertaken. Present work is aimed to study the clinical and autopsy findings in anesthetic deaths and any discrepancy between them. Out of total 61 cases of death due to alleged medical negligence, 17 cases (29 %) of anesthetic death were studied in detail. Anesthesia was second most commonly involved branch in alleged medical negligence cases after obstetric & Gynaecology cases, (n=21, 33 %). In the present study, eight cases (47 %) were due to general anesthesia and nine cases (53 %) were due to spinal anesthesia. In cases of death associated with general anesthesia, respiratory failure leading to hypoxia was responsible in five cases while in three cases, acute cardiovascular failure leading to hypotension, bradycardia and cardiac arrest was responsible for death. In cases of death due to spinal anesthesia, sudden cardiac arrest was responsible in five cases, hypotension in three cases and bradycardia followed by pulmonary oedema in one case. In anesthetic deaths, morphological findings are minimal or even absent so, full clinical information and expert advice of an anesthetist are essential.

1. Introduction

Anesthetic death is defined as death occurring within 24 hours of administration of anesthesia due to causes related to anesthesia. However, death may occur even afterwards due to its complications. In terms of Indian law, such deaths need to be notified to the law enforcement authorities. Hence, any death which is reported under this section is regarded as a death due to unnatural

unnatural causes, to be followed by an inquest. The attending clinicians are not allowed to issue a death certificate in these cases and the case must be referred for medico-legal autopsy.¹ Any autopsy on an anesthetic-related death must be a cooperative process with the anesthetist.

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Not only are the objective findings in true anesthetic deaths meager or absent, but the autopsy surgeon's training and experience of the complex techniques of modern anesthesia is insufficient for him to appreciate, analyze, and criticize constructively without the expert knowledge of the anesthetist.²

Survey conducted by Lunn and Mushin for the association of anesthetists in 1982 indicated that, although 1 in every 166 patients died within 6 days of a surgical operation, only one in 10000 die solely as a consequence of the anesthetic. Anesthesia contributed to but not totally caused the death of 1 in every 1700 patients, many of these deaths being potentially avoidable. Autopsy reports alone are of limited value in explaining deaths associated with anesthesia.³

Anesthetic death is one of the most stressful events as experienced by anesthetists who may vary from person to person or even from case to case. For some it may be the emotional trauma and for others it may be the impact on their professional functioning.⁴

In law, as in medicine, error and negligence are not synonymous. To establish liability in a medical malpractice action, a plaintiff must prove three elements. The duty inherent in the doctor-patient relationship must have been established. A breach of duty defined by failure to exercise the required standard of care must have occurred. The breach of duty must be shown to be the proximate (underlying) cause of injury or death to a reasonable degree of medical certainty, that is, that the injury or death could have been avoided except for the breach of duty.⁵

Outcome of a malpractice case may depend on the quality of the autopsy, specifically on the awareness of the autopsy surgeon of clinical issues, particularly those that are of potential medico-legal interest, and the thoroughness of the autopsy dissection with respect to those issues. Many studies have documented that major discrepancies are common between diagnosis entered on death certificate and autopsy diagnosis.⁶

The surge of technology and the hyper-specialization in every field of medicine imply that each malpractice claim gives rise to a scientific challenge, requiring specific expertise in the analysis and evaluation of the clinical case in question. The role of legal medicine has become increasingly

specific, essential and ineluctable in the judicial setting in order to prevent and avoid erroneous interpretations and hasty scientific verdicts.⁷

The present study was designed to compare the clinical findings with the findings of a medico-legal autopsy in cases of anesthetic deaths.

2. Aims & Objectives:

- i. To study the clinical and autopsy findings in deaths associated with general anesthesia.
- ii. To study the clinical and autopsy findings in deaths associated with spinal anesthesia.
- iii. To study any discrepancies in clinical and autopsy findings of anesthetic deaths.

3. Material & Methods:

In this retrospective study, total 61 cases of death due to alleged medical negligence brought to the Forensic Medicine Department, B.J. Medical College, Ahmedabad between the January 2014 and December 2018 were studied. Out of these 61 cases, total seventeen cases of anesthetic deaths were selected for comparison between clinical and autopsy findings especially regarding the cause of death. All autopsies were performed within 24 hours of death as a part of medico-legal investigation of death as per section 174 of the Cr.P.C. For detection of the autopsy findings, post-mortem reports, reports of histo-pathological examination, chemical analysis and other ancillary investigations were studied. Clinical findings and cause of death (primary diagnosis) indicated by the clinician in-charge of the patient were abstracted from the patient's hospital records, anesthetic notes, operative notes, etc. Clinical and autopsy findings then compared and conclusions were drawn.

4. Results:

Out of total 61 cases of death due to alleged medical negligence, 17 cases (29 %) were of anesthetic death as shown in [table no. 1](#). Anesthesia was second most commonly involved branch in alleged medical negligence cases after Obst. & Gynec cases, (n=21, 33 %).

In the present study, eight cases (47 %) were due to general anesthesia and nine cases (53 %) were due to spinal anesthesia. In cases of death associated with general anesthesia, respiratory failure leading to hypoxia was responsible in five

cases while in three cases, acute cardio-vascular failure leading to hypotension, bradycardia and cardiac arrest was responsible for death. In cases of death due to spinal anesthesia, sudden cardiac arrest was responsible in five cases, hypotension in three cases and bradycardia followed by pulmonary edema in one case.

Table-1: Distribution of anesthetic deaths according to type of anesthesia and Primary Disease:

Type of Anesthesia	Primary condition	No. of cases	Total
General Anesthesia	Spinal Tumor (D11-Schwannoma)	1	8 (47%)
	Spinal space reduction L5-S1	1	
	Congenital coloboma	1	
	Uterine fibroid	2	
	Umbilical Hernia	1	
	Congenital Polydactyli & Syndactyli	1	
Spinal Anesthesia	LSCS	3	9 (53%)
	Ortho- Tibia Fracture	1	
	Ortho- Femur Fracture (ST or IT)	5	
Total			17 (100%)

Out of total 8 cases of death due to general anesthesia, 3 were belonging to neurosurgery and spine surgery, 2 of general surgery, 2 of gynecology, and 1 case of ophthalmology. Out of 9 cases of death due to spinal anesthesia, 6 cases were belonging to orthopedics. Out of these 6 cases, 5 were of sub-trochanteric or intra-trochanteric fracture of femur bone and in 1 case tibia was fractured. Three cases of spinal anesthetic deaths occurred during LSCS operation. Out of total eight cases of death associated with General Anesthesia, in four cases (50 %) autopsy has revealed undiagnosed preexisting disease. Out of total nine cases of death associated with Spinal Anesthesia, in only two cases (22 %) autopsy has revealed undiagnosed preexisting disease.

5. Discussion:

Anesthetic deaths may be divided in to two broad categories^{2, 8, 9} namely:

1. Deaths which occur during the administration of an anesthetic but which are not due to the anesthetic.

2. Deaths which are the direct result of the administration of an anesthetic.

Group-1 includes following categories:

- Death due to primary injury or disease which necessitated the operation and administration of an anesthetic.
- Deaths due to diseases other than those for which the operation was undertaken, but which were diagnosed before the operation was commenced
- Deaths due to diseases other than those for which the operation was undertaken, but which was not diagnosed before the operation was commenced

In a case of this nature, it has to be determined whether the condition could reasonably have been diagnosed by a proper preoperative clinical examination.

There are several diseases of a potential serious nature, e.g. coronary artery atherosclerosis, which may be clinically latent and which may not be detectable even after most careful routine clinical examination. The failure to make a preoperative diagnosis of such a condition does not necessarily imply that the practitioner in attendance was negligent.

- Surgical deaths i.e. accidental incision of a large blood vessel or aneurysm is the direct responsibility of the surgeon.

Out of total eight cases of death associated with General Anesthesia, in four cases (50 %) autopsy has revealed undiagnosed preexisting disease. In one case severe atherosclerosis of coronary arteries was present while in another case severe atherosclerosis of coronary arteries with left ventricular hypertrophy was found in autopsy. While in two cases severe chronic lung disease was found in autopsy. These unrelated diseases were not diagnosed or suspected in preoperative and pre-anesthetic evaluation. (See [the table-2](#))

Case-1: severe atherosclerosis of left anterior descending coronary artery with left ventricular hypertrophy. Another incidental finding was cavernous hemangioma of liver.

Table-2: Clinical Diagnosis and Autopsy Diagnosis in deaths associated with G.A.

Case No.	Clinical Diagnosis	Autopsy Diagnosis	Undiagnosed preexisting condition

			revealed in autopsy
1	Male, 48 yrs, G.A. (Propofol & Scolin) for D11 Schwannoma, Hypoxia followed by cardiac arrest occurred within 5-10 minutes of G.A. before starting the surgery.	40-50 % narrowing of LAD coronary artery with atherosclerosis , Left ventricular hypertrophy, tongue and lip bite due to convulsions, signs of difficult intubation. <i>No any signs of hypoxia found in the autopsy.</i>	1. Coronary atherosclerosis . 2. Left ventricular hypertrophy. 3. Multiple small cavernous hemangiomas in liver.
2	Male, 12 yrs, surgery for congenital coloboma under G.A., vomiting occurred after recovery	Aspiration of gastric contents in to bronchial tree, brain and lungs are congested and edematous.	Nil
3	Female, 40 yrs, lap. Hysterectomy under G.A., immediately after surgery developed negative pressure pulmonary edema (NPPE) , hypoxia, pink frothy fluid from ET tube.	Both lungs are congested, edematous, and found severely adherent to chest wall. Centri-lobular hemorrhagic necrosis of liver suggestive of circulatory failure. <i>No any signs of hypoxia found in the autopsy.</i>	Chronic pulmonary disease.
4	Female, 38 yrs, Hysteroscopic and laparoscopic removal of multiple fibroid uterus under G.A. After 30 min. developed bradycardia, hypotension and pulmonary edema, died on next day.	Pulmonary edema, about half liter reddish fluid in abdomen, suggestive of cardiac failure. <i>No any findings of hypotension, and cardiac arrest found in the autopsy.</i>	Nil
5	Male, 75 yrs, surgery for umbilical hernia, G.A., died on first post op. day, known case of Hypertension, heart block and hypothyroidism .	Left ventricular myocardial infarction, both coronary arteries were showing severe atherosclerosis . Pulmonary edema. Acute tubular necrosis of kidneys.	Coronary atherosclerosis .
6	Female, 15 yrs, Cranio-Vertebral junction abnormality with neurodeficit. C2, C3, C4 laminectomy under G.A., died on same day.	Negative Autopsy	Nil
7	Female, 57 yrs, known case of asthma, spine surgery of space reduction between L5-S1 under G.A., developed hypoxia due to bronchospasm, and convulsion, followed by cardiac arrest. Died before surgery started.	Pulmonary edema. <i>No any signs of hypoxia were found in autopsy.</i>	Nil
8	Two & half yrs old male child, surgery for polydactyli and syndactyli of four limbs under G.A., hypotension and cardiac arrest after surgery, died on same day.	100 ml reddish fluid in pleural cavity, 300 straw color fluid in peritoneal cavity suggestive of circulatory failure, lungs are edematous	Histopathology shows chronic interstitial inflammation of both lungs

Case-3: lungs were found severely adherent to the chest wall could not be removed whole during autopsy.

Case-5: severe atherosclerosis of left anterior descending coronary artery with left ventricular myocardial infarction.

Case-8: chronic interstitial inflammation of lungs found in histo-pathological examination.

Out of total nine cases of death associated with Spinal Anesthesia, in only two cases (22 %) autopsy has revealed undiagnosed preexisting disease. In one case left ventricular hypertrophy and chronic pyelonephritis were present while in another case moderate atherosclerosis of right coronary artery with about 30 % narrowing of its lumen was found in autopsy.

Case-14: left ventricular hypertrophy and chronic pyelonephritis. After giving spinal anesthesia patient developed sudden bradycardia and frothing due to pulmonary edema.

Case-15: 30 % narrowing of right coronary artery with moderate atherosclerosis. Patient developed chest pain and died after 20 min of spinal anesthesia.

So, in four cases (out of nine) of general anesthesia and in two cases (out of eight) of spinal anesthesia, the new information (pre-existing undiagnosed disease) provided by the medico-legal autopsy. This could have influenced the treatment decisions in some cases.

Group-2 includes deaths which are the direct result of the administration of an anesthetic.

In all recent studies of anesthesia related mortality, problems pertaining to the respiratory system were the single largest cause of death.

Out of eight cases of deaths associated with general anesthesia, five cases were due to respiratory failure. Causes of respiratory failure in these cases are complications of endotracheal intubation due to difficult intubation in one case, aspiration of gastric contents in one case, negative pressure pulmonary edema in one case, and in one case severe bronchospasm occurs in known case of asthmatic bronchitis after G.A. but before beginning the surgery. In one case exact cause of respiratory failure could not be detected.

One of the commonest causes of anesthesia-related mishaps is complications related to the endotracheal intubation. In case no.1 of our study (**Table-2**), signs of difficult intubation in the form of injuries to the mouth and laryngo-pharynx as well as hemorrhage in the neck musculature were seen.

In a study of 50 individuals who had endotracheal intubation prior to reaching an emergency room, in an unsuccessful attempt at resuscitation, 37 (74 %) had injuries of the airway following intubation.⁹

General anesthetics can also produce asthma-like attacks that are not apparent in unconscious patients.⁹ Bronchiolar spasm may contribute to airway obstruction and may be due to many factors including pre-existing asthma, hypersensitivity to drugs, aspiration of gastric contents and fluid overload. In case no.7 (**Table-2**), due to pre-existing asthma, bronchiolar spasm occurred after general anesthesia caused hypoxia and convulsions before starting the surgery.

In case no.2 (**Table-2**), airway obstruction and hypoxia were occurred due to aspiration of stomach contents due to vomiting. Vomiting occurred after completion of the surgery and apparent recovery from the anesthesia.

Ventilatory effort may be impaired during anesthesia either as a result of depression of the respiratory center, or through muscular weakness. Almost all anesthetic agents are respiratory depressants, and overdosage will result in inadequate ventilation. Inadequate Ventilatory support following the use of neuromuscular blocking drugs has been cited as a frequent cause of death due to anesthesia, and effect of these drugs is potentiated by volatile anesthetic agents.⁸ More common is the tendency to give multiple medications during induction and maintenance of general anesthesia or deep sedation, with resultant synergistic action of these drugs.¹⁰ In case no.8 this poly-pharmacy effect of CNS depressants may have caused the hypoxia.

Disorders of circulatory homeostasis form the second largest group of anesthetic related deaths. Unrecognized or inadequately managed hypovolemia is the commonest cause of anesthesia related death attributable to the cardiovascular system. Where death has occurred from such hypovolemia, autopsy is frequently unhelpful in establishing the cause. Over-enthusiastic fluid therapy may also contribute to anesthesia related mortality from pulmonary edema or cardiac failure. Fatal cardiac arrhythmias during anesthesia may result from a number of factors, such as pre-existing disease, abnormal reactions to drugs, unskillful

anesthesia, surgical stimulation, or a combination of these.⁸

In three cases of general anesthetic deaths (refer table no. 3), cardio-vascular failure was the cause of death. In two cases bradycardia and hypotension occurred first followed by cardiac arrest and cardiogenic pulmonary edema. In these cases preoperative hypovolemia and intra-operative blood loss which may remain unrecognized or inadequate provision could not be ruled out. In such cases cardio-vascular failure due to cardiac arrhythmia could also not be ruled out. In one case myocardial infarction due to coronary atherosclerosis was found to be a cause of death.

Table-3: Distribution of General Anesthetic cases according to cause of death

Cause of death in G.A.	No. of Cases
Respiratory Failure leading to Hypoxia	5
Cardio-vascular failure leading to hypotension, bradycardia and cardiac arrest	3

Out of nine cases of deaths associated with spinal anesthesia (refer table no. 4), in five cases sudden cardiac arrest developed during spinal anesthesia. In all these five cases, immediate CPR was given due to which cardiac activity was restarted. In all these cases patient developed of permanent vegetative state due to Hypoxic Ischemic Encephalopathy. Out of these five cases of sudden cardiac arrest during spinal anesthesia, in two cases DVT followed by the pulmonary thrombo-embolism was found during autopsy at about three days and eight weeks after surgery respectively. In two cases, septicemia and DIC were found in autopsy at about 3 weeks and 4 weeks after surgery. In one case patient died on fourth post-operative day with pulmonary edema. No any specific cause of death was found in autopsy.

Table-4: Clinical Diagnosis and Autopsy Diagnosis in deaths under Spinal Anesthesia

Case No.	Clinical Diagnosis	Autopsy Diagnosis	Undiagnosed preexisting condition revealed in Autopsy
9	Female, 25 yrs, LSCS under S.A., sudden	Congestion of organs,	Nil

	cardiac arrest, revived after CPR, Hypoxic Ischemic Encephalopathy, DIC, ARF, Septicemia, died after 22 days	hemorrhages in abdominal wall due to DIC	
10	Male, 60 yrs, Road Traffic Accident, proximal tibia fracture on rt. Side, plating under S.A., just before closure developed sudden cardiac arrest, revived after CPR, severe diffuse encephalopathy, died about 2 months after surgery	DVT in both legs with pulmonary thromboembolism, red hemorrhagic spots on both kidney surfaces, septicemia	Nil
11	Female, 70 yrs, RTA, left femur IT fracture, nail removal done after 7 months under S.A., cardiac arrest, CPR, developed hypoxic ischemic encephalopathy, died after one month	septicemia	Nil
12	Male, 21 yr, RTA, left femur fracture mid shaft, plating under S.A. & Epidural catheterization, developed severe hypotension, died on second day	Congestion of organs, Negative autopsy	Nil
13	Male, 35 yr, RTA, left Femur ST fracture, bradycardia followed by sudden cardiac arrest, revived after CPR, died on third day	DVT in left femoral vein, brain and both lungs severely edematous, pulmonary thrombo-embolism	Nil
14	Male, 46 yr, RTA, left femur IT fracture, nailing done, after 24 days removal done under S.A., sudden bradycardia, frothing, died on same day	Both lungs are congested & edematous, left ventricular hypertrophy found, coronaries are patent	1. Left ventricular hypertrophy 2. Chronic pyelonephritis on

			histopathology
15	Male, 75 yr, RTA, left femur IT fracture, nailing under S.A., developed chest pain, hypotension died on same day	Only 30 % block in right coronary artery, lungs are congested and edematous. No exact cause of death could be ascertained	Moderate atherosclerosis of right coronary artery
16	Female, 23 yrs, LSCS under S.A., developed sudden cardiac arrest, unconscious, CPR given, developed hypoxic ischemic encephalopathy, died on 4 th post operative day.	Edema over face, hands, feet, legs, and back. 500 ml reddish fluid in peritoneal cavity s/o cardiac failure, pulmonary edema.	Nil
17	Female, 35 yrs, full term pregnancy, twins, LSCS, hypotension, death during operation.	Negative Autopsy	Nil

In three out of nine cases of deaths associated with spinal anesthesia (refer table no. 5), sudden fall in blood pressure was developed during surgery and all patients were died on same day. No any specific cause of death was found at autopsy in all three cases (Negative Autopsy). In one case, moderate atherosclerosis of right coronary artery with about 30 % narrowing of its lumen was found during autopsy as age related change.

Cause of death in S.A.	No. of Cases
Sudden Cardiac Arrest	5
Hypotension	3
Bradycardia followed by pulmonary edema	1

In one case of death associated with spinal anesthesia, during surgery, suddenly bradycardia was developed followed by pulmonary edema and frothing. No any specific cause of death was ascertained in autopsy. However, left ventricular hypertrophy with chronic pyelonephritis was found present in autopsy.

This report demonstrates the extremely high yield of early post-mortem autopsies performed in the case of operative and anesthetic deaths with

suspicion of malpractice. Autopsies frequently identified undetected complications, including surgical complications and disease processes. They could also suggest faulty or negligent practice that would otherwise go unrecognized.

This report also demonstrates that most early post mortem examinations performed on patients who died due to surgical or anesthetic causes, provide new and often unexpected information of great assistance in identifying the cause of death.

6. Conclusions:

The morphological findings in the “anesthetic deaths” are minimal or even absent so, more than in any other type of case, expert advice and full clinical information are essential.

Early Post-mortem examination on case of anesthetic death can provide new and often unexpected information of great assistance in identifying the cause of death.

In most of the cases of death associated with anesthesia, the cause of death has to be determined from a consideration of the clinical features as well as the autopsy findings.

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Original Research Article

Analysis of Homicidal Deaths at MBS Hospital Associated with Government Medical College Kota: An Autopsy Based Study

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Article Info

Key words

Homicidal death,
Blunt weapon,
Head injuries.

Abstract

Homicide is killing of one human being by another. There has been increase of homicide all over world including India due to rapid urbanization, increase life stress, and decrease patience etc. In present study 37 cases of homicidal death were studied. The incidence of homicidal death was 3.5% during the study period. Majority of cases, 20 (54%) were in the 21-40 years of age. Injuries were infiltrated by blunt weapons were 16 cases(43%) followed by sharp weapon 12 cases(32%). Most death 17 in numbers (45%) resulting from head injuries, followed by thoraco-abdominal injuries 12 in number (32%). This type of analysis can be used by investigating authorities to curtail, the amount of violence present in present scenario.

1. Introduction

Violence is a significant health problem and homicide is severest form of violence homicide is prevalent widely almost all over the world.¹ Homicide is one of the oldest crimes in human civilization which depriving a human being of his fundamental rights to live. Study of analysis of homicidal death in a society is one of the first steps in the developing strategies to prevent it.² Homicide is a reflection of extreme aggression may further influence such a behavior, family, environment, urbanization and presence of weapons. Medical autopsy not only give the cause and manner of death but also give importance statistical data related to legal incidence in the cities and regions where autopsy are conducted. Homicide investigations require a scientific and meticulous autopsy.

This study has been conducted to analyze of homicidal deaths and relation of homicide with features like motive, sex, weapon used and pattern of injuries.

2. Material & Methods:

Present study conducted at MBS hospital associated with Govt. Medical College Kota. This observational study was conducted from Jan.2018 to Dec.2018. Out of 1043 autopsies, 37 cases of homicidal deaths were reported.

Inclusive Criteria:

All deaths resulting from homicidal attacks were included in this study.

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Exclusive Criteria:

Suspected cases of homicidal deaths were excluded. Deaths resulting from rash and negligent act were also excluded.

Detail information regarding circumstances of crime was sought out from legal agencies inquest paper, history by relative, Hospital treatment records.

3. Observation and Results:

A total of 37 cases of homicidal deaths were included in this study, which were 3.5% of total autopsies conducted at MBS hospital associated with Govt. Medical College Kota.

Present study shows that 31 cases (about 84%) were males with only 6 cases (about 16%) were females. This study is self explainable by the pattern of Indian society, where males are active member of society. (Table-1)

Age group of 31-40 years was mostly affected (11 cases) followed by 21-30 years (9 cases) group. The least affected group was more than 60 year age group. About 50% of total cases belong to 18-35 years of age. (Table-1)

Table No.1: Age and sex wise distribution of victims of Homicidal deaths.

Age (Group) Years	Male	Female	Total
<10	00	01	01
11-20	06	02	08
21-30	08	01	09
31-40	09	02	11
41-50	03	00	03
51-60	03	00	03
>60	02	00	02

Table No. 2: Distribution of victim of Homicide according to time of incidence.

Time of Incidence	Male	Female	Total
Morning	04	03	07
Day	07	01	08
Evening	10	01	11
Night	10	01	11
Total	31	06	37

About 60% of total cases of deaths were seen during evening and night hours due to day work frustration and uses of drugs and alcohol at evening and night in the parties. (Table-2)

The most common weapon used was blunt in 16 cases (about 43%) followed by sharp weapon

12 cases (about 32%) and firearms weapons 4 cases (about 11%). Manual and ligature strangulation were least used method, one case of each (Table-3). The availability of blunt weapons are easy in both Rural and urban scenario. Poison and burn are least used method for homicidal deaths.

Table No.3: Weapon or Method wise distribution of victim of Homicide.

Weapon	Male	Female	Total
Blunt	14	02	16
Sharp	11	01	12
Strangulation	02	00	02
Fire Arm	03	01	04
Poison	01	00	01
Burn	00	02	02
Total	31	06	37

Table No.4: Distribution of injuries according to site of body.

Site	Male	Female	Total
Head	15	02	17
Chest	05	01	06
Neck	03	01	04
Abdomen	06	00	06
Poison	01	00	01
Burn	00	02	02
Limbs	01	00	01
Total	31	06	37

Table No. 5: Distribution of Victim of homicide according to motive.

Motive	Male	Female	Total
Argument	08	02	10
Revenge	03	00	03
Land dispute	07	02	09
Love affairs	06	01	07
Property	05	00	05
Owner killing	01	01	02
Unknown	01	00	01
Total	31	06	37

Head was the region where maximum numbers of injuries were observed 17 cases (about 45%) followed by chest and abdomen 16 cases for each. chest and abdomen were the preferred site of sharp injuries (Table-4). The distribution of Victim of homicide according to motive is shown in table no. 5.

4. Discussion:

During the study period total 1043 autopsies were conducted out of which 37 cases were homicidal deaths which comprise 3.5% of total

autopsies. Similar result was observed in various other Indian studies^{1,2,3,5,14} in our study the mostly affected as group was 31-40 years of age followed by 21 to 37 years of age. Most of study reported 31 to 40 years of age group to be the most commonly affected age group^{4,6,7,14}

Most homicidal deaths were reported in evening and night hours 22 cases (about 60%). in this study. Similar findings were reported by patel.D.J.⁶ who reported about 38% of total homicidal deaths.

Present study reported, the most commonly used weapons were blunt in 16 cases. Similar observation were also reported by other author's studies in Rajasthan and india^{6,7,9,14}. This study contrary to many studies where sharp weapons are mostly used weapons for homicidal deaths.^{8,15,16}. In year 2018 at Delhi, gun or sharp edged weapons were used nearly two of every three murders. The most common site of infliction of injuries was seen over head in 17 cases followed by abdomen and chest in 6 cases each. Similar finding were observed by other Indian studies.

In this study, arguments were the main motive for homicidal deaths, followed by land disputes, love affairs and revenge. The finding are not consistent with study done by patel D.J.⁶ who reported revenge was the main motive. In year 2018 at Delhi, the police said that 38 % of all murders were committed over personal enmity or a dispute. These include people killed in gang war or property, monetary and parking disputes.

5. Conclusion:

Analysis of homicidal deaths may be useful indicator for community and for law enforcement agencies.

1. In this study blunt weapons were the most commonly used weapon for homicidal deaths.
2. Head was the common site for infliction of injuries.
3. Strict enforcement of law must be ensued on possession of sharp weapons.
4. The main affected age group was 31-40 years of age.

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Original Research Article

Study of Motorcycle Fatalities In Mumbai: A Two Year Retrospective Analysis

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Article Info

Key words

Fatal,
Motorcycle,
Moped,
Road traffic accidents,
Helmet,
Pattern of injuries.

Abstract

Background- Motorcycle is a very common mode of transport in developing countries like India and it mainly caters to travel needs of working class. Though popular it comes with its own risks owing to lack of protection as compared to other road users. The risk is so high that motorcycle related fatalities account for about 33% of deaths among all road users.

Material & method- The study was conducted retrospectively between January 2015 to December 2016 at a tertiary health care centre in Mumbai and a total of 110 cases of fatal motorcycle crashes were studied which constituted 35.4% of the total 310 cases of all fatal road traffic accidents.

Observations- Fatalities were seen mostly in males (89.09%) with the majority (60%) falling in the working age group of 21-40 years. Geared vehicles were involved in 80.9% cases of fatal crashes. Helmets were worn by 72.6% victims among drivers and none by the pillions. Heavy motor vehicles were the offending agents in 39.09% followed by light motor vehicles in 18.18% cases. 32.7% of deaths occurred before arrival in hospital and further 37% deaths occurred within first 24 hours of admission. Head on collision accounted for 41.81% fatalities. Head injury was the cause of death in majority of cases 49(44.54%), followed by 21(19.09%) fatalities due to Hemorrhage and Shock.

Conclusion- Educating & sensitizing motorcycle riders regarding the use of safety measures like helmet usage, avoiding alcohol consumption at the time of riding and driving at slow speeds along with strict enforcement of traffic laws with heavy fines will be of great help in preventing such fatalities.

1. Introduction

A road traffic accident is defined as any vehicle accident occurring on a public road or highway

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and includes vehicle accidents where the place of occurrence is unspecified.¹ Motorcycle is a very common mode of transport in developing countries like India and it mainly caters to travel needs of working class. It is also popular mode as it is available at cheap price and is cost efficient in terms of operation and maintenance. Though popular it comes with its own risks owing to lack of protection as compared to other road users.

The risk is so high that motorcycle related fatalities account for about 33% of deaths among all road users. In India total 52500 & 48746 no of persons died in the year 2016 & 2017 respectively riding on two wheelers, which constituted 33% of total deaths amongst all road users.² Compared with passengers on other types of vehicles, motorcyclists are 35 times more likely to die in a road traffic accident per distance travelled.³

The problem is more pronounced in developing countries owing to many factors such as rapid motorization, using motorcycles for commercial transport, and failure of motorcyclists to wear protective helmets; the burden of motorcycle accidents is aggravated by the habit of reckless driving with tendency to over speed by some motorcycle riders, as well as a significant number of drivers lacking proper certification and valid licensing. Poor traffic regulations and law enforcement and the abuse of recreational drugs and alcohol are also major contributing factors to motorcycle accidents.^{4,5}

This study was carried out retrospectively to analyze the epidemiology and injury patterns in cases of fatal motorcycle crashes in the city of Mumbai.

2. Materials and methods

Sample:

This is a retrospective study with a study sample consisting of 110 cases of fatal motorcycle accidents brought for medicolegal autopsy at Lokmanya Tilak Municipal Medical College & General Hospital, Mumbai over a period of two years from January 2016 to December 2017. Cases satisfying the following definition of RTA and RTC were selected: RTA - A collision involving at least one vehicle in motion on a public road that results

in at least one person being injured or killed. RTC – A collision or incident that may or may not lead to injury, occurring on a public road and involving at least one moving vehicle.

3. Data Collection:

History as regards the circumstances of the accidents, demographic data, the site and cause of impact was obtained from police inquest papers. Injury pattern and cause of death and noted from the autopsy report. All cases were analysed with respect to age, time of accident, offending vehicles or objects, mechanism of accident, pattern and distribution of injuries, fatal injuries, and cause of death and history of alcohol consumption. The information gathered was entered in a standardized proforma and analysed further to obtain results.

4. Observations & Discussion

A total of 310 cases of fatal road traffic accidents were observed during the study period of which motorcycle fatalities were 110 (35.4%) as shown in [table no. 1](#).

Table 1: Age & Sex wise distribution of road traffic accident victims.

Age in years	Male	Female	Total (%)
0-10	1	0	1 (0.90%)
11-20	9	2	11(10%)
21-30	38	5	43(39.09%)
31-40	20	3	23(20.90%)
41-50	15	1	16(14.54%)
51-60	12	0	12(10.90%)
Above 60	3	1	4(3.63%)
Total	98(89.09%)	12(10.90%)	110 (100%)

A very high percentage of victims were males as motorcycles are often driven by them, moreover, females tends to be very cautious while driving and follow traffic rules more often than men. Victims in both sexes were mainly seen in the age group of 20-40 years. Risk taking behavior, urgency to reach work or home place, driving under influence of alcohol is common amongst males in leading to increased chances of motor accidents. Similar observations were noted in various national and international studies.^{6,8,9,10,13}

Considering the type of two wheelers, motorcycle fatalities were very high 89(80.9%) amongst geared vehicles as it is the mainstay of commuting for young males, whereas mopeds was involved in 21(19.09%) cases (Refer to [table no. 2](#)). All female driver victims were riding mopeds in the present study. Though the use of mopeds is increasing among both sexes in city areas every year, its engine is less powerful resulting in low speeds compared to the motorcycles, hence the chances of fatal accident are reduced to a great extent.

Helmets and helmet use laws have been shown to be effective in reducing head injuries and deaths from motorcycle crashes. Traffic rules in Mumbai makes the use of helmet compulsory, hence a good number of victims 61 (72.6% among 84 drivers) were seen wearing helmet. None of the pillion riders (26) were wearing the helmet as the helmet rule is compulsory only for the drivers in Mumbai.

Table 2: Type of offending vehicle

Type of offending vehicle	No of cases
Heavy motor vehicles*	43(39.09%)
Light motor vehicles**	20(18.18%)
Two wheelers	8(7.27%)
Three wheelers	2(1.81%)
Skidding	12(10.90%)
Dash***	6(5.45%)
Unknown	19(17.27%)
Total	110

* Truck, bus, tempo, tanker etc **car, jeep etc,

***Dash to stationary vehicle, divider, electric pole.

Heavy & light motor vehicles were the offenders in 57% cases followed by skidding in 10.9% cases. In 19 cases (17.27%) the offending vehicle or the exact manner of accident could not be ascertained. Impact with trucks, bus, jeep, tankers etc is highly fatal owing to their weight and speed. Other Indian studies^{1,6,12} are in concurrence with the common offending vehicles being four wheelers. Maximum fatalities (38.18%) were seen between 6 pm and 12 am, followed by 30.9% cases

between 12pm to 6pm. More number of accidents during evening hours could be attributed to tiredness after long hours of work and rush to reach back home.

Table 3: Time of accident

Time of accident in hours	No of cases
00:00-06:00	11(10%)
06:00-12:00	23(20.90%)
12:00-18:00	34(30.90%)
18:00-00:00	42(38.18%)
Total	110 (100%)

Patel¹⁹ recorded maximum cases (40%) between 18:00 to 00:00 hours, followed by 21% cases between 12:00 to 18:00 hours. Biswas et al²⁰ observed majority (30.9%) of cases occurring in the evening followed by 28.1% cases in afternoon (Refer to [table no. 3](#)). Amish Jain et al¹⁴ too noted maximum cases between 6pm to 10pm. In contrast, Deepak Sharma et al¹⁷ recorded majority of accidents between 12 noon to 6 PM, comprising (56%) of cases, followed by between 6 AM to 12 noon (27%).

Table 4: Survival period of the victim.

Survival period	No of victims
Death on spot/on the way to hospital	36(32.72%)
1-12 hours	27(24.54%)
12-24 hours	14(12.72%)
24-48 hours	13(11.81%)
48-72 days	7(6.36%)
More than 72 hours	13(11.81%)
Total	110(100%)

Survival period of the victims suggests a high percentage (32.7%) of deaths occurring before arrival in hospital and 37% deaths occurring within first 24 hours of admission (Refer to [table no. 4](#)). Harnam Singh et al¹⁰ noted that 39.5% victims had succumbed within 1 hour & 2/3rd (67.8%) by 12 hours. B.R. Sharma et al¹¹ in their study related to helmet safety adequacy noted that a very high number of deceased (75%) not wearing helmet succumbed to their injuries within one hour of accident. Similarly, Amish Jain et al¹⁴ in their study on motorcycle fatalities in Mangalore observed that 45 out of total 75 deaths occurred on the spot. The

high incidence of early deaths in motorcycle crashes can be attributed to the large extent of injuries in motorcyclists as there is no adequate protection and lack of effective ambulatory services due to high traffic in metropolitan cities like Mumbai.

Table 5: Manner of collision

Manner of collision	No of cases
Head on*	46(41.81%)
Hit from behind	15(13.63%)
Side impact	18(16.36%)
Skid	12(10.90%)
Unknown	19(17.27%)
Total	110 (100%)

* Head on including 6 cases of dash to stationary vehicle (4), divider (1) & electric pole (1)

Observing the manner of collision in the present study, Head on impact was most fatal (41.81%) followed by side impact (16.36%), impact from behind in 13.63% cases and skidding in 10.9% cases. In 19 cases (17.27%), the manner of collision was unknown (Refer to [table no. 5](#)). Zhao Hui et al¹⁴ in their study regarding motorcycle crashes in China noted that Impact injury was the main fatal cause, accounting for 72% of motorcyclist deaths, followed by tumbling injury (26%) and run-over (2%). K.Prasannan et al¹⁶ noted front on collision in 46.70% of cases, impact from behind accounted for 11.10% and Skid and fall comprised of 10.40% cases. In contrast, in a study done in Delhi by C Behera et al⁶ most of the fatalities occurred due to impact of another vehicle from behind (40.42%), followed by fall of the rider due to loss of balance of vehicle due to various reasons (29.78 %).

In the present study, Head injury was the cause of death in majority of cases 49(44.54%), followed by 21(19.09%) fatalities due to Hemorrhage and Shock, Blunt trauma to chest and abdomen comprised of 17.2% cases, Cervical spine injury in 03 (2.72%) cases, injury to vital organs in 21(19.09%) cases and in 8 (7.27%) cases death was attributed to septicemia (Refer to [table no. 6](#)). Our observations are consistent with studies done by C Behera et al⁶, Mau-Roung Lin⁷, Nattapong Wittayarungruengsri et al⁸, Francis Faduyile et al¹²,

Zhao Hui et al¹⁴, K.Prasannan et al¹⁶ & Deepak Sharma et al¹⁷.

Table 6: Cause of death

Cause of death	Total
Head injury	49(44.54%)
Spine injury	03(2.72%)
Blunt trauma chest	11(10%)
Blunt trauma abdomen	8(7.27%)
Hemorrhage and shock	21(19.09%)
Injury to vital organs	10(9.09%)
Septicemia	8(7.27%)
Total	110(100%)

In contrast to other studies, Harnam Singh et al¹⁰, in their study on motorcycle fatalities observed Shock and hemorrhage as the most common cause of death (36.9%) followed by intracranial hemorrhages (19.6%) and severe brain injury (14.0%).

History suggestive of alcohol consumption was present in 21(25%) cases among 84 drivers. However, chemical analysis for alcohol consumption was found positive only in 12(14.2%) cases amongst drivers and 3 cases of pillion. None of the female driver or pillion was found drunk in our study.

5. Conclusion

In Metropolitan cities like Mumbai, owing to the rapid development, motorcycle use has been drastically increased and has become a very important means of transport due to its easy availability and ease of movement in heavy traffic.

For any measures to be effective on motorcycle traffic injuries the risk factors and target groups should be searched for and their magnitude of effect and preventability assessed. Young men in the age group 20-40 years must be the target groups for safety promotion work. Educating & sensitizing motorcycle riders regarding the use of safety measures like helmet usage, avoiding alcohol consumption at the time of riding and driving at slow speeds along with strict enforcement of traffic

laws with heavy fines will be of great help in preventing such fatalities.

Conflict of interest- Nil

Source of funding- Self.

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Original Research Article

**An Autopsy Study of Maternal Mortality at Tertiary Care Centre
at Kolhapur**

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Article Info

Abstract

Key words

Maternal death,
Medicolegal autopsy,
Direct causes,
Indirect causes,
Hemorrhage.

Prevailing high maternal morbidity and mortality has always been source of concern and antenatal and intrapartum care aimed at reducing maternal morbidity and mortality have been components of the Family Welfare programme since inception. The major causes of maternal mortality continue to be unsafe abortions, ante and post-partum haemorrhage, anaemia, obstructed labour, hypertensive disorders and post-partum sepsis. Inadequate coverage, lack of training of health personnel in antenatal screening, risk identification and referral, had led to hindrance towards the reduction of maternal mortality. In this study we have retrospectively analysed the autopsy cases concerning the maternal mortality in the period between 2015 to 2018 referred to Rajarshree Chhatrapati Shahu Maharaj, Government Medical College & CPR hospital, Kolhapur, Maharashtra. Total 60 cases of maternal deaths which were brought for autopsy were studied during period of January 2015 to December 2018.

1. Introduction

Although pregnancy is considered as a physiological process in developed nations, for women from developing and underdeveloped countries it is a life threatening event. World wide about 830 women die every day of preventable causes related to pregnancy and childbirth, 20 % are from India.¹

Maternal mortality is defined as “ The death of a woman while pregnant or within 42 days of termination of pregnancy (delivery

the duration and site of the pregnancy from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.²

Delivery includes miscarriages, abortions (spontaneous, legal and illegal), live or stillbirths, vaginal or cesarean deliveries.³WHO classifies maternal

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maternal deaths causes into four groups: 1) Direct 2) Indirect 3) late due to unanticipated complications of management, and 4) fortuitous deaths.²

- 1) Direct causes: The death is directly related to obstetric complications of pregnancy (pregnancy, delivery or puerperium); from interventions, omissions or treatment, or from chain of events resulting from any one of these.
- 2) Indirect causes: The death occurs as a consequence of the pregnancy exacerbating a pre-existing medical condition, or medical condition developing in pregnancy, but not directly attributable to the existing pregnancy, although the physiologic effects of pregnancy are partially responsible for the death.
- 3) Late death: The death occurring between 42 days and 1 year post-delivery from the conditions that are due to direct or indirect causes.
- 4) Accidental, incidental or fortuitous death: Death due to causes unrelated to pregnancy, delivery or puerperium. This many result from the accidental events (for eg. Vehicular accidents) or incidental causes (eg. Swine flu).⁴

Maternal mortality rate: The number of maternal deaths in a population divided by the number of women of reproductive age (15-49), usually expressed per 1,00,000 women of reproductive age per year. In India, it is about 120 as compared to 0.5 in the US.⁵The various causes of maternal deaths may be a combination of direct and indirect causes, and the deaths may be multifactorial.

Objectives:

1. To know the causes of maternal death subjected to postmortem examination.
2. To classify the causes according to groups.
3. To suggest measures to prevent maternal deaths.

2. Material & methods:

A total of 60 cases of maternal death which underwent medico-legal postmortem examination in the period of 4 year 2015 to 2018 were studied at the Department of forensic medicine and toxicology, Rajarshi Chhatrapati Shahu Maharaj Government medical college, Kolhapur, Maharashtra. All the autopsies in maternal death were performed by a team of forensic expert,

pathologist and a gynecologist, after an inquest along with the clinical papers were received for the same. The study includes cases of maternal deaths which were treated at the same institute, along with cases referred from private hospitals, peripheral government hospitals, remote areas, and the cases which were brought dead at the hospitals. Cases from the year 2015 to 2017 were studied retrospectively after detail analysis of the postmortem reports, inquest papers and histopathology reports, while cases from the year 2018 were studied prospectively.

3. Results:

It is observed from this study that out of the 60 cases of maternal mortality brought for autopsy in the period of 2015 to 2018, maximum number of maternal deaths were seen in age group of 20 to 29 years comprising 40 (66.4%) and 12(19.92%) cases were found in the age group 30 to 34 years of age. Only 3 cases belong to the age category below 20 years and 5 cases above the age 35 years (Refer to **table no. 1**).

Table no. 1 distribution of cases as per age groups

Age wise distribution %	Present study	Thomas et al	Kuralkar et al	Mukherjee et al	Soni et al	Patil et al
<20	3(5%)	3.1%	7.4%	10%	21.5%	7.94%
20-29	40 (66.4%)	70.8%	73.7%	68%	65.5%	74.6%
30-34	12(19.92%)	16.9%	11.6%	18%	7.53%	15.1%
>35	5(8.3%)	9.2%	7.4%	4%	2.15%	2.34%

Table no. 2 distribution of cases as per residence (urban/rural)

Urban/Rural	Present study	Kuralkar et al	Soni et al	Bangal et al	Patil et al
Urban (%)	16.6	61.1	36	1.8	61.9
Rural (%)	83.4	38.9	64	98.2	38.1

Maximum cases 50 (83.4%) were residing in rural area where as rest 10 cases (16.6 %) belonged to urban area. Most cases (30) of maternal mortality were referred for autopsy from the government hospitals including the present institute where the study was conducted, while 24 cases were from the

private hospitals, and 6 cases were directly brought as dead to the casualty (Refer to [table no.2](#)).

Table no. 3 Distribution of cases as causes of maternal death and their percentage

Causes	Number of cases with percentage		
	Present study	Thomas et al	Kuralkar et al
Direct maternal deaths	48 (80%)	39 (60%)	85 (89.4%)
Indirect maternal deaths	11 (18.3%)	24 (37%)	10 (10.5%)
Undetected deaths	0 (0%)	2(3%)	0 (0%)
Incidental causes	1 (1.66%)	0	0 (0%)

Most of the cases (32) were with full term gestation while only 2 cases belonged to the first trimester. Death occurring in the 3rd trimester were the second most with 18 no. of cases. 24 cases of maternal mortality were primigravida, while 18 cases were of second gravida and least no. of cases belonged to the 4th gravida and above.

Table no. 4 Distribution of cases as causes (direct/indirect)

Causes of death		No. of cases.
Direct causes	Hemorrhage	22 (36.66 %)
	Sepsis/ Respiratory causes	14 (23.33%)
	DIC/PIH/HELLP syndrome/ anemia	12(20%)
Indirect causes		11(18.3%)
Incidental		1(1.66%)

Most of the causes of death found during autopsy were direct causes, of which hemorrhage was the leading cause (22 no. of cases) followed by the respiratory causes and respiratory causes. 11 cases of maternal death were having indirect causes while only one case had incidental cause of death

4. Discussion:

Most maternal deaths occur in underdeveloped and even developing countries like India and are bundled around delivery and the immediate post-partum period, although there are variations depending upon the population. Maternal mortality reduction has been the topmost priority for the international community. The Millennium Development Goals⁶ and the WHO 'Make every mother and child count' Initiative⁷ describe the importance of maternal mortality reduction as a healthcare issue. A recent systematic review of the causes of maternal mortality and its geographic distribution has shown that the Indian

subcontinent has a significantly higher maternal mortality attributable to sepsis, infection and hemorrhage.⁸ Though maternal mortality has been the subject of a number of studies in India, very few detailed autopsy studies have been reported. A comprehensive summary of the magnitude and distribution of the causes of maternal deaths is critical to reform reproductive health policies. With this view we conducted the study based on the medicolegal autopsy done in cases of maternal deaths during the period of 2015 to 2018 at RCSM GMC Kolhapur.

In the present study, higher incidence of maternal deaths 40 (66.4%) in the age group 20 to 30 years is in accordance with that observed by Thomas et al⁹, Kuralkar et al¹⁰, Mukherjee et al¹¹, Soni et al¹², Patil et al¹³. Greater incidences of maternal deaths in the group of 20 to 30 years in the present study may be attributed to the common tradition of marriages in the early 20's and early pregnancy, especially in the rural areas.

In the present study, 16.6 % females were residing in urban area and rest 83.4 % in rural areas. The predominance of rural area in maternal death was in consistency with the observations of Soni et al¹² and Bangal et al.¹⁴ However, these results are in contrast with that observed by Kuralkar et al¹⁰ and Patil et al¹³ who noted maximum maternal deaths in urban locality. Majority of the women in rural area belong to lesser awareness about the healthcare to be taken during maternity, with fewer ANC visits and poverty causing more no. of deaths during the pregnancy and labour. Also distant health facilities at the rural areas in the vicinity of this region also may be responsible for the predominance of maternal deaths in females residing at rural areas.

A retrospective autopsy study of all cases of maternal deaths that underwent a medicolegal autopsy at this tertiary health centre from January 2015 to December 2018 where a total of 60 cases were autopsied, we found that in the autopsy cases most common causes of maternal mortality were due to direct causes i.e 80 % , among them hemorrhagic shock (36.66 %) was the most common. It was followed by septicemia (14 %) and disseminated intravascular coagulation due to pregnancy induced hypertension, anemia (12%). Indirect causes followed the direct causes which was 18.33 % which included death causes like

kidney infections, pneumonia, anemia, subarachnoid hemorrhage, hepatitis, etc. Only one incidental cause of death due to swine flu infection was observed in the study.

Predominance of deaths due to direct causes over the indirect causes was consistent with the observations by Thomas et al (60% direct causes over 37 % indirect causes)⁹ and by Kuralkar et al (89.4% direct causes over 10.5 % indirect causes).¹⁰ In both the studies it was observed that hemorrhage alone was most common cause of death in direct causes, which was followed by pregnancy induced hypertension.

In the current study, where hemorrhage was the leading cause, 3 cases died of hemorrhagic shock due to uterine rupture, 2 cases due to vaginal and cervical tears, 3 cases due to placental separations and abruption. One death was related to hemorrhage following lower segment caesarean section.

Most of the direct causes of deaths were from the rural areas which were either brought in dead or referred from primary health centres and rural hospitals with insufficient management to prevent the morbidity. Rural women face a series of restrictions that prevent necessary care leading to higher risks during pregnancy and birth. In study by Bangal et al¹⁴, it was observed that significant number of cases (46.42%) had one or the other form of delay in seeking or receiving care before death of which thirty-eight cases out of 56 had avoidable factors. In twenty-six cases there was delay in decision making to seek care. Eight deaths were seen due to delay in reaching care, mainly due to lack of transport facilities.

5. Conclusion:

The facility of health care at the terminal end of our health provisioning system in the rural are as urgently requires a headstrong political drive to improve the present situation. In addition, lack of acceptable referral facilities to provide emergency obstetric care for complicated cases also subsidize to high maternal mortality rate.

To lower maternal mortality following steps must be taken into consideration: -

1. Early registration and mandatory four antenatal check-ups

2. Dietary supplementation, including correction of hemoglobin
3. Early diagnosis of pregnancy induced hypertension.
4. Prevention of hemorrhage during delivery, puerperium
5. Promotion of institutional deliveries for women with bad obstetric history and risk factors
6. Identification of every maternal death and searching for its cause through autopsy
7. Provision of safe abortion services
8. Analysis of every maternal death through maternal death audit.

To conclude, it should always be remembered that Maternal mortality, even today, is a preventable tragedy.

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Conflict of interest: None declared.

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Short Communications

Executive Summary of 22nd Annual State Conference of Medicolegal Association of Maharashtra (MLAM): Pravara Forensicon 2019

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Article Info

Key words

Competency Based
Medical Education,
Forensic Medicine,
Medicolegal
Conference.

Abstract

The twenty-second State annual chapter of Medicolegal Association of Maharashtra (MLAM) was being hosted by the Department of Forensic Medicine, Rural Medical College, Pravara Institute of Medical sciences, Loni, Ahmednagar, Maharashtra on 12th & 13th October 2019. The main theme of conference was to inculcate and to concoct Competency Based Medical Education (CBME) in Forensic Medicine & Toxicology. Around 200 delegates and invitees with expertise in various field attended the conference. The conference Inaugurated in the hands of Dr G Pradeep Kumar Vice Chancellor, SDU University Kolar, Karnataka at Sindhu Hall of Padmabhushan Dr. Balasaheb Vikhe Patil Lecture Hall Complex. The Souvenir & MLAM official Journal- Journal of Forensic Medicine Science & Law were released at the same time. Various guest lectures on CBME curriculum, clinical Forensic Medicine, Tele-evidence, laws related to medical practice & E-documentation were delivered by eminent experts. On day two oral & poster presentations were done by faculty & Postgraduate students.

1. Introduction

The "22nd Annual State Conference of Medicolegal Association of Maharashtra (MLAM) 'PRAVARA FORENSICON 2019', had been held on 12th & 13th October 2019; and was organized by Department of Forensic Medicine & Toxicology, Rural Medical College of Pravara Institute of Medical Sciences (Deemed to be University) Loni; India under the aegis of Medicolegal Association of Maharashtra (MLAM).

Objectives of this Conference was to inculcate and to concoct Competency Based Medical Education (CBME) in Forensic Medicine & Toxicology and to know the Horizon of Medicolegal Solutions in Cases of Conflicts between Law & Medicine further to practice advanced Medico-legal services with updated knowledge and professional medical care

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with the use of recent advances in the field.

The conference was hosted by Pravara Institute of Medical Sciences (Deemed to be University) under the eminent leadership of Hon. Pro-chancellor Dr. Rajendra Vikhe Patil sir.

The conference had over 158 delegates registered from states. Delegates, Post graduate

students & researchers from various parts of the country attended the conference. On October 12, between 09.30 to 10.30 am Grand Inauguration Ceremony was held at Sindhu Hall of Padmabhushan Dr. Balasaheb Vikhe Patil Lecture Hall Complex. The release of Souvenir & MLAM's official journal also took place during the ceremony.



Photograph no. 1: Hon'ble Dr. Y M Jayaraj – PIMS DU's Vice Chancellor addressing the conference, 12.10.19.

The conference has declared open by Dr. Shailesh Mohite, President, Medico-legal Association of Maharashtra (MLAM). Dr. G Pradeep Kumar, Vice Chancellor, SDU University Kolar, Karnataka was the Chief Guest. Dr. Shailesh Mohite and Dr. Rajesh Dere President and Secretary of MLAM respectively were the Guests of Honours. The Inauguration Ceremony was presided by Dr. Y. M. Jayaraj, Vice chancellor of PIMS DU, Loni. Organizing President AVM (Retd) Dr. Rajvir Bhalwar – Dean RMC presented the welcome address. Shri Panjabrao Aher- the Executive Director of PMT was among the eminent guest on the Dias. Organizing Secretary Dr. Mohan Pawar – Professor & Head of Forensic Medicine department read the vote of thanks on behalf of the organizing committee.

The scientific sessions were carefully crafted and an innovative holistic Interactive

approach was employed whereby speakers, students and the faculty shared the same session. There were 19 speakers' presentations which included 3 keynote addresses & the lectures.

Sessions conducted on 12th October were as follows- Keynote Address on Skills & Competencies towards clinical Forensics Medicine Resource Person: Dr G Pradeep Kumar, Strategies for Implementing of Competency Based Medical Education in Toxicology, Resource Person: Dr V V Pillay; Enhancing the Competencies of budding doctors for depositing an evidence by Video Conferencing Resource Person: Dr Anil Agarwal; Viscera & Sample Preservation in Medicolegal Cases, Resource Person: Dr Krishna Kulkarni; Applicability of Forensic Science Advancements nanoforensics in Clinical Forensics. Resource Person: Dr R C Dere; Opportunities of consultancy &

Private practice for Forensic Expert. Resource Person: Dr Anil Agarwal; Sample Preservation protocol, Procedures and Challenges in medicolegal

Cases. **Panelist:** Dr S C Mohite, Dr S M Patil Dr Krishna Kulkarni.



Photograph no. 2: Release of the MLAM's Journal by the dignitaries at the conference, 12.10.19.



Photograph no. 3: Felicitation of Dr. V V Pillay at the hands of MLAM's President Dr. Shailesh Mohite & Organizing President AVM (Retd) Dr. Rajvir Bhalwar – Dean RMC Loni, after keynote address, 12.10.19.

On 13th October, various sessions were conducted as follows- The guidelines of POCSO overlooked by the Practitioners Resource Person: Dr S C Mohite; E- documentation & its status Medical Negligence. Resource Person: Dr. A V Patil; Legal liabilities of telephonic & e-consultations Resource Person: Dr. R.S. Bangal; Postmortem retrieval of sperms Resource Person: Dr. R.V. Bardale; Panel Discussions on 1) Grey areas of conflicts between Law & medicine 2) Practitioners' Medicolegal issues; **Panelist:** Retd. Justice S S Patil, Dr A T Barkul, Dr S M Patil, Dr Ashok Nandapurkar & Dr Ravindra Deokar and Moderator Dr Mohan pawar. The various topics were discussed at large during their presentations in this conference.

A total of 20 scientific presentations in the form of oral/poster were made by the student and

faculty delegates. The high quality of the research was well appreciated by all the attendees.

The conference also hosted a marvelous banquet to enable the delegates to interact with

the eminent academicians and researchers. The participants were entertained by a well known Orchestra of Maharashtra- '*Mumbai Melody*' from Mumbai.



Photograph no. 4: Former Justice Hon'ble Shri. S S Patil felicitating the awardee for their best presentation, at valedictory function, 13.10.19. Link for all conference photographs- <https://photos.app.goo.gl/7NwDzcWrudKMD5C78>



Photograph no. 4: Dignitaries & Faculty at the valedictory function, 13.10.19.

The grandeur of the venue and the gastronomic delighted menu left the attendees spell bound. This gave the delegates a much needed chance to unwind and interact in an informal setting.

The two-day extravaganza came to an end with the valedictory function. Former justice Hon'ble Shri. S. S. Patil of Mumbai High Court (Aurangabad Bench) was the chief guest for the valedictory function. He enlightened the audience about the importance of newer aspect of modern Medical Jurisprudence. He also gave away the

awards for the best scientific presentations at the conference. The first lady in Forensic Medicine Dr. Vasudha Apate, Founder President and Secretary of Medicolegal Association of Maharashtra was also present for valedictory function.

The conference helped all of us to put forth novel solutions for complex Medico-legal Problems. It ignited young minds and enabled Forensic Experts & other delegates to get exposed to newer practices in Forensic Fields.

The conference was hailed as one of the land mark Academic meeting at the Pravara family.



Photograph no. 5: Dignitaries & Organizing committee at the valedictory function, 13.10.19.

Concluding Remarks:

The detail discussions on contents, implementation & fruitful outcomes of Competence Based Medical Education (CBME) in Forensic Medicine & Toxicology was accomplished. It was solidly accepted by the august gathering that CBME is going to yield better IMGs.

It was felt that there is a need of formulating & updating time to time clear cut guidelines to be issued by Forensic Science

Laboratories for receiving various samples for analysis purpose. It was agreed that the further effective Forensic Services are possible with the assistance of an advancement of the Medical & Forensic specialties.

It was observed that, the Medical personnel faced many ground reality problems to attain & to depose their evidence in Court of Law. There are many areas of this front to be represented before the Judiciary.



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Review Article

Duty of Candour in Indian Context: How Much Information is too Much for Our Patients?

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Article Info

Key words

Physicians,
Patient interest,
Inadvertent
complications,
Compensation.

Abstract

Introduction:

Duty of candour is the requirement of all physicians i.e., being open and honest with their patients especially when things are likely to go wrong or have gone wrong. This is very crucial especially in high risk branches such as obstetrics and gynaecology where two lives, mother and baby are at stake.

Background:

Following this duty of candour can be very tricky in present day Indian scenario, when patient trust is difficult to gain and every move of the physician is taken by patient as a means of monetary gain.

Method:

We present a review article with stimulated examples of commonly encountered scenarios in obstetrics and gynaecology where physician duty and patient interest are at stake. These are followed by discussion.

Conclusion:

The current scenario in Indian subcontinent is such that doctors are afraid to tell in detail about any inadvertent complications patients may file lawsuit or claim monetary compensation or damage the hospital.

Introduction:

In the branch of Obstetrics and Gynaecology things can go very wrong sometimes and what is expected to be a straightforward case can have serious complications. 97% of all obstetrics patients have no complications and have good outcomes. It's the ones who have unexpected outcomes that we have to be careful in management, documentation and communication. But unless things go wrong we do

not know which patient needed to have adequate and detailed communication and documents.

Professional "Duty of condour" as described by Nursing and Midwifery Council¹ is that each and every doctor should be frank and truthful with his/her patients and when any treatment or surgical

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procedure that goes wrong or causes, or has the potential to cause, harm or distress the doctor must tell the patient or his family when something has gone wrong, apologise to the patient offer an appropriate remedy or support to put matters right (if possible), explain fully to the patient the short and long term effects of what has happened.^{1,2}

This is absolutely essential in correct medical practice, but in present day Indian Scenario, with relation to obstetrics and gynecology patients things can be quite tricky. As honorable doctors it makes complete sense to give complete and accurate information, but this information itself can antagonize the patient and may increase hostility.

Scenario 1:

A 24 year old primigravida with 39 weeks of pregnancy with high blood pressure not being controlled on medications. She need to be delivered early and is offered induction of labour. She and her family want to know the possible options and their outcomes. They are counseled in detail by the treating physician that her baby size is small for gestation age, possibly due to the pregnancy induced hypertension, they are also explained in detail about chances of failure of induction of labour, prolonged stay in hospital for mother and baby, detailed information about labour increased time taken by a primigravida to respond to labour pain told. Chances and risks of cesarean sections explained. Risks of complications in future pregnancy if this one ends up in cesarean also explained. Another option of immediate cesarean section also offered. Small chance of baby requiring NICU (neonatal ICU) also told. Prolonged hospitalization, risk of convulsions in mother if not delivered soon explained. After discussion they opt for induction of labour.

The mother takes 3 prostaglandin pessaries sequentially every 8 hours and then is started on oxytocin augmentation after artificial rupture of membranes. The entire process takes more than 36 hours. Still she is nowhere near delivery, the physician offers her cesarean for failure of induction, but the family wants to wait more. They wait for another 6 hours though are constantly urged by the physician to go cesarean as there are

no changes in bishop's score (which indicates chances of normal delivery). Finally, the fetal heart becomes abnormal on cardiotocography and reluctantly they agree for cesarean on persistent counseling by the doctor. The baby is 2.3 kg and handed to neonatologist but needs admission to NICU for 5 days. Mother has post partum hemorrhage and is also admitted in ICU for 4 days before being sent home.

The family gets upset and refuses to settle bills claiming this to be a complication by the doctor. They accuse the doctor of also trying to pressurize them for cesarean from the beginning itself. They accuse him of planning the prolonged stay and cesarean in advance to make more profit. The doctor thinking that it was his duty to inform about all outcomes but this itself is taken against him and the patient relative refuse to settle the bills and take him to consumer court for malpractice.

There is a general perception in the public that most obstetricians want to do cesarean section directly without giving trial of labour. But in reality in most developed countries with adequate health infrastructure the rate of cesarean section is about 25%. In fact, WHO has identified 15% cesarean section rate as a marker for adequate healthcare for pregnant women³ This rate of cesarean also is increased in women for whom labour is induced which could be due to multiple reasons. In fact the chances of caesarean in case of induction of labour are known to be close to 22%.⁴

But unfortunately Indian doctors are losing trust from their patients and their families and are constantly being accused of unnecessary interventions for generating profits, though these interventions may only be offered for the best interest of the patient. If the cesarean was done 6 hours earlier, as advised by the doctor in the above case, possibly the baby's NICU admission could have been avoided.

Scenario 2:

34-year-old patient trying to conceive for 3 years, she and her husband have tried multiple medications but to no avail. They have tried ovulation induction with clomiphene, injectable gonadotropins and finally opted for invitro fertilization(IVF). As duty of candour the fertility specialist informed them the chances of success of

in vitro fertilization could be upto 30% per cycle. Increased risk of miscarriage, preterm and multiple gestation were explained. They were also informed about chances of congenital malformation are increased in IVF pregnancies and could be 2-5%. They underwent the first cycle of IVF which was unsuccessful, after taking a break for a month they opted for their second cycle and were fortunate to conceive. They conceive triplets and unfortunately one of the babies had a congenital heart condition and required multiple surgeries post delivery. Being triplet pregnancy the baby was also preterm and this increased morbidity.

The couple were informed in detail about chances of malformation in the baby and risks of preterm. Since, it has long term implications and very high morbidity for the baby it was imperative for the couple to be informed about the possible implications.

Scenario 3:

28-year-old gravid 2 para 1 was 8 weeks pregnant and she suffered a missed miscarriage, she opted for surgical management of miscarriage and underwent a suction evacuation under general anaesthesia. Unfortunately, she had a uterine perforation during the procedure. The doctor identified the mistake but since she was vitally stable did not do any further procedure. Post operative after the patient regained consciousness, she informed the patient in detail about the events. She also informed the patient about the chances of delayed peritonitis, as there is a small possibility that she may have delayed onset of the symptoms. Also need for caution in future pregnancies explained, close monitor and possible cesarean at term to avoid uterine damage explained.

This doctor shows exemplary duty of candour. When an inadvertent complication arises it's the duty of the doctor to inform it in detail to the patient as in this case it can have implications in future fertility of the patient as well. Peritonitis is a life threatening condition and patient was made aware of all its symptoms so she could avoid immediate medical help necessary.

Conclusion:

The professional duty of candour is vital, even if it meant risking a possible litigation from the patient side for the complication.

However, the current scenario in Indian subcontinent is such that doctor are afraid to tell in detail about any inadvertent complications patients may file lawsuit or claim monetary compensation or damage the hospital. This culture of fear will be more detrimental to the patients' best interest in the future as doctor and other health care professional may hide or under report any possible complications to avoid reprimand. This will harm patient interest. This will also bring down the level of care that Indian physician are known for world over.

Strict laws should be made to protect doctors from litigation when they disclosed complete information to the patient in a timely and systematic manner.

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Case Report

Penetrative Pelvic Trauma with Isolated Iliac Artery Injury: A Case Report

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Article Info

Key words
Pelvic,
Vascular Trauma,
Road Traffic Accident,
Massive blood loss.

Abstract

Iliac vessel injury has a high mortality rate, within the first 24 hours, due to massive blood loss. The pattern of pelvic vascular trauma can range from isolated vessel injury to complex arterio-venous injuries. The deceased was an 80-year-old female, who sustained a penetrative injury to her right gluteal region from a projecting screw of the horizontal iron bar of a truck, leading to fatal bleeding due to internal iliac artery tear. This case highlights the isolated lacerated injury of the right internal iliac artery which is an uncommon phenomenon in road traffic accidents.

1. Introduction

Penetrative pelvic trauma (PPT) cases are usually uncommon, presenting as a challenging medical case to the emergency medicine department. 'Penetrating pelvic trauma (PPT) is defined as a wound extending within the bony confines of the pelvis to involve the vascular, intestinal or urinary pelvic organs'.¹ The pelvic compartment has a very compact and complex anatomy which makes every penetrative injury unique and potentially fatal. Every case of PPT is unique in its own way which may be related to the foreign material causing the injury like a bullet, knife, metal rods, etc or in relation to the path taken by the foreign object to cause the injury.

Patient's with PPT present to the emergency medicine in an extreme haemodynamically unstable condition or to the Forensic pathologist with history of sudden death or survival for very short duration following the trauma incident. Exploration in most cases show injury to the soft tissues, pelvic bones, genitourinary system, rectum, vessels, nerves and intra-abdominal organs. Among these vascular injuries are usually a surgical emergency with high percentage of mortality. Arterial and venous vascular injuries are equally common following PPT and both are highly fatal.² The major vessel seen in pelvis is the iliac artery and veins.

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Mortality rate of iliac vessel injuries range from 30-50%.³ The most major factor contributing to mortality are blood loss and related haemorrhagic shock.^{4,5} In cases which survive the acute event, risk of fatal infection is very high.¹ In 80% of cases, pelvic injuries happen as a result of road traffic accidents (50% cars, 20% bikes and 30% pedestrians).⁶ In literature, pelvic vascular injuries are more common due to blunt traumas as they are associated with pelvic fracture.⁷ Isolated iliac vessel injury without pelvic fracture is uncommon in road traffic accidents. We report a case of a female pedestrian who sustained an iliac vessel tear due to penetrative injury in road traffic accident.

2. CASE REPORT

A 80-year-old lady, was a pedestrian walking along the left side of road, road did not have a cemented pedestrian walk station. A mini truck which had a transverse iron bar which was part of the locking mechanism of the metal door at the rear end of vehicle got loosened and became oblique in position extending towards the road. A 2-inch-long screw, which connected the iron bar and the main frame of the vehicle, was projecting outwards at the free end of the iron rod. While the truck passed by the pedestrian, she was hit by the iron rod with the screw which was projecting out of the vehicle and the pedestrian was thrown out of balance (Refer to [Figure 1](#)).

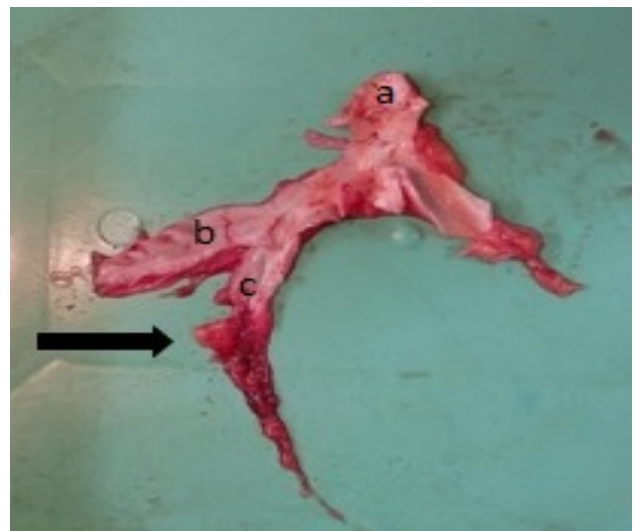
Figure 1: Iron rod with projecting screw being loosely suspended at the rear of the mini truck



She was immediately shifted to the nearest tertiary care hospital where the initial trauma management was done and she expired within few hours of arrival at the hospital. The screw which had caused the injury had a grooving surface all along its length and was covered with dried blood stains. It had caused a penetrative pelvic injury which had resulted in severe haemorrhage and death of the pedestrian. On autopsy, the body appeared pale on general examination. On external examination a sutured lacerated wounds of size 5 cm X 2 cm X bone deep on was present over the right gluteal region placed 4 cm lateral to the gluteal cleft and 10 cm below the posterior superior iliac spine.

On internal examination of the abdomen, 1000 ml of blood was present, on suctioning out the blood; an organized clot was present on the right pelvic cavity. The clot measured 10 cm x 7 cm and on removing the clot the right internal iliac artery was lacerated, 3 cm distal to common iliac artery bifurcation (Refer to [Figure 2](#)).

Figure 2: Laceration of right internal iliac artery (black arrow)



The margins of the tear were contused and serrated. On probing the wound from the external injury, the track passed through skin, gluteal muscles, the right obturator foramen, and obliquely passed upwards to pierce the right internal iliac artery along its posterior wall. The uniqueness of this PPT was that pelvic bone was intact and there was no injury to any other pelvic viscera except for the right internal iliac artery. Hence the cause of

death was opined as Haemorrhagic shock due to laceration of the right internal iliac artery.

3. DISCUSSION

Pelvic injuries are very common cases in medical practice. They could be either blunt pelvic trauma or Penetrating/perforating pelvic traumas. Among them blunt traumas are very common and mostly is associated with road traffic accidents.^{8,9}PPT even though is comparatively less than blunt trauma but has higher chances of fatality with a risk of visceral injury in up to 90% cases.¹⁰Impalement pelvic injuries are a category of PPT where the object which causes the penetrating injury is still in-situ, this to some extent has a protective effect due to the tamponade effect of the object on the injured organ and prevents haemorrhage. In cases where the object causing the PPT gets dislodged or is removed, it usually causes severe uncontrolled bleeding as in the case presented here where the screw which caused the injury got dislodged as the vehicle was still in motion and the pedestrian lost balance and moved away.¹¹

PPT patients present with history of usually accidental injury, less commonly homicidal injury and very rarely suicidal injuries. At presentation to the casualty these patients will be usually in an extreme haemodynamically unstable condition especially following the dislodgement/removal of foreign object as in this case. There can also be a history of sudden death following the trauma incident due to the high fatality of these injuries. Radiological investigations like X-ray and CT scan are of immense importance in handling such cases but stabilization before these procedures take the priority. Exploration in most cases show injury to the soft tissues, pelvic bones, genitourinary system, rectum, vessels, nerves and intra-abdominal organs. Among these vascular injuries are usually a surgical emergency with high percentage of mortality and account to about 10.6% cases of PPT. Arterial and venous vascular injuries are equally common following PPT and both are highly fatal.²

The major vessel seen in pelvis is the iliac artery and veins. Isolated vascular injury in PPT as was the condition in the case presented above is very rare and very limited literature is available regarding this type of injury. There are numerous

studies available on pelvic vascular injuries. According to Tyburski et al, who studied the mortality rates of 470 patients with an abdominal vascular injury, blunt trauma and gunshot wounds had the highest mortality (57%) and stab wounds had the lowest mortality (30%). Among iliac vessel injuries, common iliac and internal iliac artery vessels are associated with higher mortality.

As far as iliac veins are considered, common iliac veins injuries have high mortality.^{12,13}In general, penetrating vascular trauma is often due to stab or gunshots injuries.¹⁴ In European countries stab wounds are more frequent than gunshot wounds due to strict firearms law contrary to the pattern in the United States.¹⁵ Pelvic vessel injuries due to blunt force are commonly associated with pelvic fractures. Isolated pelvic vessel injuries without pelvic fracture in road traffic accident are barely reported in the literature.¹⁶ Hence isolated penetrative iliac vessel injuries following a road traffic accident is uncommon in this context. In accessibility to the pelvic cavity structures is the main practical problem faced by forensic pathologists which leads to limited exploration of structures and in many cases causes the Forensic pathologists to miss many key injuries. Meticulous complete dissection of pelvic structures at autopsy is required for detailed examination of the organs injured and this usually needs a wider approach by removing part of the pelvic bone.

Use of radiological investigations like X-ray and CT scan before starting autopsy can help in better understanding the path traversed and also structures damaged. Death mostly occurs due to haemorrhagic shock and in cases which survive the risk of infection is very high. The protruding screw of the vehicle acted as a projectile causing a deep penetrative injury to the right internal iliac artery. The track followed was unique because it had pierced the obturator membrane and caused the deep cut of the vessel. The pathophysiology of death in this case i.e. haemorrhagic shock is simple, however, the mechanism of isolated vessel injury is uncommonly encountered in forensic practice.

4. CONCLUSION

Pelvic injuries are always a challenge to the doctors handling them and also to the forensic

pathologists in particular during autopsy. Radiological studies should be made use of for better understanding and handling of such cases. Pelvic injuries especially penetrative pelvic trauma needs more aggressive and active management.

At autopsy such cases mandates in detail pelvic exploration for better understanding of the mechanism of injury and cause of death. Isolated right internal iliac artery tear in penetrative pelvic injury are highly uncommon entity and must be anticipated by the forensic pathologist while encountering such cases.

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Case Report

Exploration of Surgical Site In Vertebral and Spinal Cord Injury- A Unique Approach and Experience

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Article Info

Key words

Vertebro-spinal
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Surgical Implant,
Spinal Cord
Dissection,
Vertebral Dissection.

Abstract

Introduction: Conventional methods of autopsy are essential for valid scientific outcome. But in many cases, unforeseen circumstances may lead an autopsy surgeon to utilise unconventional methods to perform post mortem examination. Hence, it is important to be flexible in practical fields to obtain best possible results. Spinal cord in autopsy can be removed via anterior & posterior approach; anterior approach being the best accomplished one. **Objective:** To depict the experience including difficulties and improvisation during autopsy of a post spinal surgery case with unique method of dissection and post mortem exploration of surgical site. **Case History:** 61 years old male had history of road traffic injury & expired 35th day post injury. **Findings:** During autopsy, a longitudinal midline surgical incision 20cm long over back of neck and thorax, placed vertically, was revealed on external examination. On further dissection of the surgical site, a prosthetic implant is explored but cannot be taken out through posterior approach dissection only. Thus, another unique manoeuvre was performed to reveal rest of surgical sites and implants. The prosthesis has anterior and posterior component. The posterior component was larger and longer compared to the anterior ones. Spinal cord was also dissected accordingly through the unique approach. **Discussion:** Anterior vertebro-spinal dissection permits removal of spinal cord and peripheral nerves in continuity. Posterior approach is recommended to visualise cervical spine and cranio-cervical junction better. But in this case, performing these conventional methods was not enough for completing autopsy. Hence, recognition of this procedure is essential for future use by autopsy surgeons. **Conclusion:** This case highlights unique method of spinal cord dissection and exposure of prosthesis.

1. Introduction

In the field of forensic medicine, a trained eye, a questioning mind and a flexible approach are essential for the pathologist to come to the best conclusions. In many post mortem examinations, examinations, limiting oneself to conventional techniques may result in important

observations being missed. This case report demonstrates the importance of flexibility in ones

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autopsy techniques to achieve the best possible outcomes.

The ability to undertake vertebral column and spinal cord dissection is a necessary skill for any autopsy surgeon. Post mortem examination of the spinal cord is important to assess injuries in traffic accidents, homicides, suicide by various modes of asphyxia and also to detect poisons.¹ Vertebral or vertebro-spinal injuries are commonly seen as a result of fall from height, fall on ground by slipping, road traffic injuries or in some pathological conditions. It is commonly seen in adult or old age group, but also encountered in children or young population.²

There are two methods of approach, anterior and posterior, each having its own merits and demerits. Anterior approach is usually attempted to remove the spinal cord and peripheral nerves in continuity. While, the posterior approach is done to visualise the cervical spine and cranio-cervical junction better along with dissecting out the spinal cord intact.^{3,4,5}

Case History:

61 years old male had history of road traffic injury. He was first taken to a nearby Peripheral Health Centre, referred to SSKM Hospital, from which he was referred and finally admitted in private nursing home. A clinical diagnosis of traumatic cervical vertebrae and spinal injury with quadriplegia was made. He was operated on the 3rd day post injury. The patient was then transferred to the ward and after being admitted in the nursing home for over a month, he finally expired on the 35th day post injury. Being an unnatural death, the case had undergone medicolegal autopsy at the authors' institution.

Post Mortem Findings:

On external examination it was observed that the subject was average built and moderately nourished. Rigor Mortis was present all over the body. Cornea was hazy with pupils dilated and fixed. Scalp hair was 8 cm in length and beard and moustache each 2 cm in length all mixed black and grey hair. Vene-puncture mark was present over the dorsum of the right hand and also over left inguinal region 7.5 cm below left anterior superior iliac spine.

On external examination, a surgically made faint subcutaneous incised wound was present over the right side of the anterior aspect of the neck [Refer to Fig 1] and a surgically made incised wound 20 cm long was present over the back of neck and thorax placed vertically on midline [Refer to Fig 2].

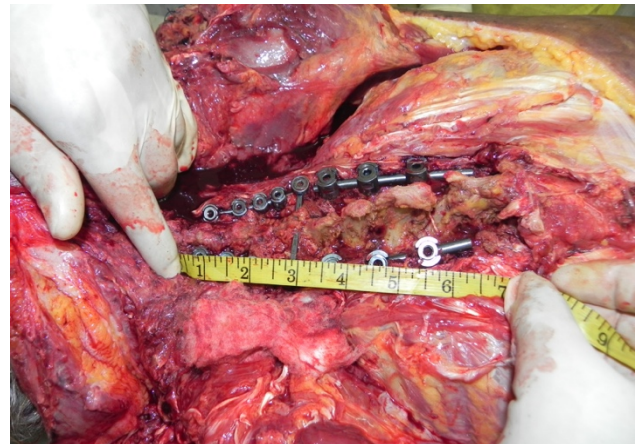
Fig-1: Subcutaneous incision mark on the anterior aspect of the neck



Fig-2: The surgically incised wound is apposed by 53 metallic clips



Fig-3: Prosthesis extends from lower border of C3 to lower border of T3



Hence, the body was made prone and posterior approach was attempted first. The wound started 5.5 cm below external occipital protuberance going downward up to 135 cm above heel. The margins of the wound were apposed by 52 metallic clips. On removing the clips, underlying soft tissue & muscle planes were found to be stitched in layers with surgical sutures. There was extravasation of blood over the back of the neck and back of the upper thorax present 25 cm x 10 cm area longitudinally.

On further dissection, one longitudinal metallic prosthesis was found present from lower border of C3 to lower border of T3 [Refer to Fig 3]. It had two longitudinal metallic curved rods (convexity laterally), each 16.5 cm long and 0.5 cm diameter which is 3.5 cm apart above and 4.6 cm apart below, having 7 screws on each rod. Upper 4 screws are shorter (1.7 cm length) and lower 3 screws are longer (3.6 cm length). Below 4th screw from above there is a narrow metallic transverse bar connecting both longitudinal rods. But even after removing the screws the whole prosthesis could not be removed posteriorly.

Fig-4: Longitudinal rectangular metallic plate

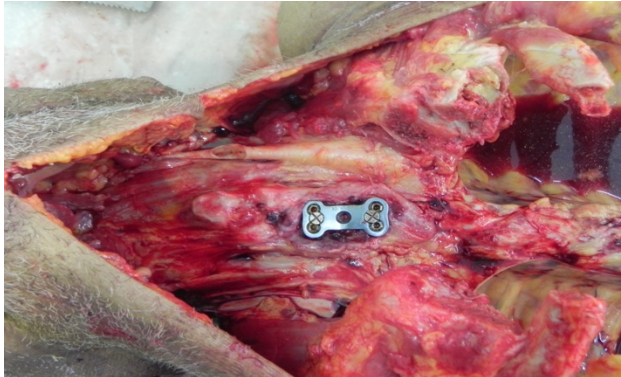
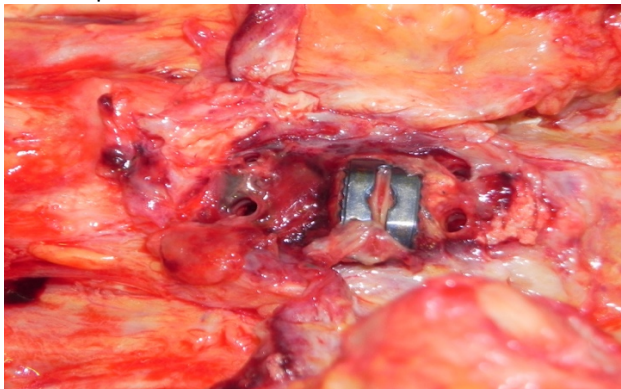


Fig-5: Cylindrical hollow implant exposed on removal of metallic plate



Hence, the body was made supine and the anterior approach was attempted. Anteriorly, on the right side of the neck, a subcutaneous incision was observed. It was 7 cm long and starts 10 cm below the symphysis menti going laterally and horizontally. On incision and removal of muscle and organs in layers the spine was exposed anteriorly. There was one longitudinal rectangular metallic plate measuring 3.5 cm x 2 cm fixed over the anterior surface of the body of C5, C6 and C7 vertebrae [Refer to Fig 4]. There were 6 screws (4 longer screws over four corners and 2 shorter screws in between) and a hole at the centre.

Fig-6: Posterior prosthesis



Fig-7: Metallic, centrally hollowed, cylindrical shaped implant



On removal of the metallic plate, there was another underlying metallic, centrally hollowed, cylindrical shaped implant measuring 1.3 cm x 0.7 cm x 0.7 cm in dimensions, placed within the anterior aspect of body of C6 [Refer to Fig 5]. "TA-GESCO-1281-CE" was written over it [Refer to Fig 6]. This implant was then removed. The body was then made prone again and the posterior prosthesis was removed.

“TA-TR-3X2-60-GESCO-CE” was written over horizontal bar of posterior prosthesis [Refer to Fig 7].

Discussion:

No dead body in authors` country can be legally disposed off (burnt or buried) without removal of all internal metallic foreign bodies or prosthesis. Moreover, as being the death an unnatural one, the medicolegal autopsy was performed. During medico-legal autopsy, improvisation is essential to come to a valid and scientific result. Spinal column and spinal cord examination is an awkward and potentially protracted procedure during autopsy. Numerous detailed complex procedures for dissection and examination of vertebral column and its contents have been described in many literatures till date. Thorough examination of vertebro-spinal column in situ is an effective method of demonstrating vertebral fractures and spinal injuries.⁶

After performing extensive review of literature, the authors found that antero-posterior dual approach of dissection of vertebral column for exploration of the surgical site during post mortem in a vertebro-spinal injury case has not been reported worldwide till date.

Post mortem vertebro-spinal dissection can be done by two approaches, anterior and posterior. In anterior approach, pedicles of the vertebrae are sawed by lateral cuts and the spinal cord is removed.^{7,8,9} While, in the posterior approach, the laminae of the vertebrae are sawed and the spinal cord is exposed.²The spinal cord should be removed via a dorsal approach when there is a likelihood of spinal injury. If a rostral cervical injury is suspected the spinal dissection should be performed before the brain is removed.⁶

In an ideal mortuary set up, cervico-thoracic instability of vertebra and spinal cord injury with or without fracture is best demonstrated by postmortem computed tomography (PMCT) and postmortem magnetic resonance imaging (PMMRI) which makes the autopsy procedure easy. But in this case the investigations were not available in the mortuary, so the task was more challenging.¹⁰

Studies have been published on postmortem radiological investigation to find out vertebro-spinal injuries before starting dissection. Flexion and

extension studies of the suspected areas were immensely helpful in demonstrating injuries and including occult lesions.^{11,12}

Conclusion:

Obscure and occult lesions in intervertebral discs, joints and also in the vertebral structures due to fatal road traffic trauma may be present at times which are not visible in naked eye during dissection. Non-invasive radiographic investigations before autopsy dissection are helpful, but not absolutely sensitive. So subtle lesions may still remain unrevealed leading to, underreporting of lesions during standard autopsy.¹³ In this particular case report, both anterior & posterior dual approaches have been attempted to dissect vertebra & expose spinal cord to visualize the lesions at best. This case has been published by the authors to enlighten the future autopsy surgeons encountering such situation during autopsy with ease of approach, and so that that they are not unprepared when a case as such, arrives at their hospital`s morgue.

Abbreviation:

PMCT- Postmortem Computed Tomography.

PMMRI- Postmortem Magnetic Resonance Imaging.

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Case Report

Suicidal Death By Xylazine and Ketamine Mixed Intoxication

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Article Info

Key words

Suicides,
Xylazine intoxication,
Ketamine intoxication,
Occupational access,
Suicide prevention

Abstract

Suicide is a complex personal and sociological phenomenon. India accounts for a growing share of the world's suicides. The suicide rates for men and women in India were much higher than the global averages. For both sexes in India, suicide was the leading cause of death among those aged 15-39 in 2016, while globally it was the third most common cause of death for this age group. The reasons for the suicide include lack of employment, poverty, high degree of stress in academic, financial and social reasons. The methods used depends on varies from hanging, poisoning, fall from height, firearms etc. here is a case, we aimed to present a veterinary physician, who had attempted suicide by Xylazine and Ketamine injections. With this case we wanted to present in detail about the Xylazine and Ketamine fatalities and forensic implications and current scenarios regarding suicidal deaths.

1. Introduction

Suicide is a complex personal and sociological phenomenon. India alone accounts for approximately 30% of the world's suicide deaths. In 2013 according to the website, Humansphere, suicide was the most claimed reason for the deaths of more than a quarter of a million Indians.

^[1] Worldwide it has been seen that 15-35 age group has highest incidence for suicide followed by the 50 plus age group. ^[2] Research suggests that psychiatric illness constitutes a major cause for suicides. High occupational suicide rates are often linked to easy occupational access to a method of suicide. The literature on suicide has identified consistent relationships between occupation and suicide. Several occupations with the highest

suicide rates include veterinarians (ranked first), pharmacists (fourth), dentists (sixth), doctors (tenth) and farmers (thirteenth). In this case study, we aimed to present a veterinary physician, who had attempted suicide by Xylazine and Ketamine. Use of Xylazine as a suicidal agent is a rare situation. There are few reports in which it was used for this purpose by veterinary physicians or people dealing with livestock.

CASE REPORT

An adult male of 28yrs old, who is a veterinary doctor by profession found to be dead in his house along with injectable syringes around him. He has called his

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girlfriend and said he would commit suicide. His clinical history is unremarkable. Only we know that he was smoker and social alcohol user. According to the information obtained from his I.O, and he might have injected I.V and S.C himself one vial of Xylazine (500 mg) and Ketamine (1000mg) with suicidal purpose. During Autopsy, on external examination there were multiple puncture wounds (injection marks) present over back of both hands and dorsum of both feet. Internally, the organs are intact and congested. The blood and viscera along with the skin around the injected sites with control sites were preserved for chemical analysis and sent to forensic science laboratory. Chemical analysis report found to be positive for Xylazine and Ketamine hydrochloride in the sent articles along with the presence of ethyl alcohol. Quantum of alcohol is 143.8mg/100ml of blood. Cause of death is due to cardiac arrest due to Xylazine and Ketamine mixed intoxication.

3. DISCUSSION

Xylazine is a colourless, bitter-tasted, crystalline substance, which is basically used in veterinary medicine. Its chemical structure is similar to phenothiazines, tricyclic anti-depressants, and clonidine. It is a nonnarcotic drug and used as a sedative or in combination with other drugs for sedation, analgesia, or general anaesthesia in animals.³ The use of Xylazine in humans was investigated and was not approved by FDA due to permanent hypotension, bradycardia, and reduction of cardiac output, with depression of central nervous system.⁴ Use of Xylazine as a suicidal agent is a rare situation. There are few reports in which it was used for this purpose by veterinary physicians or people dealing with livestock.

Ketamine is structurally and pharmacologically similar to the recreational drug phencyclidine (PCP), sharing its potent hallucinogenic and analgesic properties. Ketamine is used as an induction and sedation agent in emergency departments. It is used in all fields of anaesthesiology, including paediatrics, critical care, cardiac surgery, outpatient sedation and for the management of acute and chronic pain. In addition

to its legitimate uses, Ketamine is also a drug of abuse (rave culture)⁵ commonly identified by street names such as Special K, Vitamin K, and K. Ketamine is primarily acquired for abuse through sources such as hospitals and veterinary surgeons. Despite the reported increased use of Ketamine as a recreational drug, relatively few fatalities attributed to Ketamine poisoning have been documented. The adult literature is even more limited since all of the overdosed cases were self-induced from recreational use and were found postmortem.⁶⁻⁸ There are evidences for the lethality of mixed-drug intoxication involving Ketamine and Ethanol⁹ and Ketamine with various rave-associated drugs.⁷ Numerous mixed-drug fatalities cite a variety of Ketamine concentrations as contributing causes of death, all of which are markedly lower than the few reports of intoxication due to Ketamine alone.⁹

In a study of several mixed drug intoxications, in which Ketamine was detected, the presence of other drugs were concluded to be the major contributing factors for the fatalities. In our case report, as there was mixed intoxication and FSL report confirmed the presence of Xylazine, Ketamine and Ethyl alcohol. So, when the intake of Xylazine was mixed with Ketamine together with the alcohol, the toxic effects and the fatality increased by synergic effect. In our case, that the deceased had received 500mg of Ketamine and 1000mg of Xylazine. The concentration of Xylazine is more and studies show the death due to Xylazine is quite common. The overdose of Ketamine result in prolonged sedation or is tolerated, as studies shows due to overdosed cases of self-inflicted from recreational use and were found postmortem. So the fatality of Xylazine is more when compared to Ketamine, however, in our case, it was due to mixed intoxication due to Xylazine, Ketamine and Ethyl alcohol.

Occupations with access to lethal means represented those that had greater access to lethal means in the course of their work, and had knowledge about how to use these lethal means to harm themselves.^{10, 11} Our study suggest that occupational access to means is an important risk factor for suicide. Factors influencing an individual's choice of suicide method are believed to include

availability, knowledge about how to use a potential suicide method, and the overall perceived cultural acceptability of the method. There has been limited research on the relationship between access to means and suicide within the employed population, and those that have been conducted have been based in specific occupational settings (e.g., police, military, doctors and veterinarians).¹²⁻¹⁴

4. CONCLUSION

To our knowledge, there are six cases of Xylazine intoxication with the suicidal purpose in the medical literature. The common characteristics of the cases who attempted suicide were dealing with veterinary medicine or livestock; Our case was the first veterinary physician who had used Xylazine with Ketamine for the suicidal purpose. Since Xylazine and Ketamine are started to be used as a narcotic substance, the probability of meeting with Xylazine-related intoxication cases is increasing. There is evidence for the lethality of mixed-drug intoxication involving Ketamine, Ethanol and Ketamine with various rave-associated drugs. With this case, we wanted to present Xylazine and Ketamine in detail, and to update, inform, and warn the emergency physicians on Xylazine and Ketamine intoxication. The findings of this study suggest the importance of controlling access to lethal methods in occupations where these are readily available, and where there is evidence that these are particularly utilized by those who die by suicide.

Acknowledgement

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Case Report

Accident To Homicide- A Case Report

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Article Info

Abstract

Key words

Homicide,
Accidental Death,
Defence wound.

Homicide is defined as killing of one human by another. Homicide cases can often present at mortuary with the mask of accidental death. This case report describes such a case which turned out to be homicidal in nature even though information from police marked it to be an accidental death. The deed was revealed by the presence of defence wounds on the fingers of the cadaver.

1. Introduction

Section 299 of Indian Penal Code (IPC)¹ defines culpable homicide as "Whoever causes death by doing an act with the intention of causing death, or with the intention of causing such bodily injury as is likely to cause death, or with the knowledge that he is likely by such act to cause death, commits the offence of culpable homicide" while murder is defined under section 300 of IPC as "If the act by which the death is caused is done with the intention of causing death, or If it is done with the intention of causing such bodily injury as the offender knows to be likely to cause the death of the person to whom the harm is caused, or If it is done with the intention of causing bodily injury to any person and the bodily injury intended to be inflicted is sufficient in the ordinary course of nature to cause death, or if the person committing the act knows that it is so imminently dangerous that it must, in all probability, cause death, or such bodily injury as is likely to cause death, and commits such act without any excuse for incurring

the risk of causing death or such injury as aforesaid". A study done by UN Office on Drugs and Crime (UNODC)² showed that there is an increase in homicide cases from 395,542 in the year 1998 to 464,000 in the year 2017; whereas, in India, the number of homicide victims reduced from 48,167 in the year 2000 to 46,460 in the year 2010 and then 44,373 in the year 2015 to 42,678 in the year 2016. However, many cases come disguised as accidental deaths and hence meticulous examination may reveal otherwise.

2. Case report:

We received a 50 years old male cadaver for autopsy at our institute. He was a labourer working for construction of a building. On that very morning, he was found lying dead on the ground, where the

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construction was going on, with injury to head (Refer to **Photograph no 1**). He was a known alcoholic and on history from the co-workers by the police, one hypothesis was made that in drunken condition he might have slipped from the top of the building.

Photograph no 1: Deceased with head injury



Photograph no 2: Contused abrasion over right parietal region of scalp.



of decomposition. There were twenty-four numbers of injuries all over the body. Major amongst them were- A) One contused abrasion measuring 5cms x 2cms, was present on the right parietal region of the scalp on midline and is situated 10cms above medial canthus (Refer to **Photograph no 2**).

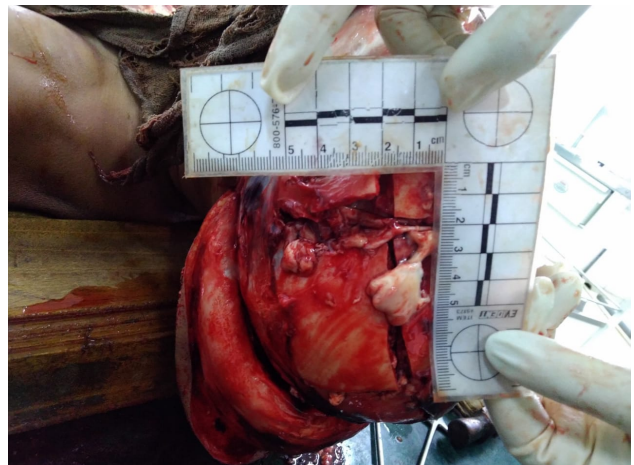
Photograph no 3: Defense wound over right index finger.



Photograph no 4: Defense wound over left middle finger.



Photograph no 5: Cranio-cerebral trauma with multiple skull fractures.



3. Autopsy findings:

External examination- The length of the body was 166cm and weight was 63kgs. Head was shaved and contour of the head was disfigured. Head and neck was smeared with blood and mud. Black eye was present bilaterally on both lids. Right eye ball was depressed and parts of cornea were abraded. Face was congested and finger nails had bluish discoloration. Rigor mortis was fully developed all over the body and postmortem staining was appreciated on the back of trunk and back of lower limbs and fixed. There were no signs

B) Multiple contused abrasions(5 in number) were present on left side of forehead over an area 6cm x 4cm, ranging in measurement from 3 cm x 1 cm to 1 cm x 0.5 cm. C) Multiple contused abrasions (3 in number) were present on right side of forehead over an area 8 cm x 5cm, ranging in measurement from 4 cm x 2 cm to 2 cm x 1.5 cm. D) One lacerated wound (Defense wound) measuring 5 cm x 3 cm x bone deep was present on the inner aspect of right index finger, 2 cm from metacarpo-phalangeal joint (Refer to **Photograph no 3**). E) One lacerated wound (Defense wound) measuring 4 cm x 3 cm x bone deep was present on the inner aspect of left middle finger, 2cms from metacarpo-phalangeal joint (Refer to **Photograph no 4**).

Internal examination: On dissection of the head, one sub scalp haematoma measuring 10 cm x 4 cm was found over frontal region and another measuring 18 cm x 8 cm over bilateral temporo-parieto occipital region. Whole skull was fractured into several pieces and inwardly displaced into brain matter (Refer to **Photograph no 5**). Stomach was empty and all the internal organs were intact and pale. Meninges were torn at multiple places. Subdural and subarachnoid haemorrhage was present all over the brain. Brain was lacerated at many places over the outer aspect of cerebral hemisphere.

Viscera were sent for chemical analysis. Chemical examiner's report came positive for ethyl alcohol. Cause of death was opined as Head Injury and all the injuries were antemortem in nature, caused by blunt weapon and homicidal in nature.

Discussion: Homicidal deaths are present since the beginning of human existence. Jealousy, feuds, wars, family issues all can be the cause of such action. Many a time, homicidal deaths appear as accidental deaths. In this present case, the presence of defense wound helped us to state the manner of the injuries and to exclude accidental death as suggested by the police. Defence wounds occur as a result of spontaneous reaction of the victims during an assault so as to protect them. This is an instinctive behavior that is present in all life form. The medico-legal importance of such wound is that it specifies the victim to be conscious and aware of the attack. Also it can point out the type of weapon used. It also signifies that the victim defended

himself. In one study conducted by Basappa et al³, it was found that defense wounds were present in 33% cases out of 121 homicidal deaths that were studied. Another study conducted by Lakmali et al⁴ stated that out of 213 cases of defense wounds, male victims were 75% and majority falling in the group 30-40 years. Most of them were struck by blunt weapon (72.3%). In another study conducted retrospectively in Egypt for a period of five years stated that 32.3% of the cases had defence wounds⁵.

4. Conclusion:

To aid in the administration of justice, we as autopsy surgeons should examine the cases with diligence and if defense wounds are found, it should be notified to the investigating officer so as to help them fast-track their investigation.

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Case Report

An Unusual Case of Death Due to Florid Lymphoid Hyperplasia

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Article Info

Abstract

Key words

Infant,
Lymph node,
Intussusception,
Intestine.

Florid lymphoid hyperplasia is described in Medical literature as rare entity and mortality arising out of it is still the rarest. The presentation of this condition to clinicians may mimic the signs and symptoms of Crohn's disease, acute appendicitis, acute regional ileitis etc. The present case has been taken for discussion to enlighten the rare disease and its unusual presentation.

1. Introduction

Florid lymphoid hyperplasia is type of lymphoid hyperplasia caused by stimulation of B cell compartment. Florid lymphoid hyperplasia of terminal ileum is characterized by localized morphological changes in lymphoid tissue of intestinal mucosa with nonspecific mesenteric lymphadenitis.^{1,2} The etiology of Florid lymphoid hyperplasia of terminal ileum is obscure but there may be association of this condition with yersinia infection, adenovirus infection, shigella infection and antigenic response to allergens.³

2. Case History:

An eight Months old male child having abdominal pain and tenderness in right lower quadrant with H/O vomiting, diarrhoea and fever from 8 days. He was admitted in private Hospital and taken treatment for the same. Instead of vigorous treatment the condition of child get worsens and died on 12/02/2019, 03:27 pm. Then body was brought for post-mortem examination on same day.

3. Autopsy findings:

External examination:

The body was moderately built, well nourished. both limbs were semi flexed, rigor mortis well marked and generalised.

Post-mortem lividity was present over back and buttocks except over pressure points. Milky fluid oozing from mouth. There was no evidence any external injuries over the body.

Internal findings:

On internal examination there is 100ml clear fluid-each pleural cavity, both lungs and pleura-Unremarkable, brain oedematous and congested. Peritoneum shows soft gelatine likemass present all over mesenteric border with evidence of enlarged lymph nodes. 200ml clear fluid in peritoneal cavity. Liver spleen pancreas, kidneys were unremarkable.

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Ileo-ileal intussusception present. Serosal surface of small intestines covered with exudate & ileo-ileal intussusception seen (Refer to **photograph no. 1, 2 & 3**).

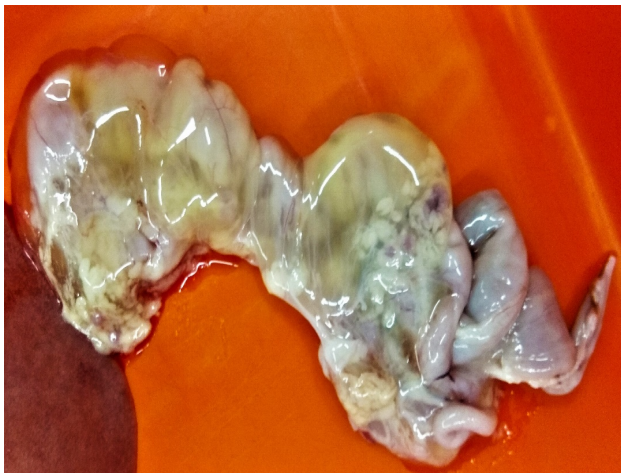
Photograph 1: Showing ileo-ileal intussusception.



Photograph 2: Cut section of ileum showing ileo-ileal intussusception.

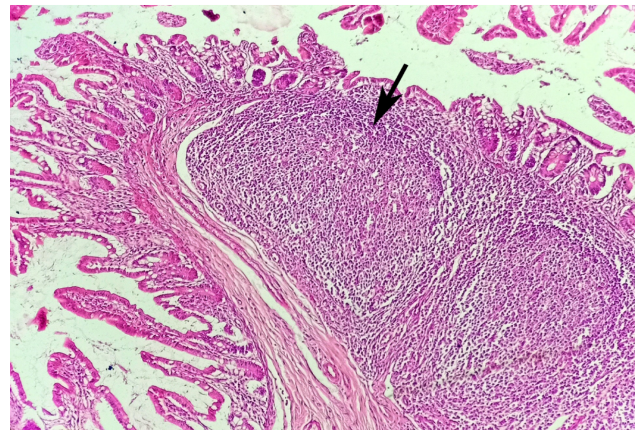


Photograph 3: Serosal surface of small intestines covered with thick gelatinous exudate Histopathological examination

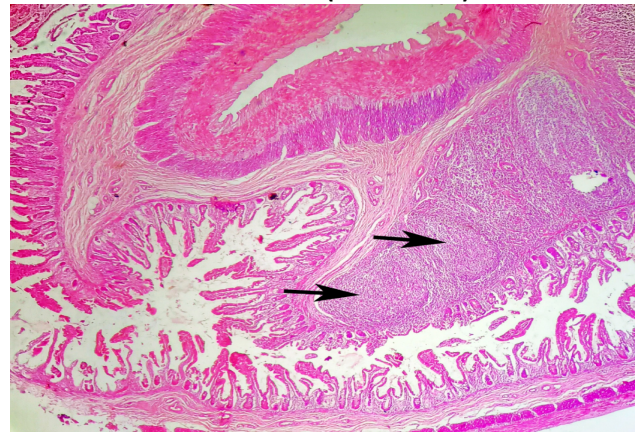


Brain, heart, lungs, spleen, both kidneys & liver were unremarkable with intestine shows serosal surface of small intestines covered with exudate on one side. On opening the ileum shows ileo-ileal intussusception measuring 2 cm in length. Mesentery shows presence of ten lymph nodes, largest measuring 1.5 x 1 cm, smallest being 0.2 x 0.2 cm.

Photograph 4: Scanner view showing hyperplastic lymphoid follicles (arrows) in the submucosa of intussusceptum (H & E X 40)



Photograph 5: Hyperplastic lymphoid follicles in the submucosa of intussusceptum (H & E X 100)



Microscopic examination:

Intestine shows ileo-ileal intussusception due to florid lymphoid hyperplasia (FLH). The ileum, caecum and appendix show FLH (Refer to photograph no. 4 & 5). Lungs shows focal intra alveolar haemorrhages, liver shows micro vesicular fatty change, spleen shows reactive lymphoid hyperplasia. Brain, heart, kidneys shows no specific lesion.

Discussion:

Golden described the roentgenological picture of 'non sclerosing ileitis' in detail. Mucosal folds of the terminal ileum are thickened with a loss of flexibility of walls. Polypoid elevations give it a cobblestone appearance. When the size of the follicles reaches its culmination, most severe pain and tenderness can be elicited.³Clinically florid lymphoid hyperplasia of terminal ileum is most frequently confused with acute appendicitis, acute regional ileitis, acute mesenteric lymphadenitis, and giant follicular lymphoblastoma.³ Rubin et al illustrated that terminal ileum lymphoid hyperplasia can be divided into childhood (common) and adult (rare) form.

The adult form is difficult to distinguish from low grade lymphoma, but can only be differentiated by the absence of light chain restriction.⁵Though, there are a few case reports of association with other systemic diseases such as multiple intestinal polyposis, Gardner syndrome, and malignant lymphoma, these associations were noted to occur only in children <10 years of age.⁶In infant, ileo-ileal intussusception can be easily missed at autopsy, in absence of any other pathology. A Thorough examination of intestine may yield positive findings. This case demonstrates, unusual cause of death due to florid lymphoid hyperplasia that had caused ileo-ileal intussusception.

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Letter to Editor

Amalgamation of Biometric systems like 'AADHAR' with the traditional methods of identification: Can it be a solution for identification in forensic cases in future?

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To,

The Editor in Chief, JFMSL.

Identification of an individual can be an important part of investigation in cases of homicide, accident, suicide etc.¹ Currently the identification process done by the investigating officers or the forensic medicine expert, or forensic science person is limited to facial photos, fingerprints, anthropometric measurements, dentistry or DNA profiling etc.

A recent progression in biometric technology which is equipped with computational intelligence techniques is substituting manual identification approaches in forensic science.² Biometrics is a important verification mechanism that identifies individuals on the basis of their physiological and behavioral features.²

In recent years biometric system of data had been generated by our government through Unique Identification Authority of India (UIDAI) and made biometric identification cards like AADHAR cards an essential entity.

Similarly, some private or semi government organizations have also developed their own sets of biometric identity system like smart card etc.

What is Aadhaar biometric ID system?

Aadhaar is a 12-digit unique identity number that can be received voluntarily by residents of India, based on their biometric and demographic data.³ The data is gathered by the Unique Identification Authority of India (UIDAI), a statutory authority constituted in January 2009 by the government of India, under the jurisdiction of the Ministry of Electronics and Information Technology, following the provisions of the Aadhaar (Targeted Delivery of Financial and other Subsidies, benefits and services) Act, 2016, check resident's eyes and fingers for fitness (missing/amputated). If the resident has any deformities due to which it is not possible to take fingerprints/iris, these also have to be captured as a biometric exception.³

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The number is linked to the resident's basic demographic and biometric information such as a photograph, ten fingerprints and two iris scans, which are stored in a centralized database. Facial Image, IRIS and Fingerprints for all the residents above 5 years in age is taken. In case of any children who are below 5 years in age, only Facial Image and any one parent's Biometric Confirmation is captured.

Aadhaar is the world's largest biometric ID system. World Bank Chief Economist Paul Romer described Aadhaar as "the most sophisticated ID programme in the world".⁴ Now can such a large data pool of information be utilized for the purpose of identification in forensic cases is a matter of research? If properly channelized and used the biometric system of identification can be easily utilized for the same. This together with the traditional methods of identification can go much nearer to the identity of the person in question of the investigation. In India, currently many government beneficiary schemes are linked with AADHAR cards. Hence, many of the peoples have registered themselves with the AADHAR biometric system. mAadhaar is an official mobile application developed by the UIDAI to provide an interface to Aadhaar number holders to carry their demographic information including name, date of birth, gender, and address along with photograph as linked with their Aadhaar number in smartphones.

Possible uses of AADHAR biometric system in Forensic cases

Tertiary care hospital, district hospitals, rural hospitals, primary health centers caters medical services ranging from treatment to dealing with medicolegal cases related to sexual offenses, accidents, homicide, suicides etc. in the process when the identity of the individual admitted to the hospital in unconscious state, or in comatose condition becomes of paramount importance than various traditional methods of identification like clothes, ornaments, mole, tattoo, height, weight, colour complexion, etc are noted for identification purpose. However, utilization of such methods for identification takes its own course leading to unnecessary delay in identification of individual causing grave harm medicolegally to the case.

Services like AADHAR linked biometric system if utilized with due permission and process of the government can be a great boon in quick identification of the individual leading to solving of problems as small as tracing of relative to nabbing of accused in relevant cases.

Similarly, during postmortem examination many a times unknown, unclaimed bodies are brought by the police for postmortem that remain unidentified even after several days of admission and postmortem examination. This can be to a certain extent resolved with the help of AADHAR linked biometric system. Also, the investigating agencies can easily utilize its services in cases of kidnapping, child theft and in places where there are large crowd gathering like kumbh mela, devotional yatra like Amarnath yatra, pandharpur vari etc. to identify the person in question. If at all a system be developed where in a fingerprints found at the crime scene be properly developed and subjected to identification through AADHAR biometric system, this can lead to quick solving of many serious nature of offenses.

Requirement for AADHAR Linked biometric system³

1 Authentication Devices & Documents

Authentication devices are host devices/electronic actors that form a critical link in the Aadhaar authentication ecosystem. These devices collect personal identity data (PID) from Aadhaar number holders, prepare the information for transmission, transmit the authentication packets for authentication and receive the authentication results. Examples of authentication devices include form factors ranging from desktop PCs, laptops, kiosks to Point-of-Sale (PoS)/handheld mobile devices (microATMs) and tablets. Such devices are expected to be used for a variety of purposes specific to every requesting entity's requirements.

Authentication devices are deployed by requesting Entities. Based on the mode of operation, such devices are classified as Self-Assisted and Operator Assisted devices.

Self-Assisted devices are the devices where Aadhaar authentication transaction is carried out by the Aadhaar number holder himself/herself without

any assistance. Operator-Assisted devices are the devices where the Aadhaar authentication transaction of the Aadhaar number holder is performed with the assistance of requesting entity's operator.

2 Biometric Devices

Biometric devices means the devices that are used for capturing the biometric data inputs i.e Fingerprint / Iris /both the information from Aadhaar number holders. These biometric devices fall under two categories viz. Discrete Devices, Integrated Devices.

Discrete Devices: These type of devices refer to the class of biometric devices (Fingerprint/IRIS) that require connectivity to a host device such as PC/laptop/Micro ATM etc.

Integrated Devices: The integrated devices have the sensor integrated into the device package i.e. phone/tablet etc.

The form factors in which biometric devices may be deployed include: Hand-Held / PoS Device such as MicroATMs, attendance devices, USB device connected to PC, Mobile phone with biometric sensor, Kiosks such as ATMs, MNREGA job request kiosks.

Requesting Entities may choose appropriate authentication type (Fingerprint/Iris in case of biometric modality) based on their service delivery needs, nature of service, volume of transactions, desired accuracy levels and risk factors associated with their service delivery. Once the modality is chosen as Fingerprint/Iris/a combination of both/multi-factor authentication involving OTP along with biometrics (Fingerprint/Iris/Both), the requesting entity can leverage the published list of certified device suppliers for the purpose of procurement of certified biometric devices (Fingerprint/Iris).

UIDAI Requires that only registered devices should be used by all Authentication Eco partners.³

"Registered Devices" refer to devices that are registered with Aadhaar system for encryption key management. Aadhaar authentication server can individually identify and validate these devices and manage encryption keys on each registered device. Device identification – every physical sensor device having a unique identifier allowing device

authentication, traceability, analytics, and fraud management.

Eliminating use of stored biometrics – every biometric record is processed and encrypted within the secure zone eliminating transmission of unencrypted biometrics from sensor to host machine.

Legality of sharing data with law enforcement⁵

In 2013 in Goa CBI approached a local court in the case of a rape of a schoolgirl, for acquiring UIDAI database for matching the fingerprint obtained from crime scene with the UIDAI database of all the persons in Goa. The court asked the UIDAI to hand over all data of all persons in Goa to the CBI.

The UIDAI appealed in the Bombay High Court saying that accepting such a request would set precedent for more such requests. The High Court rejected the argument and on 26 February 2014 in an interim order directed Central Forensic Science Laboratory (CFSL) to study the technological capability of the database to see if it could solve such a crime. The UIDAI then appealed in the Supreme Court. It argued that the chance of a false positive was 0.057% and with 600 million people in its database it would result in hundreds of thousands of false results.

On 24 March 2014, the Supreme Court restrained the central government and the UIDAI from sharing data with any third party or agency, whether government or private, without the consent of the Aadhaar-holder in writing. Vide another interim order dated 16 March 2015, the Supreme Court of India has directed that the Union of India and States and all their functionaries should adhere to the order passed by this court on 23 September 2013.

Conclusion

AADHAR linked biometric system has now well established itself in our country. Majority of the current population are aware regarding registering themselves in this system. This has created an enormous data pool for identification purpose. Though currently there are some legal and technical hurdles for utilization of this system for the purpose of identification in forensic cases. This will not remain the same in near future. With

advancement in technology and more and more people getting registered in this system, it will definitely help in identifying not only the missing or unknown person but also people accused for any crime related offenses. The merits of utilization of such system together with the traditional system of identification can greatly over-weigh the demerits. Hence, the time has ripen now for the investigating agencies, doctors, forensic experts handling medicolegal cases to seriously look in for the utilization of such unique identification system.

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