

Non Obstetric Accidental Maternal Deaths: A Retrospective Autopsy based Study.

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Abstract : Due to the overwhelming obstetric causes of maternal mortality, non-obstetric causes have not gained much attention in India and only a few sporadic cases spark the attention of media. Forty four (44) cases of non-obstetric accidental deaths during pregnancy subjected to medicolegal autopsy in the period from 1991 to 2010 have been analysed retrospectively. Data related to age, marital status, type of inquest, gestational age, mechanism of injury and cause of death was collected. The mean age of victims was 25.72 years with range from 19 to 40 years. Motor Vehicle Accidents were the commonest cause of trauma (n=29, 65.91% of cases). Head injury (n=23, 52.27%) was the commonest cause of death followed by haemorrhagic shock (n=12, 27.27%). Most of the deaths (n=20, 45.45%) occurred in second trimester. Majority of the trauma related maternal deaths can be prevented by strict enforcement of motor vehicle related safety measures and specific protocol based management with team approach.

INTRODUCTION

In India, more than a thousand people die everyday due to accidents and suicides and about one fifth of them are females¹. Most of them are in reproductive age group which include 15-44 years. Maternal deaths are of specific concern because of two lives involved. Morbidity and mortality due to non-obstetric accidental causes among pregnant females is largely related to anatomical and physiological changes seen during pregnancy². Worldwide, trauma is the leading non-obstetric cause of maternal death and has an overall 6-7% maternal mortality³⁻⁶. Foetal mortality has been quoted as high as 61% in major trauma and 80%, if maternal shock is present⁷.

A wide number of review articles and text books have discussed trauma in pregnant females however, very few population based studies have been published⁸. There is a dearth of literature on non-obstetric accidental deaths among pregnant females in Indian population.

The present study was aimed to analyse the demographic profile, cause and mechanism of trauma related deaths among pregnant females and attempts have been made to suggest measures to prevent and manage trauma in pregnant women.

MATERIAL AND METHODS

The present study was a retrospective study carried out in the Department of Forensic Medicine of All India Institute of Medical Sciences, New Delhi from 1991 to 2010, on 44 maternal deaths due to non-obstetric accidental causes, subjected to autopsy examination. Data was collected from autopsy reports present in the department and inquest papers. Accidental deaths in pregnancy due to suicides and homicides were excluded from the study.

RESULTS

A total of 44 cases of accidental deaths during pregnancy were studied. Age of the women ranged from 15 years to 40 years with an average of 25.72 years (Table 1). Excluding two cases (4.55%) whose identity

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could not be established, others (n=42, 95.45%) were married (Table 2). Of the married women, four (9.09%) had been married for less than seven years and the inquest was made by Executive Magistrate (176CrPC) (Table 3). The manner in which accidental injury took place is described in table 4.

Table 1: Age wise distribution

Age range	Number of cases	Percentage
15-20	4	9.09
21-25	22	50
26-30	13	29.55
31-35	4	9.09
36-40	1	2.27
Total	44	100

Table 2: Marital status

Marital status	Number of cases	Percentage
Married	42	95.45
Unknown	2	4.55
Total	44	100

Table 3: Type of inquest

Type of inquest	Number of cases	Percentage
Police inquest	40	90.91
Magistrate inquest	4	9.09
Total	44	100

The mechanism of injury was motor vehicle accident in most of the cases (n=29, 65.91%), other causes were accidental fall (n=4, 9.09%), fall of heavy object on the victim (3 cases, 6.82%) and train accident (n=2, 4.55%), the mechanism was undetermined in one case (2.27%). There were six cases of non-traumatic accidental deaths which included electrocution (n=2, 4.55%), asphyxia (n=2, 4.55%) and poisoning (n=1, 2.27%). In one case (2.27%), there was no injury and results for chemical analysis of viscera is yet to be received. (Table 4).

Table 4: Period of gestation

Gestational period	Number of cases	Percentage
I trimester	9	20.45
II trimester	20	45.45
III trimester	15	34.09
Total	44	100

Most of the women (n=20, 45.45%) were in their second trimester,

followed by 34.09% (n=15) in third trimester and 20.45% (n=9) in the first trimester (Table 5).

Table 5: Manner of causation of injury

Manner	Number of cases	Percentage
Motor Vehicle accident	29	65.91
Train accident	2	4.55
Accidental fall	4	9.09
Fall of heavy objects	3	6.82
Non traumatic	5	11.37
Undetermined	1	2.27
Total	44	100

Craniocerebral damage (n=23, 52.27%) due to head injury was the most common cause of death followed by haemorrhagic shock in 12 cases (27.27%). Electrocutation, traumatic asphyxia, septicaemia and spinal shock were among other causes. Cause of death could not be ascertained and the viscera was kept pending for toxicological examination in two cases (4.55%)(Table 6). Cranial cavity was predominantly affected in 23 cases (52.27%) followed by multiple injuries in 12 cases (27.27%). Thoracic cavity, spine and limbs were injured in one case each (2.27%) (Table7).

Table 6: Cause of death

Cause of death	Number of cases	Percentage
Head injury	23	52.27
Hemorrhagic shock	12	27.27
Electrocutation	2	4.55
Traumatic asphyxia	2	4.55
Septicemia	2	4.55
Spinal injury	1	2.27
Not ascertained	2	4.55
Total	44	100

Table 7: Cavity predominantly involved

Cavity involved	Number of cases	Percentage
Cranial cavity	23	52.27
Multiple injuries	12	27.27
Thoracic cavity	1	2.27
Spine	1	2.27
Limbs	1	2.27
Non traumatic	6	13.64
Total	44	100

DISCUSSION

Maternal mortality is an important indicator of adequacy of health care in a society. With the use of advanced technology in obstetric care, there has been a significant reduction in the maternal mortality rate. However, non-obstetric causes of maternal mortality still remain issues of concern to the modern health care system⁹.

In our study, most of the victims were in the age group of 21-30 years, with an average age of 25.72 years. Fifty percent of the total number of cases (n=22) were in the 21-25years age group followed by 30% (n=13) in the 26-30years age group. Connolly et al (1997) in their study on pregnant trauma patients at a tertiary care centre and a large community hospital reported mean maternal age as 24 years¹⁰.

These days women prefer to establish careers and financial stability before child-bearing. This could be the reason for the present trend of increased maternal age observed in the present study. Young age has been reported as a major risk factor for maternal trauma along with African-American race, use of illicit drugs or alcohol, domestic violence, non-compliance with seat belt use and low socioeconomic status³. However, in Indian setup, the use of drugs or alcohol may not a major contributor because of social fabric which strongly condemns pregnant women abusing drugs or alcohol.

Review of literature reveals that the incidence of trauma during pregnancy

increases with increase in gestational age.⁷ In our study, the gestational age of women in 20 cases was second trimester (45.45% cases) followed by 15 victims (34.09% cases) in third trimester and 9(20.45% cases) in first trimester. During the first trimester, the uterus is a thick-walled structure of limited size, confined within the bony pelvis. During the second trimester, the uterus enlarges beyond its protected intrapelvic location but the amniotic fluid provides some protection for the foetus by absorbing the thrust of blunt trauma. By the third trimester, the uterus is large and thin walled. The foetus head is usually within the pelvis so pelvic fracture in late gestation can lead to serious intracranial injury to the foetus.

Motor vehicle accident was the most common cause of trauma in 29 cases (65.91%) followed by accidental fall in 4 cases (9.09%). Connolly et al (1997) have also reported MVA (54.6%) as the commonest cause of trauma among pregnant females followed by fall (21.8%)¹⁰. Shah et al¹² (2003) and Corrina et al¹³ (2009) have also reported similar observations. A study of cases reported to NTDB by Harris also indicates that the most common mechanism of injury was MVA (55%) followed by fall (13%).¹⁴ Enlarged uterus alters the centre of gravity and lax pelvic ligaments are responsible for the gait instability which makes pregnant women more susceptible to falls⁵. During pregnancy, majority of blunt abdominal trauma (40%) is due to motor vehicle accidents and 30% due to fall^{4,9,15-18}. During blunt abdominal trauma, the foetus is protected from direct injury due to the abdominal wall, uterine musculature and the amniotic fluid. Direct foetal injury is rare (less than 1%)^{40,41} although it may occur directly when the abdomen strikes an object such as the dashboard or steering wheel. Indirect injury can occur due to rapid deceleration or contre-coup effect.

Cranial cavity was predominantly affected in 52.27% cases followed by multiple injuries in 27.27% cases. Thoracic cavity, spine and limbs were injured in one case each. Studies show that injuries often involve head trauma, intra-abdominal bleeding, visceral rupture and pelvic fractures³⁸. Due to increased intravascular volume, the pelvic vessels are engorged thus, there may be increased chances of retroperitoneal haemorrhage as a result of blunt trauma⁵. Pelvic fractures resulting in bowel, bladder, and urethral damage are commonly encountered with blunt trauma⁴⁰. Pelvic injury and loss of consciousness have been reported to be independent predictors of poor foetal outcome and are common causes of foetal loss in accident victims⁴¹. Gastrointestinal injuries are less common as the gravid uterus tends to be protective³⁹.

In our study, craniocerebral damage due to head injury (52%) was the most common cause of death followed by hemorrhagic shock in 27% cases. Electrocutation, traumatic asphyxia, septicaemia and spinal shock were among the other causes. Aniuliene Rosita et al (2006) reported motor vehicle accident (MVA) in 42% cases and fall in 34% cases led to death¹¹. Head and neck injuries, respiratory failure and hypovolemic shock constitute the most frequent cause of death in pregnancy²⁴. In vivo and clinical studies suggest that the elevated levels of oestrogen and progesterone seen in pregnancy are neuro-protective in moderate to severe traumatic brain injury (TBI)²⁵⁻³¹. However, there are studies which have failed to confirm this finding³²⁻³⁶. Berry et al (2011) had concluded that pregnant patients with moderate to severe TBI showed no statistically significant difference in mortality in comparison to their non-pregnant counterpart³⁷.

Domestic violence is a major contributory factor for trauma in pregnancy regardless of socioeconomic status. Universal screening for domestic violence is recommended by organizations such as American Medical Association(AMA)¹⁴. In the present study, magisterial inquest was conducted in four cases as per legislative provisions under section 176 Cr PC of India to rule out any foul play in causation of death.

Knowledge of mechanism and pattern of injuries can aid in proper management of the pregnant trauma victim. A pregnant trauma victim

should ideally be shifted to a tertiary care centre. Protocols suggest that the patient or the spine board should be tilted by 15 degrees to the left and supported with a bolster to relieve the compression. Primary survey and resuscitation includes ensuring a patent airway, adequate ventilation and oxygenation and effective circulation. For foetal wellbeing and to rapidly identify serious maternal injuries, an abdominal examination is required. This is followed by secondary survey of the mother which follows the same pattern as for non-pregnant patients².

LIMITATIONS

The present study, being retrospective based on autopsy records lacks details of victims of motor vehicle accidents into pedestrians, pillion riders or passengers of automobile, type of vehicle involved and use of protective gear. Information about foetal outcome in those who died with premature delivery or immediately after delivery or during postpartum period could not be found in autopsy records. Our Institution lacks the facility to manage patients with burn injuries which is also a highly significant cause of accidental injuries sustained by females, hence, this aspect could not be analysed.

CONCLUSION AND RECOMMENDATIONS

The most common cause of death in the current study was head injury due to trauma which is preventable. The data furthermore emphasizes the need for adequate protection during driving/riding motor vehicles. Helmets of appropriate fit and size need to be used along with proper fixation. Restraints in motor vehicles have been known to reduce severity of injuries in vehicular accidents and unrestrained women have higher chances of premature delivery and foetal death⁵. The use of a proper seat belt (shoulder restraint along with lap belt) has been identified as the most significant factor in decreasing maternal and foetal injury in motor vehicle accidents. Improperly placed belts could cause uterine rupture and damage to the foetus^{14,41}. There seems to be no increase in pregnancy-specific risks from the deployment of air-bags. Features suggestive of domestic violence should be looked for and appropriate help be given to victims of trauma.

A panel of experts comprising of emergency physician, intensivist, obstetrician and neonatologists should be formed and manage the patient in a co-ordinated manner. It must be borne in mind that pregnancy alters the physiology and anatomy of almost every organ system in the body. Knowledge of maternal changes in pregnancy will help in anticipating injuries and facilitate management in the pregnant female. All pregnant patients with major injuries require admission to a facility with trauma and obstetric facilities and even, minor trauma should be carefully observed. For optimal outcome of mother and foetus, the mother should be resuscitated first followed by assessment of the foetus. Obstetric consultation should be obtained and Advanced Trauma Life Support

management guidelines for trauma in pregnancy should be followed^{2,3}.

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Title: Analysis of weight loss and type 2 Diabetes Mellitus after Bariatric surgery - A Meta analysis.

Dr. Shiji P V: Asstt. Prof. Dept. of Medicine, Govt. Medical College, Calicut, Kerala,
Title: Vitamin D levels in Rheumatoid Arthritis patients and its correlation with severity.

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Editor