Title :- **Perspective of Maternal Deaths : A Retrospective Autopsy Study.**

Patekar M. B.[1] , Jagtap N.S.[2] , Pawale D.A.[3]

1. Patekar M B
   Assistant professor, Department of Forensic medicine & toxicology
2. Jagtap N S
   Assistant professor, Department of Forensic medicine & toxicology
3. Pawale D A
   Professor & Head, Department of Forensic medicine & toxicology
   1, 2, 3 – Rajarshi Chhatrapati Shahu Maharaj Government Medical College , Kolhapur, Maharashtra, India

Corresponding author-

1. Jagtap N S, Assistant professor, Department of Forensic medicine & toxicology

Email- drmanojpatekar@gmail.com

Abstract –

Reducing maternal mortality has been a constant struggle globally. India has made extensive efforts to achieve the same, which are visible through the sharp increase in the rate of institutional births (NFHS 4), but the concurrent high incidences of maternal mortality present a contradictory picture of the nation's progress in improving maternal health. The major causes of maternal mortality remain to be ante and post-partum haemorrhage, anaemia, obstructed labour, hypertensive disorders and post-partum infections, liver disorders as observed in various studies.

Inadequate reporting, lack of training of health employees in antenatal screening, risk identification and referral, had led to hindrance towards the reduction of maternal mortality. The determinants of maternal mortality need to be studied through the lens of autopsy.

The present study was carried out with view to determine factors causing maternal deaths, causes of maternal deaths and utility of autopsy with autopsy record as a useful and adjunct data source for ascertainment of maternal deaths.

In this study we have retrospectively considered the autopsy cases in relation to the maternal mortality in the period between 2015 to 2019 referred to Rajarshee Chhatrapati Shahu Maharaj, Government Medical College & CPR hospital, Kolhapur, Maharashtra.

Total 66 cases of maternal deaths which were brought for autopsy were studied during period of January 2015 to June 2019.

Key words- Maternal Death, Autopsy, Direct Causes, Indirect Causes, Hemorrhagic Shock

Introduction:-

In the past decade, India has been able to reduce maternal mortality from 206 to 181 maternal deaths per 100000 live births, but with 17 % (50000 maternal deaths) of all maternal deaths occurring in India, it still is the highest contributor of maternal deaths in the world followed by Nigeria (14%, 40000)[1]

Recent studies have shown significant decline in the incidences of maternal deaths in the developed world, but the estimates from the developing countries are still highly disappointing. It is used as a proxy indicator to assess the country's maternal and reproductive health status. World wide about 830 women die every day of preventable causes related to pregnancy and childbirth, 20 % are from India[2]

Maternal mortality is defined as " The death of a woman while pregnant or within 42 days of termination of pregnancy (delivery) irrespective of 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[3]. Delivery includes, abortions (spontaneous, legal and illegal), live or stillbirths, vaginal or cesarean deliveries[4]. WHO classifies maternal deaths causes into four groups:- 1) Direct 2) Indirect 3) late due to unanticipated complications of management, and 4) fortuitous deaths.[3]

The four groups into which the cause of maternal death can fall are [5]:

2. Direct obstetric deaths: Direct obstetric deaths are those resulting from obstetric complications of the pregnancy state (including pregnancy, childbirth and the puerperium to 42 days), such as deaths as a result of obstetric haemorrhage or eclampsia.
3. Indirect obstetric deaths: Indirect obstetric deaths are those resulting from previous existing disease or disease that developed during the pregnancy which was not a result of direct obstetric causes, but which was aggravated by the physiologic effects of pregnancy, such as cardiac conditions aggravated by pregnancy.
4. Unanticipated complications of management: Unanticipated complications of management are deaths resulting from interventions, omissions, incorrect treatment or from a chain of events resulting from any of the above during pregnancy, childbirth or the puerperium (up to 42 days).
5. Unknown: Cause unknown and thus not attributable to either direct or indirect causes.

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. The numerous causes of maternal deaths may be a blend of direct and indirect causes, and the deaths may be multifactorial.

One important risk factor which may lead to maternal death is insufficient antenatal care. Antenatal care has been termed as one of the "four pillars" of safe motherhood by the WHO (High-quality antenatal, intra-natal and postnatal care and emergency obstetric care are the most important ways to reduce the maternal morbidity and mortality[6].

In India data on state/district specific maternal morbidity/mortality data is not available. However available data from analysis of causes of death provide sufficient information on

mortality rates and causes of death so that national programmes could be evolved to combat major health problems in women.

Hence the study was aimed to analyze the causes of maternal death through autopsy records.

Objectives-

1. To know the causes of maternal death subjected to autopsy.
2. To categorize the causes according to various groups.
3. To identify various factors which influence maternal deaths.
4. To suggest measures to prevent maternal deaths.

Material & methods:-

A total of 66 cases of maternal death which underwent medico-legal autopsy during the period of January 2015 to June 2019 were studied at the Department of forensic medicine and toxicology, Rajarshi Chhatrapati Shahu Maharaj Government Medical College, Kolhapur, Maharashtra. The current study includes cases of maternal death cases referred from private hospitals, peripheral government hospitals, remote areas, and the cases which were brought dead to the hospital. The cases of maternal deaths which were treated at the same institute, were also brought for medicolegal autopsy. 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. Cases from the year 2015 to 2018 were studied retrospectively after detail analysis of the postmortem reports, inquest papers and histopathology reports, while cases from the year 2019 were studied prospectively.

The study involved a detailed analysis of the postmortem findings including the history of each case, with the external examination and internal findings pertaining to the maternal death. Special emphasis was given on the findings involving in the abdominal and pelvic cavities including the organs of generation i.e. uterus, ovaries, tubes. The pregnancy related findings apart from the organs of generation like the fetus if present, placenta, upper vagina, broad ligament, internal iliac vessels, etc were also studied to conclude the given cause of death after postmortem examination.

Results :-

It is observed from this study [table no.1] that out of the 66 cases of maternal mortality brought for autopsy in the study period, maximum number of maternal deaths were seen in age group of 20 to 29 years comprising 42 (63.63%)and 14(21.21%)cases were found in the age group 30 to 34 years of age. Only 4 cases belong to the age category below 20 years and 6 cases above the age 35 years.

Maximum cases 53 (81.30%) were resident of rural areas where as rest 13 cases (19.70%) belonged to urban area [table no. 2]. Most cases (33) of maternal mortality were referred for

autopsy from the government hospitals including the present institute where the study was conducted, while 27 cases were referred from the private hospitals, and 6 cases were directly brought as dead to the casualty.

Most of the cases (34) were with full term gestation while only 2 cases belonged to the first trimester [Table no. 3]. Death occurring in the 3rd trimester were the second most with 20 no. of cases. 26 cases of maternal mortality were primigravida, while 21 cases were of second gravida and least no. of cases belonged to the 4th gravida and above[Table no. 4].

Maximum causes of death on autopsy were direct causes, of which hemorrhage was the predominant cause (24 no. of cases) [Table no. 8].Postpartum hemorrhage due to atonicity had the most no. of 12 cases, while 5 cases had hemorrhage due to genital trauma during labour which included of uterine rupture, cervical tears and vaginal tears. Sepsis and respiratory infections during pregnancy and after delivery were responsible for deaths in 17 cases. Indirect causes were responsible for 12 cases of maternal death and only one case had incidental cause of death.

Maximum no. of 34 cases were liveborn in maternal deaths followed by 20 cases with intra-uterine fetal death in the last trimester and full term. Total 10 maternal deaths occurred in the first and second trimester with fetal outcome as abortion in 2 cases, premature delivery in 2 cases and death in utero in 6 cases [table no. 5].

A total of 8 cases were referred to private hospital, while 22 cases were referred to this tertiary government institute including 7 cases referred from private hospitals and 15 cases referred from peripheral government hospitals. Total 30 cases were treated at the same hospital without any referral to higher centres [table no. 6].

Most of the cases (42 out of 66) died within 24 hours of admission to the hospital, while about 12 cases died within one week of admission. 6 cases were declared as brought in dead before treatment [Table no 7].

Discussion :-

Although pregnancy is well-thought-out as a physiological process in urbanized nations, for women from developing and underdeveloped nations it is a frightening event. World wide about 830 women die every day of avoidable causes associated with pregnancy and childbirth, 20 % are from India [7]

Deaths due to conditions related to pregnancy and childbirth is considered the 6th biggest cause following infectious and parasitic diseases, injuries, conditions not elsewhere classified, cancer, and cardiovascular diseases[8]

The various causes of maternal death are being highlighted depending upon the classification of maternal deaths into direct and indirect deaths. However, there may be combination of both and the death may be multi-factorial. . A current systematic assessment of the reasons of maternal mortality and its territorial distribution has revealed that the Indian subcontinent has a considerably greater maternal mortality attributable to sepsis, infection and hemorrhage[9].

Though maternal mortality has been the subject of a number of studies in India, very few broad autopsy studies have been reported. A broad summary of the extent and distribution of the causes of maternal deaths is critical to reform reproductive health policies. With this vision we conducted the study based on the medicolegal autopsy done in cases of maternal deaths during the period of January 2015 to June 2019 at RCSM GMC Kolhapur.

In the present study, higher incidence of maternal deaths 42 (63.63%) in the age group 20 to 30 years is in accordance with that observed by Thomas et al [10] , Kuralkar et al[11], Mukherjee et al[12], Soni et al[13], Patil et al[14]. Larger occurrences of maternal deaths in the group of 20 to 30 years in the current study may be attributed to the common ritual of marriages in the early 20's and early pregnancy. Also 20-30 years age is the most fertile age of a female, with obvious dominance in maternal deaths is this age group.

Considering the residence pattern, 19.70% females were residing in urban area and rest 81.30% were from rural areas. The high proportion of females from rural area in maternal death was in consistency with the observations of Soni et al[13]and Bangal et al [15]. However, these results are in dissimilarity with that observed by Kuralkar et al[11]and Patil et al [14] who noted dominance maternal deaths in urban section. Bulk of the women from rural section belong to lesser awareness about the maternal health, ignorance to nutrition necessary during pregnancy, poverty causing more no. of deaths during the pregnancy and childbirth. Also distant health facilities at the rural areas in the vicinity of this region also may be liable for the preponderance of maternal deaths in females residing at rural areas.

34 cases of maternal death were in full term gestation, while 20 cases were in the 3rd trimester and only 2 cases belong to the first trimester. The predominance of the maternal deaths in full term gestation points the sudden risk involved during prelabour, labour and post labour period. Thus it highlights the importance of special precaution to be taken in terminal period of pregnancy. One case in the first trimester belong to death due to complications following surgical abortion, while the other had aplastic anemia. Predominance of death in the full term gestation and 3rd trimester was consistent with the observations by Badrinath et al (42.20%)[16]

26 cases of maternal mortality were primigravida, while 21 cases were of second gravida and least no. of cases belonged to the 4th gravida and above. The long stages of labour in primigravida increases the period of risk of maternal complications. However, our observations were not in consistency with observations by Kuralkar et al[11] where multipara (47.4 %)dominated the primigravida (46.3 %)in maternal deaths and in Mukherjee et al [12]deaths in multipara (75 %) were more as compared to primigravida (25%).

In this current study we observed that most common cases of maternal deaths were due to direct causes i.e 83.3 % , among them hemorrhagic shock (39.39 %) was the most common. It was followed by septicemia and infective causes (25.75 %) and pregnancy inducted hypertension

(18.8%). Maternal deaths due to indirect causes which was 16.66% which included death causes like kidney infections, pneumonia, anemia, subarachnoid hemorrhage, hepatitis. Only one incidental cause of death due to swine flu infection to which was unrelated to pregnancy was observed in this study. Dominance of direct causes over the indirect causes was consistent with the observations by Thomas et al [10] which included 60% direct causes over 37 % indirect causes and by Kuralkar et al [11] (89.4% direct causes over 10.5 % indirect causes). 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 of maternal death, 12 cases died due to uterine atony induced postpartum hemorrhage as evident by soft, flabby uterus on autopsy. 3 cases died of hemorrhagic shock due to uterine rupture, 3 cases due to vaginal and cervical tears. One death was related to hemorrhage following lower segment caesarean section and one maternal death was related to post abortion complications.

Of the total 66 cases, 30 cases died at the same treating hospital while 6 cases were directly brought in dead at the casualty. In the study 30 cases were referred to higher treating hospitals, which involved 8 private hospitals and 22 cases were referred to this government tertiary hospital. Of the 22 referrals to government tertiary hospital, 8 were referred from private hospitals, probably due to bad prognosis or inability of the relatives to continue the treatment in private hospitals for various reasons. Patil et al[14] observed high referral from private hospitals which was in contrast with our study.

Of the 12 cases which were referred from government hospitals, 10 were from the primary health centers, signifying the lack of potency of this peripheral hospitals to tackle the complications of the maternal death due to lack of specialist gynecologists and lack of proper facilities. Considering the facts that such primary health centers are the core of rural health, and the observation that the dominance of rural maternal deaths over urban, it can be predicted that these deaths may be due to insufficient management, delay in decision making to seek care and delay in reaching tertiary hospitals, mainly due to lack of proper transport facilities. Badrinath et al[16] observed that comparatively high MMR probably because of the many complicated referrals from rural areas and the referrals were brought in the last stage of maternal complications, which is consistent with our observations. Bangal et al[15], 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 this study we observed that 63.63% cases died within 24 hours of admission, while only 2 cases died following a prolonged hospital stay of more than a week which was consistent with Mukherjee et al[12]. Considering the factors like delay in referral, sudden deterioration of the health in the health due to pregnancy and labour complications, early death even on hospital admission might be the reason for death within 1 day of admission. Such early deaths had been a reason for allegation of negligence in recent times.

Conclusion:

Maternal death is not just a health issue, but a social injustice which leads to breakdown of the vital pillar of the family. So there should formation of strategies to reduce the maternal mortality, since it's a preventable tragedy. 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.

- Training the medical officers in maternal health services can achieve remarkable improvement in maternal and perinatal outcome. This can be done by certification course in basic and emergency obstetric care at family and health training center for the medical officers on a priority basis.
- Early recognition of high risk cases through ANC, timely sonography, good healthy communication between the health staff accompanied with proper transport facilities.
- Guidance from the hospital administration to implement the national health programmes of the Ministry of health like Janani Suraksha Yojna to prevent home deliveries or deliveries by unqualified staff.
- To discuss local cases of death or severe morbidity and identify immediately remediable local solutions in relation to maternal morbidity.
- Maternal death audit which should include the forensic experts, pathologists in addition to gynecologists to discuss reasons, factors and lack of proper management leading to maternal death.

- Disclosure of interests- None to declare.
- Source of Funding- None to declare.
- Ethical clearance- Obtained from the institutional ethics committee.
-

References-

1. World Health Organization (WHO) and UNICEF. (2014). Trends in maternal mortality: 1990 to 2013: Estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division: Executive summary.
2. (Maternal mortality. Fact sheet No. 348. [Online] Available from:www.who.int/mediacentre/factsheets/fs348/en/[Accessed April 2019].
3. Nour NM. An introduction to maternal mortality. Rev Obstet Gynecol.2008; 1(2):77-81
4. Lucas S. The maternal death autopsy. In: Pignatelli M, Gallagher P (eds). Recent advances in histopathology:23. London:JP Medical publishers; 2014.p17-30.
5. Say L, Chou D. Better understanding of maternal deaths—the new WHO cause classification system. BJOG 2011;118 (Suppl. 2):15–17.
6. Bergsjø, P. (2001). What is the evidence for the role of antenatal care strategies in the reduction of maternal mortality and morbidity? Studies in HSO&P, (17).
7. Maternal mortality. Fact sheet No. 348. [Online] Available from:www.who.int/mediacentre/factsheets/fs348/en/[Accessed April 2019].
8. Kaur H, Padda P. Verbal autopsy of maternal death in a rural community of India. Int J Prevent Med. 2012; 1(2).
9. Khan KS, Wojdyla D, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: A systematic review. Lancet 2006;367:1066-74.
10. Thomas. Z. Direct Causes Of Maternal Death An Autopsy Study. International Journal of Advanced Research. 2017;5(7):2278-2285.

11. Kuralkar R, Kumar P, Kumar N, Savardekar R. Analysis of maternal deaths: autopsy study at tertiary health care center. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2017;6(12):5282.
12. Mukherjee S, Mukherjee S, Sarkar R. A six year retrospective study of maternal mortality at a tertiary teaching institute in Uttarpradesh. International Journal of Medical Science and Public Health. 2014;3(11):1407.
13. Soni M, Soni P, Agrawal S, Mehra H. Causes of Maternal Mortality: Our Scenario. Journal of South Asian Federation of Obstetrics and Gynaecology. 2013;5(3):96-98.
14. Patil V, Surve M. Maternal Mortality – A Challenge?. JKIMSU,. 2013;2(1):58-61.
15. Bangal V , Fernandes D. Facility Based Maternal Death Review at Tertiary Care Teaching Hospital – An Observational Study. Sch. J. App. Med. Sci., 2016; 4(2C):494-499
16. Badrinath M, Karekal S. Maternal Mortiality: A retrospective Study. IOSR Journal of Nursing and Health Science. Mar.-Apr. 2015;4(2):10-13.

Table . no. 1 Age Distribution of maternal deaths.

Age in years.	No of cases	percentage
<20	4	6.06%
20-29	42	63.63%
30-34	14	21.21%
>35	6	9.09%
Total	66	100%

Urban/ Rural	Present study	Kuralkar et al	Soni et al	Bangal et al	Patil et al
Urban %	19.70%	61.1%	36%	1.8%	61.9%
Rural%	81.30%	38.9%	64%	98.2%	38.1%

Table no. 2:- Region wise distribution of cases of maternal death.

Table no. 3: Distribution as per trimester of gestational age-

Trimester	No of cases
1st	2
2nd	10
3rd	20
Full Term	34
Total	66

Table no. 4 Distribution of cases as per gravida.

Gravida	
primigravida	26
2nd gravida	21
3rd gravida	13
4th gravida	4
>4 grand multipara	2
Total	66

Table no. 5 fetal outcome in maternal deaths.

Fetal outcome	
Fetal Outcome of cases in maternal deaths in last trimester/full term	
Intra-uterine fetal death	20
Liveborn	34
Stillborn	2
Fetal outcome of cases in maternal deaths in first and second trimester	
Aborted	2
Premature delivery	2
Death in utero	6
Total	66

Table no. 6 cases of maternal mortality with referral to higher centres

Referral of cases	
No referral	36
To private hospital	8
To government tertiary hospital	
From private hospital	7
From primary health centre	10
From rural hospital	2
From civil hospital	3
Total	**66**

Table no. 7 cases of maternal mortality with referral to higher centres

Referral of cases	
Brought in dead	6
No referral	30
To private hospital	8
To government tertiary hospital	
From private hospital	7
From primary health center	10
From rural hospital	2
From civil hospital	3
Total	66

Table no. 8 Distribution of cases according to the causes of maternal death.

1) DIRECT CAUSES		**No of deaths.**
	a) Hemorrhagic causes	
i) Uterine atony	-postpartum hemorrhage	12
ii) Uterus/ Genital-tract trauma	-uterine rupture	3
	-cervical tear	1
	- vaginal tears	2
	uterine inversion	1
	Intraperitoneal bleeding following bicornuate uterus	1
iii) placental causes	-placenta acreta	1
	-placenta previa	1
	-partial separation of lower end of placenta with vaginal tears	1
	- abruption placentae	1
iv) post operative	Dilatation and curettage for abortion	1
	post –lower segment Caeserean Section	2
Total	**26 (39.39%)**	
	b) Respiratory causes during pregnancy/delivery	
Septicemia		3
Pneumonitis		9
Pleural effusion		4
Lung collapse		1
Total		**17(25.75%)**
	c) Pregnancy Induced Hypertension	
DIC		9
Ecclampsia with hepatic disorders		3
Total		**12(18.8%)**
INDIRECT CAUSES		
Chronic pyelonephritis		1
Aplastic anemia		1
Adeno carcinoma of gall bladder		1
Hepatic encephalopathy with hepatitis E		1
Subarachnoid hemorrhage		1
Bronchopneumonia		6
Total		**11(16.66%)**
INCIDENTAL CAUSES		**1 (1.51%)**
TOTAL NO. OF MATERNAL DEATHS		**66 (100 %)**

Table no.9 Distribution as per period of hospital stay

Period of admission in hospital	
<24hrs	42
>24 hours to 1 week	12
>1 Week	2
Brought in Dead	6
Total	66