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ANALYSIS OF MATERNAL MORTALITY IN CHENGALPATTU DISTRICT, TAMILNADU, MARCH 2017 – APRIL 2022, INDIA

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Abstract

BACKGROUND: Maternal mortality is the reflection of the Health care services and the support of the society to the women. Maternal mortality is usually ascribed to complications that generally occur during or around labour and cannot be predicted. The major causes of maternal mortality are hemorrhage, hypertensive disorders of pregnancy and sepsis. All those causes are preventable through early identification and prompt treatment.

METHOD: This Retrospective analysis was done for the maternal deaths occurred in Chengalpattu District from April 2017 to March 2022.

RESULTS : A fluctuating trend is being observed. MMR is peak in last 2 years. It was 18.96 during the period April 2019 to March 2020. Higher proportion of maternal deaths (64.6%) has occurred in the age group of 21 – 30 yrs. Majority of maternal deaths (74.7 %) have occurred in Government Medical College Hospital. Larger proportion of maternal deaths (69.6%) has occurred during the postnatal period. Majority of the deaths (43%) have occurred in post LSCS period. Major proportions of maternal deaths (55.7%) have occurred among the multigravida mothers. Among 57 deliveries majority (55.7%) of the birth were live birth. Majority of the maternal deaths (64.6%) are due to direct cause, which is highly preventable. Higher proportions of maternal deaths (31.4%) are due to PPH. Majority of maternal deaths (60.7%) are due to Covid followed by Heart disease complicating pregnancy (10.7%) and Anaemia (7.1%)

CONCLUSION : Overall Maternal mortality was 54.97/100000 live births. Last 2 years maternal mortality was high due to covid pandemic. The leading cause for maternal death in the District is hemorrhage followed by hypertensive disorders of pregnancy. These direct causes of deaths are potentially preventable by optimum utilization of existing MCH facilities, identifying the bottlenecks in health care delivery system, early identification of high risk pregnancies and complications and timely referral to tertiary care centre.

KEYWORDS : Maternal deaths, Postpartum Hemorrhage (PPH), maternal mortality, Antenatal care, Hypertension complicating pregnancies, postnatal care, maternal mortality ratio, anemia.

INTRODUCTION

Mothers play a vital role in the family, which is a powerful force for social cohesion and integration. Mothers are the backbone of the family. For the healthy development of a child, mother and child relationship is vital. Maternal deaths will considerably affect the development of the child as well the family, society and country. Although pregnancy is being considered as a normal physiological state, it carries risks of maternal morbidity and mortality.

World Health Organization (WHO) defines maternal death as "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes". Maternal mortality ratio is defined internationally as maternal deaths per 1, 00,000 live births in a specific period.

Much progress has been made in ending preventable maternal deaths in the past two decades: Globally the number of women and girls who die each year due to issues related to pregnancy and childbirth has dropped considerably, from 451,000 in 2000 to 295,000 in 2017, a 38 per cent decrease. One of the most important goals of Sustainable Development Goals is to reduce maternal mortality. Sustainable Development Goals (target 3.1) says the global maternal mortality ratio should be less than 70 per 100,000 live births by 2030.

India's maternal mortality ratio (MMR) has improved to 103 in 2017-19, from 113 in 2016-18. This is according to the special bulletin on MMR released by the Registrar General of India March 14, 2022. The Government of India has been focusing on initiatives to improve maternal health indicators. Indicators for Antenatal care (ANC), institutional deliveries, C sections, distribution of IFA tablets, follow up of high-risk pregnancies, provision of postnatal and newborn care - have shown substantial improvement since 2005 (NFHS 4 & 5).

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Tamilnadu has achieved the Sustainable development Goals target. The maternal mortality ratio in Tamilnadu has significantly declined from 97(SRS MMR Bulletin 2007-09) to 60 (SRS MMR Bulletin 2016-18) per 1, 00,000 live births. The State has been able to provide RMNCHA+N services with major focus on primary and secondary care services under the NHM. Maternal mortality is just a tip of iceberg, behind each mortality there are at least 20 mothers who experiences severe morbidity. Direct obstetric causes like haemorrhage, hypertensive disorders of pregnancy, septic abortion and medical cause like hepatitis, heart disease in pregnancy are common causes of maternal death. Anaemia is the most important indirect cause of maternal mortality. As these causes are preventable by early detection of high risk factors and early intervention during pregnancy, and can help to reduce the maternal mortality.[1]

It was in this context, this study was conducted with the objective to assess the existing MMR and the cause of maternal mortality over a period of 5 years in Chengalpattu District, Tamilnadu, India.

OPERATIONAL DEFINITIONS

1. Antenatal : It is the period from the date of conception to onset of labour pain

2. Intranatal : It is the period from the onset of labour pain to two hours after delivery.

3. Postnatal: It is the period from two hours of delivery to 42 days of delivey.

METHODS

The present study was a Retrospective analysis of the maternal deaths occurred in Chengalpattu District from April 2017 to March 2022.

Inclusion criteria : All maternal deaths from April 2017 to March 2022 were included in the study.

Exclusion criteria : All deaths due to non maternal cause were excluded from the study.

The line list maintained at the District level was used to ascertain the number of maternal death which included the data on age of the deceased mother, parity, period of death, place of death, cause of death. The results were analyzed with simple descriptive statistics and presented in frequency table and charts.

RESULTS

In the present study there were 79 maternal deaths for 1, 43,701 live births from April 2017 to March 2022.

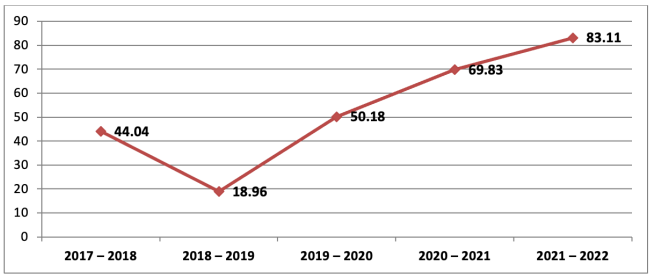

Figure: 1 Maternal Mortality Ratio (MMR) year wise

A fluctuating trend is being observed. MMR is peak in last 2 years. It was lowest (18.96) during the period 2019 to 2019 (Table 1). Maximum maternal deaths have occurred in 2021 – 2022, as 10 maternal deaths were due to covid. The MMR of the district was lower than the Sustainable development goals till March 2021.

Table: 1 Maternal Mortality Ratio (MMR) Block wise

S. No	Name of the Block	2016 - 17	2017 -18	2018 -19	2019 - 20	2020 - 21	2021 - 22
1	St. Thomas Mount	70.65	108.21	23.82	70.41	40.96	114.38
2	Kattankulathur	22.02	0	19.02	15.36	70.55	128.09
3	Thiruporur	43.1	82.78	40.39	73.37	59.97	33.1
4	Thirukazhukundram	162.01	0	0	0	78.49	41.44
5	Lathur	0	0	0	0	0	0
6	Chithamur	64.68	0	0	150.15	0	69.54
7	Acharapakkam	-	-	-	-	282.29	158.35
8	Zamin Endathur	-	-	-	-	165.47	0
9	Pallavaram	0	0	37.16	38.49	77.85	81.67
10	Tambaram	0	45.19	0	88.42	88.53	0
11	Chengalpattu	0	0	0	0	0	215.98
12	Madhuranthagam	-	-	-	-	0	0
District MMR		**50.66**	**44.04**	**18.96**	**50.18**	**69.83**	**83.11**

Chengalpattu District has 8 Blocks and 4 major Municipalities. Acharapakkam Block, Madhuranthagam Block and Madhuranthagam Municipality were added in Chengalpattu District in the year 2019. Hence the data for the period 2017 to 2020 is not available. Lathur Block had no maternal deaths during the last five years and the MMR of the block is zero.

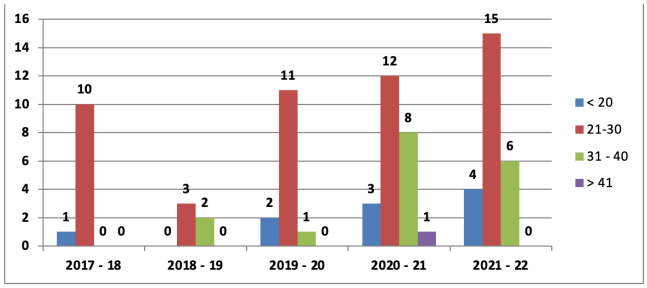

Figure: 2 Age wise distribution

Majority of maternal deaths (64.6%) have occurred in the age group of 21 – 30 yrs.

Majority of maternal deaths (74.7 %) have occurred in Government Medical College Hospital. Government Medical College Hospitals are teaching Institutes and tertiary care centres, so these institutes receive many complicated cases from secondary and primary care hospitals.

Table: 2 Place of death

Place of death	2017 - 2018	2018 - 2019	2019 - 2020	2020 - 2021	2021 - 2022	Total	Percentage
Home	0	0	0	0	0	0	**0.0**
Transit	1	0	1	2	3	7	**8.9**
PHC	0	0	0	0	0	0	**0.0**
GH	0	0	2	2	1	5	**6.3**
Govt. MCH	10	5	9	17	18	59	**74.7**
Pvt	0	0	2	3	3	8	**10.1**

No deaths in home reported, however 3 maternal deaths (one in each year 2019 – 2020, 2020 – 2021 and 2021 – 2022) reported in transit were the mother was on the way to hospital. During the year 2021 – 2022 (2 maternal deaths) transit deaths were high which was due to the referral of covid positive mother to higher centre. No maternal deaths reported in PHCs, however 2 maternal deaths (one in 2020 – 2021 and other in 2021 – 2022) reported in transit were referred from PHC.

Table: 3 Period of pregnancy at the time of death eath

Period of Pregnancy	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22	Total	Percentage
Antenatal	0	3	5	2	12	**22**	**27.9**
Intranatal	0	0	0	1	1	**2**	**2.5**
Postnatal	11	2	9	21	12	**55**	**69.6**

Higher proportion of maternal deaths (69.6%) has occurred during the postnatal period. 2 maternal deaths were reported in the intranatal period. During the year 2020 – 2021 one maternal death reported within 15 mts after delivery and in the year 2021 – 2022 one maternal death reported in intranatal period as the mother went for cardiac arrest and mother was taken up for perimortem LSCS. Postnatal care and follow up to be strengthened to reduce the maternal deaths in postnatal period. During the year 2017 – 2018 no maternal deaths reported among Antenatal Mothers. However during the year 2021 – 2022 maternal deaths among Antenatal mothers was high, which was due to covid.

Table: 3 Period of pregnancy at the time of death eath

Type of delivery	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22	Total	Percentage
Normal	3	1	3	9	4	**20**	**25.3**
LSCS	7	1	6	12	8	**34**	**43.0**
Assisted Vaccum	1	0	0	1	1	**3**	**3.7**

Majority of the deaths (43%) have occurred in post LSCS period. Since tertiary care institutions are referral centre, there is higher caesarean section. Caesarean section rate in our district is 55% which also accounts for the higher incidence of maternal death following caesarean section.

Higher proportions of maternal deaths (55.7%) have occurred among the multigravida mothers. In our district among the total AN registration, primi AN registration is 45% and multi AN registration is 55%. Since the percentage of AN registration among multi mothers is more, the percentage of maternal deaths among the multi mothers also high. More maternal deaths were reported among Primi during 2020 – 2021 and 2021 – 2022, which was due to covid. Among the multi gravida mothers, 9 maternal deaths were HOB mothers (above G3).

Table: 5 Parity Index

Parity Index	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22	Total	Percentage
Primi	6	2	4	13	10	35	**44.3**
Multi	5	3	10	11	15	44	**55.7**

Among 57 delivered, majority (55.7%) of the birth were live birth. However, on anlysing the outcome of pregnancy it was observed that 25% of the births are dead born.

Table: 6 Delivery Outcomes

Delivery Outcome	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22	Total	Percentage
AN	0	3	5	2	12	22	**27.8%**
Dead Born	6	0	4	1	2	13	**16.5%**
Alive Baby	5	2	5	21	11	44	**55.7%**

Majority of the maternal deaths (64.6%) are due to direct cause, which is highly preventable

Table: 7 Cause of maternal death

Cause of Death	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22	Total	Percentage
Direct Cause	8	2	13	16	12	**51**	**64.6**
Indirect Cause	3	3	1	8	13	**28**	**35.4**
Total	**11**	**5**	**14**	**24**	**25**	**79**	**100.0**

Higher proportions of maternal deaths (31.4%) are due to PPH. Following active management of third stage of labour universally and availability of oxytocics, the death due to hemorrhage can be reduced. Early identification and appropriate management of PPH will reduce maternal deaths.

Table: 8 Direct causes of Maternal death

Cause of Death	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22	Total	Percentage
PPH	4	1	4	2	5	**16**	**31.4**
Sepsis	4		2	2	1	**9**	**17.6**
PIH / HELLP / Ecclampsia		1	3	9	2	**15**	**29.4**
Abortion			1		1	**2**	**3.9**
Amniotic Fluid Embolism / Pulmonar Embolism			2	3	2	**7**	**13.7**
Ruptured Ectopic			1			**1**	**2.0**
Adherent Placenta					1	**1**	**2.0**
Total	**8**	**2**	**13**	**16**	**12**	**51**	**100.0**

Table 9: Indirect cause of maternal deaths

Cause of Death	2017 - 18	2018 - 19	2019 - 20	2020 - 21	2021 - 22	Total	Percentage
Heart Disease	1		1		1	**3**	**10.7**
Anaemia	2					**2**	**7.1**
Viral Hemorrhagic Fever		1				**1**	**3.6**
Lymphoma 4th stage		1				**1**	**3.6**
Viral Pneumonia		1				**1**	**3.6**
Covid				7	10	**17**	**60.7**
TB Meningitis				1	1	**2**	**7.1**
Intra abdominal hemorrhage					1	**1**	**3.6**
Total	**3**	**3**	**1**	**8**	**13**	**28**	**100.0**

Majority of maternal deaths (60.7%) are due to Covid followed by Heart disease complicating pregnancy (10.7%) and Anaemia (7.1%)

DISCUSSION

The 5 year MMR for the District was found to be 54.97 per 100000 live births, which is lower than the state value 60/100000 live birth (SRS MMR Bulletin 2016 – 2018). On comparing with the national value 113/100000 live birth (Special Bulletin on MMR, RGI, 2022), the District MMR is significantly low and far better when compared with the MMR of 383/100000 live birth in 9 empowered action group state in India.[2]

In this study majority (64.6%) of the maternal deaths were in the age group of 21 – 30 years, and decreased sharply with age. A similar finding was reported by Sridevi et.al[3] on analysis of maternal mortality in GMKMCH Salem as 50.98% of the maternal deths were reported in the age group of 21 – 30 years. The legal age for marriage is 21 years. Hence, more number of births is being reported in this age group. In this present study higher proportions (69.6%) of the death have reported in Government Medical College Hospitals. Since Government Medical College Hospitals are the tertiary care hospitals with all facilities pooled in one institution, all the high risk and complicated mothers are referred to these institutions. In our district around 55% of the mothers are delivered in Government institution. Among the government institution delivery 71% of the deliveries are occurring in Government Medical College Hospitals.

On analyzing the data 69.6%% of maternal deaths have occurred in the postpartum period which is comparable with the findings by Patel D et.al[4] showed 69.23% deaths in the postpartum period. Our study highlights 43% of maternal deaths occurred following Caesarean section. Similar results was observed in a study conducted by Shobha et.al [5] which showed 88.5% of maternal deaths were following Caesarean section. Maternal deaths were more observed in multigravida women (55.7%0 as compared to primigravida women (44.5%).Similar findings have been reported in other Indian studies too. Garg p et.al[6] reported 75%, Yadav et.al[8] reported 82% and Badra B et.al [9] reported 60 % of maternal deaths in multigravida women. In our study out of 57 birth occurred, 44 (55.7%) were live birth. Our finding was consistent with the study findings by Patel D et.al [4] who reported 64.10% live births. As far as the causes of maternal death are concerned, 64.6% of the maternal deaths were due to direct Obstetrical cause and 35.45% were due to indirect causes. Similar findings were observed in other study by Badra et.al[9] and Yadav et.al.[7]

Among the direct causes of death, the majority were due to hemorrhage 31.45% followed by hypertensive disorders of pregnancy 29.4%. Hemorrhage was the major cause of maternal deaths reported by other Indian studies too.[8, 9] However Horwood et.al[2] reported equal proportion of hemorrhage and hypertensive disorders of pregnancy for maternal deaths. In few studies Behuria et.al [10] and Para S et.al[11] have reported Hypertensive disorders of pregnancy as the major cause for maternal mortality.

On analysis of data, it was observed that women who died of obstetric hemorrhage related cause has been identified in late stage or in the stage of irreversible shock. For such patients, shock index (Heart ate/systolic Blood Pressure) can be a useful guide. A score of <0.9 indicates low risk whereas score of >1.4 indicates urgent intervention.[12] In addition, the use of Non Pneumatic Anti Shock Garment (NASG) suite while transferring the mother from a primary care level to tertiary care is also proved beneficial. Basic procedures like Active Management of third Stage of labour (AMSTL), early detection of postpartum hemorrhage, appropriate use of Oxytoics, monitoring of third stage of labour, intravenous fluids, blood and blood products and timely surgical intervention has been enforced in use and again it is reinforced as a crucial step to prevent hemorrhage related maternal deaths. Such trainings need to be continued. On the other hand, we found that Hypertensive disorders of pregnancy were the next leading cause of death. We observed that early recognition of preeclampsia, continuous monitoring both in field and institution level, use of appropriate anti hypertensives and rationale use of Magnesium sulphate, as well as timely referral and delivery could help in the incidence.

CONCLUSION

Maternal moratlity ratio in the district is in fluctuating pattern. Majority of the maternal deaths were in the age of 21 – 30 yrs, multigravida, postnatal period and following caesarean section. Hemorrhage, hypertensive disorders of pregnancy and sepsis are leading causes of maternal deaths. Most of these maternal deaths are preventable if patients are given appropriate treatment at periphery and timely referred to tertiary care centre. Higher proportions of deaths were occurred in covid pandemic period in first and second wave. Among the non maternal causes heart disease complicating pregnancy and anemia were the leading cause.

RECOMMENDATIONS

Many maternal mortality and morbidity are preventable. Early AN registration, regular antenatal care, early

identification of high risk factors, complication, timely management and referral to the tertiary care institution for management and delivery are essential. Creating awareness among the public about the health care facilities available in various levels and also educating them about the warning signs which they need to seek medical care and intervention. Maternal deaths should be reviewed at all levels to identify the bottlenecks for further prevention of maternal deaths. Maternal death audit should be focused on identifying the delays in recognizing complications, decision in seeking medical care, reaching a medical facility with adequate care and receiving quality care at the facility. Nutrition, education, and empowerment of girl child are the need of the hour. Maternal mortality can be reduced considerably by late marriage, contraceptive use, spacing pregnancy and limiting family size. It is the responsibility all health care professionals to ensure the health of all mothers and newborn survival as the mother and child play a crucial role for the future generation and community.

LIMITATIONS

We analysed the maternal deaths occurred among the mothers registered in our District, which cannot be generalized. A prospective study can be replicated including the demographic variables influencing maternal health.

CONFLICTS OF INTEREST : NIL

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