MATERNAL MORTALITY IN A TERTIARY CARE CENTRE IN SOUTH INDIA- COMPARATIVE ANALYSIS OVER 10 YEARS

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ABSTRACT

BACKGROUND

Maternal mortality is used as a general indicator to gauge the health and even social status of an Indian mother. Reduction of maternal mortality ratio remains a challenge in India.

The aim of the study is to compare the maternal mortality ratio in a tertiary care centre over a span of 10 years and to analyse the changes and trends in maternal mortality with reference to the causes of maternal mortality and sociodemographic factors.

MATERIALS AND METHODS

A retrospective facility based study was done at Government Medical College, Kozhikode. The detail of maternal death was analysed with respect to age, parity, gestational status of pregnancy and cause of death. Data from a period of 2007-2016 was compiled and compared as two five-year interval to enable a comparative analysis. Causes of death were classified according to World Health Organization application of International Classification of Diseases-Maternal Mortality (ICD-MM) classification. The results were compiled and statistical analysis done using Chi-square and unpaired t-test.

RESULTS

Over the first 5 years of our study, there were 80,217 livebirths and 87 maternal deaths. The next five years showed a similar trend with 77,473 livebirths and 88 maternal deaths. The maternal mortality ratio for 2007-2011 is 109 per 1 lakh livebirths, while maternal mortality ratio is 114 per 1 lakh livebirths in 2012-2016. There is a gross rise in deaths during antepartum period in 2012-16. The most common cause of mortality is still direct causes constituting 79% in 2007-11 and 56% in 2012-16. Indirect causes have risen from 21% to 37% during 2012-16.

CONCLUSION

Maternal mortality ratios for both 5 year periods during the 10 years study period are comparable. The sociodemographic profile has also remained constant. There is a definite decline in deaths due to haemorrhage while mortality due to other obstetric causes and non-obstetric causes are rising.

KEYWORDS

Maternal Mortality, Maternal Deaths, Maternal Mortality Ratio, International Classification of Diseases-Maternal Mortality (ICD-MM).

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BACKGROUND

A maternal death is 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 the pregnancy or its management, but not from accidental or incidental causes. Maternal Mortality Ratio (MMR) is defined as the number of maternal deaths during a given period per 1,00,000 livebirths during the same period.[1] Maternal mortality in India can be used as a general indicator to gauge the health and even social status of an Indian mother. Globally, there were an estimated 2,89,000 maternal deaths in 2013, a decline of 45% from 1990. India accounted for 17% (50,000) maternal deaths though the maternal mortality ratio declined from 560 in 1990 to 190 in 2013.[2,3] The Millennium Development Goal 5 target to reduce by three-quarters, the maternal mortality ratio between 1990 and 2015 and achieve universal access to reproductive healthcare by 2015 remains a farfetched dream for many states. This remained unattained while the world shifted to

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SDG goals of reducing by 2030, the maternal mortality ratio to 70.[4] As a country of more than a billion, it is no mere feet to achieve a steady decline in mortality; however, we have seen rampant progress in the past years. But, there are major hurdles yet to cross our National Maternal Mortality Ratio is 167 and State Maternal Mortality Ratio is 61. Kerala has a maternal mortality rate of 3.2, much better than the national 11.7. The lifetime risk of death of a mother in Kerala is 0.1% as compared to 0.4% on the national level.[5] But, when compared on the international level, our progress is far too little. Here lies the importance of regular surveillance of maternal death. Only with thorough understanding of the causes and sociodemographic factors that underlie each case of maternal death, can we move forward in our implementation of preventive strategies.[6]

Objectives

The aim of our study is to compare the maternal mortality ratio in a tertiary care centre over a span of 10 years. We also aimed to analyse the changes and trends in maternal mortality with reference to causes of maternal mortality and sociodemographic factors.

MATERIALS AND METHODS

A retrospective facility-based study was done at a tertiary care centre in Kozhikode, which has an annual turnover of pregnancy close to 16,000. The detail of maternal death was analysed with respect to age, parity, gestational status of pregnancy and cause of death. Data from a period of 2007-2016 was compiled and compared as two five-year interval to enable a comparative analysis. Causes of death were classified according to World Health Organization application of International Classification of Diseases-Maternal Mortality (ICD-MM) classification.[1,7] The results were compiled and statistical analysis done using Chi-square and unpaired t-test.

Maternal mortality ratio was calculated by the formula.

Maternal mortality ratio = Total number of maternal deaths/total number of livebirths × 1,00,000.

The maternal mortality ratio for both the study periods were derived by taking the mean over 5 yrs. Being a referral center, the study thus offers a glimpse into a large and diverse demographic pool. However, many cases of maternal death tend to skew the data. Nevertheless, it helps to better understand what causes the maximum mortality and morbidity and where in our primary setup was suboptimal care delivered.

RESULTS

Over the first 5 years of our study, there were 80,217 livebirths and 87 maternal deaths. The next five years showed a similar trend with 77,473 livebirths and 88 maternal deaths. The maternal mortality ratio for 2007-2011 is 109 per 1 lakh livebirths, while maternal mortality ratio is 114 per 1 lakh livebirths in 2012-2016. Table 1 depicts the total number of maternal deaths and maternal mortality ratio during the past 10 years. Figure 1 shows the maternal mortality ratio trend over past 10 years compared to the available State and National Maternal Mortality Ratio levels during the time period. From Table 2, we see that maximum number of maternal deaths occurred in the 20-29 years age group in both time periods. There is an increase in the number of deaths in young mothers from 2.29% in 2007-2011 to 5.68% in 2012-2016. The number of deaths in elderly has marginally declined (11.49% to 9.09%), although not statistically significant. From Table 3, we find that during 2012-16, 50% of deaths were constituted by multigravida. The number of deaths in grand multipara has declined from 11.49% to 6.81%. Doing a statistical analysis of maternal deaths in grand multigravida compared to primi/multipara, we got an OR of 9.95 with a p value <0.00001 in 2007-2011 and an OR of 4.93 with a p value <0.0002 during 2012-2016, which was statistically significant. Table 4 shows that most deaths occurred in postpartum period in both time periods. 73% of deaths were postpartum in 2007-2016 while only 69% were postpartum in 2012-2016. There is a gross rise in deaths during antepartum period (26%) in 2012-16 with statistical significance (p<0.005).

The most common cause of mortality is still direct causes constituting 79% in 2007-11 and 56% in 2012-16. Indirect causes have risen from 21% to 37% by 2012-16 with p <0.025. Table 5 enumerates the causes of death- Group 3 (obstetric haemorrhage) was the leading cause of death in 2007-2011 (24%), followed by Group 2 (hypertensive disorders of pregnancy) (17.24%), Group 4 (pregnancy related infection) (16%) and Group 5 (other obstetric complications) (16.09%). Group 1 (abortive outcome) was only minimal (5.74%). In 2012-2016, the leading cause of death was Group 5 (other obstetric) at 20.45%, followed by hypertensive disorders at 17%. Obstetric haemorrhages drastically reduced to 7.95%. Pregnancy-related infection (7.95%) and deaths due to abortive outcome (2.27%) were also reduced. The last 5 years showed a trend towards other obstetric causes (Group 5) being the lead cause of mortality. Under Group 5, pulmonary embolism was still prominent at 7.95%. However, table 6 shows a declining trend in amniotic fluid embolism (6.89% to 4.54%) with a marginal increase in peripartum cardiomyopathy and cerebral venous thrombosis. Table 7 highlights the trends in Group 2 (hypertensive disorders). Although, the general prevalence of mortality remains the same in this group, there is a mild decrease in HELLP and eclampsia-related deaths with an increase in severe preeclampsia-related deaths (1.14% to 4.54%). Table 8 elaborates the indirect causes/Group 7 (non-obstetric complication). During 2007-11, majority of indirect deaths were due to cardiovascular diseases (10.34%), followed by digestive system disease (5.74%), nervous system disorders (2.29%) and anaemia (2.29%). During 2012-16 period, maternal infectious diseases (10.22%), followed by other nonspecific causes (7.95%) were the most prevalent among indirect causes.

Year	Deaths	Livebirths	MMR
2007	17	22,666	75
2008	14	17,402	81
2009	14	16,058	87
2010	23	13,242	174
2011	19	14,839	128
2012	14	15,525	90
2013	13	15,776	82
2014	27	15,640	173
2015	17	15,285	111
2016	17	15,247	112

Table 1. Maternal Mortality Ratio

Maternal Age	2007-2011		2012-2016	
	Number	%	Number	%
≤=19	2	2.29	5	5.68
20-29	59	67.81	58	65.9
30-34	16	18.39	17	19.31
≥=35	10	11.49	8	9.09

Table 2. Maternal Age at Death

Parity	2007-2011		2012-2016	
	Number	%	Number	%
Primi	39	44.82	35	39.77%
Multi	38	43.67	44	50%
Grand multi	10	11.49	6	6.81%
Unknown			3	3.40%

Table 3. Parity

Delivery Status	2007-2011		2012-2016		P Value
	Number	%	Number	%	
Postabortive	6	7	4	5	
Pregnant	8	9	23	26	0.0036
<24 hrs. postpartum	73	84	21	24	
>24 hrs. postpartum			40	45	

Table 4. Delivery Status at Death

Cause of Death	2007-2011		2012-2016		P Value
	No.	%	No.	%	
Group 1- Abortive outcome	5	5.74	2	2.27	0.2
Group 2- Hypertensive disorders	15	17.24	15	17.04	
Group 3- Obstetric haemorrhage	21	24.13	7	7.95	0.003
Group 4- Pregnancy-related infections	14	16.09	7	7.95	0.09
Group 5- Other obstetric complications	14	16.09	18	20.45	0.45
Group 6- Unanticipated complications					
Group 7- Non-obstetric complications	18	20.68	33	37.50	0.0146
Group 8- Unknown			6	6.81	0.0135

Table 5. Causes of Maternal Mortality According to ICD-MM

Other Obstetric Causes	2007-2011		2012-2016	
	Number	%	Number	%
O26.6 Liver disease in pregnancy	0		1	1.13%
O88.1. Amniotic fluid embolism	6	6.89%	3	4.54%
O88.2. Pulmonary embolism	6	6.89%	7	7.95%
O90. Peripartum cardiomyopathy	1	1.14%	2	2.27%
O87.3. CVT in puerperium	1	1.14%	2	2.27%
X. Intentional self-harm	0		2	2.27%
O21.1 Hyperemesis with metabolic disturbance	0		1	1.13%

Table 6. Other Obstetric Causes

	2007-2011		2012-2016	
	Number	%	Number	%
O14.1. Severe PE	1	1.14%	4	4.54%
O14.2. HELLP syndrome	5	5.74%	4	4.54%
O15. Eclampsia	9	10.34%	7	7.95%

Table 7. Hypertensive Disorders Leading to Maternal Death

Cause of Death	2007-2011		2012-2016		P Value
	No.	%	No.	%	
O98. Maternal infectious and parasitic disease	0		9	10.22%	0.002
O99.0. Anaemia	2	2.29%	3	3.40%	
O99.1. Other blood disease	0		2	2.27%	
O99.3. Nervous system	2	2.29%	2	2.27%	
O99.4. Circulatory system	9	10.34%	6	6.81%	
O99.5. Respiratory system	0		1	1.13%	0.32
O99.6. Digestive system	5	5.74%	3	3.40%	0.4
O99.8. Other unspecified	0		7	7.95%	0.0074

Table 8. Indirect (Non-Obstetric Causes) of Maternal Mortality

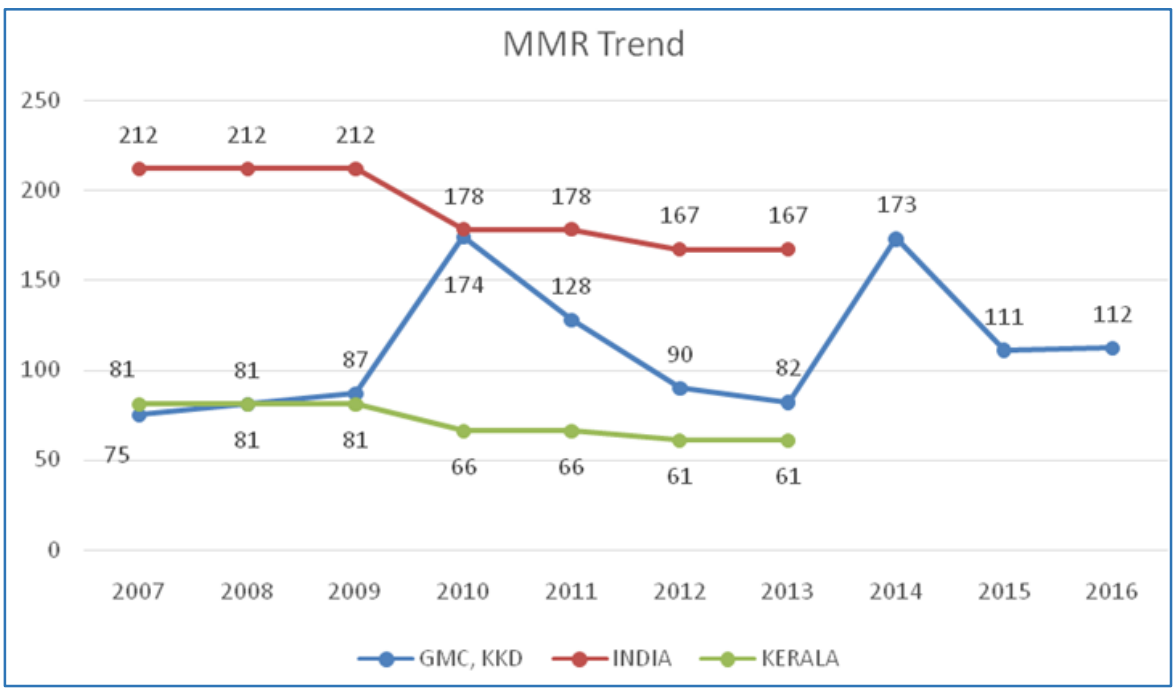

Figure 1. Trend in MMR

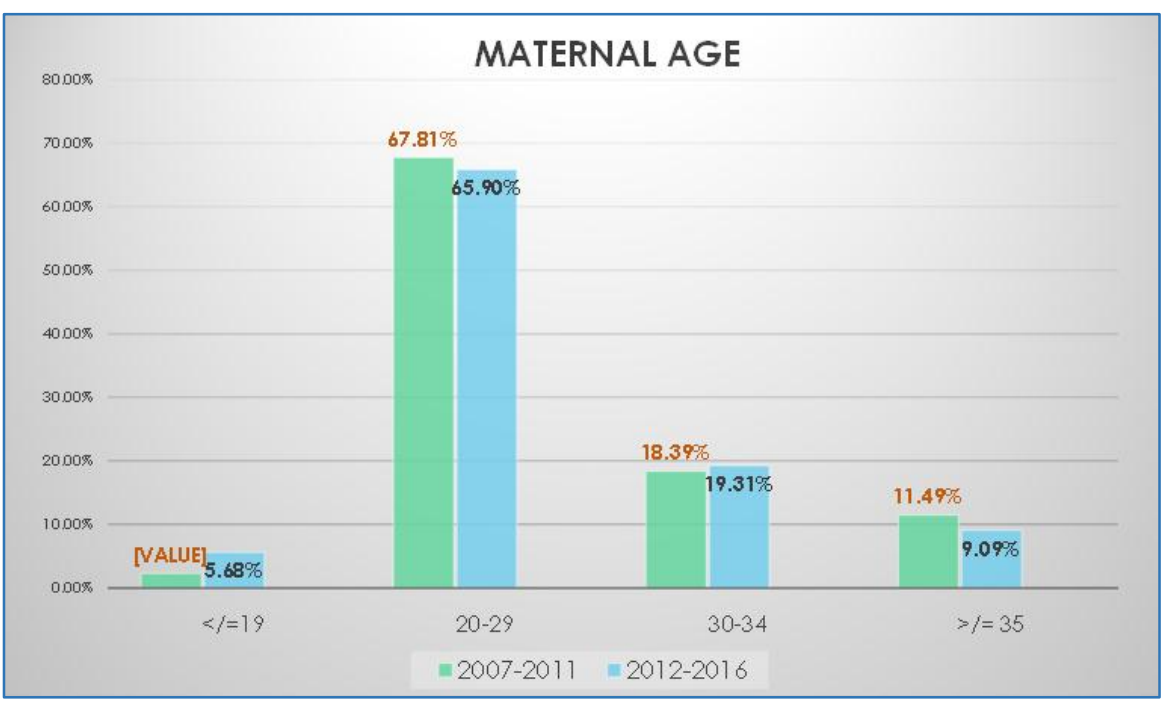

Figure 2. Maternal Age

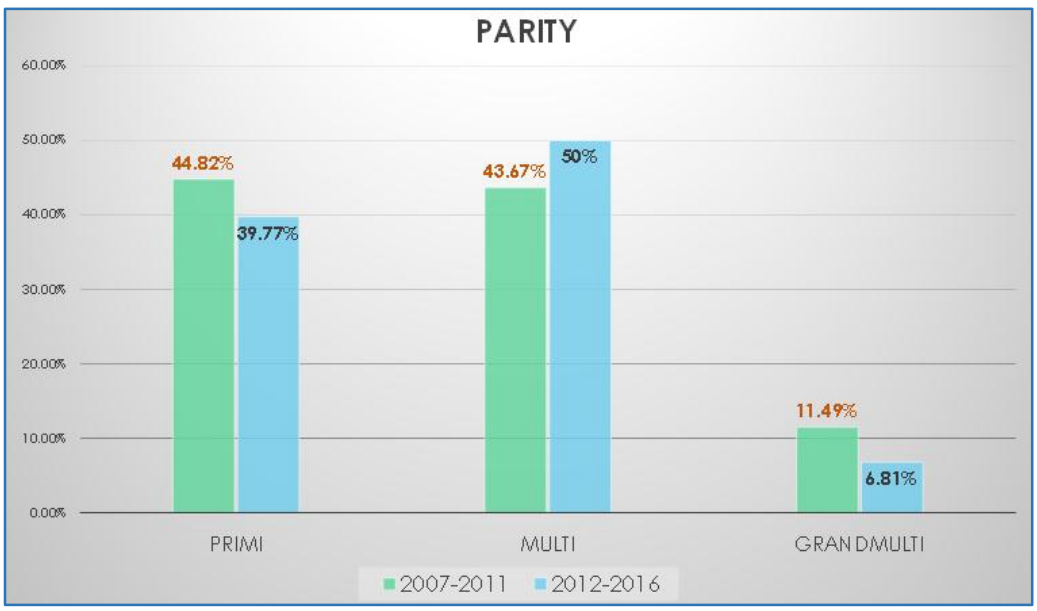

Figure 3. Parity

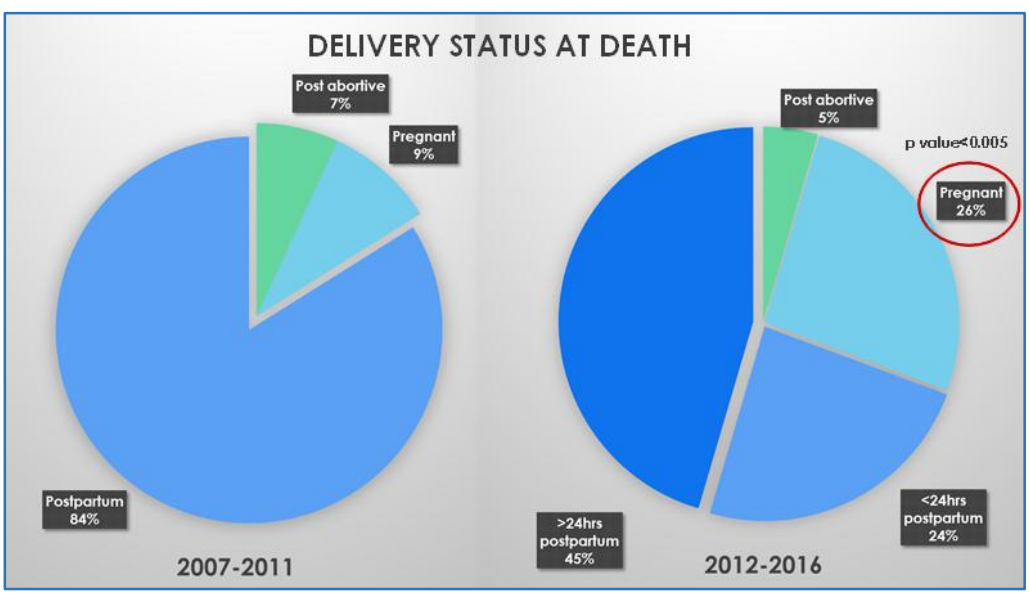

Figure 4. Delivery Status at Death

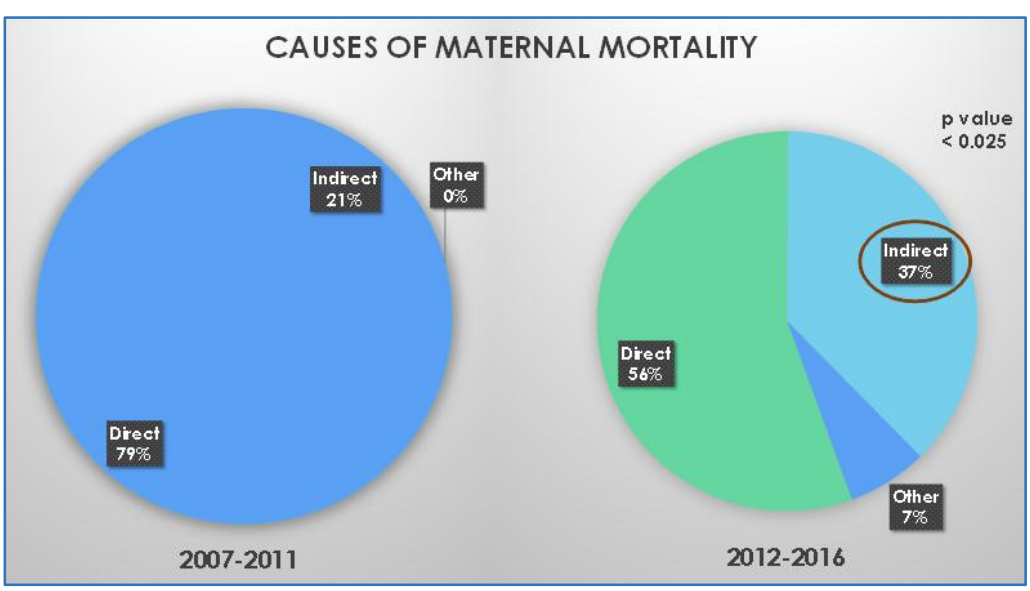

Figure 5. Causes of Maternal Mortality

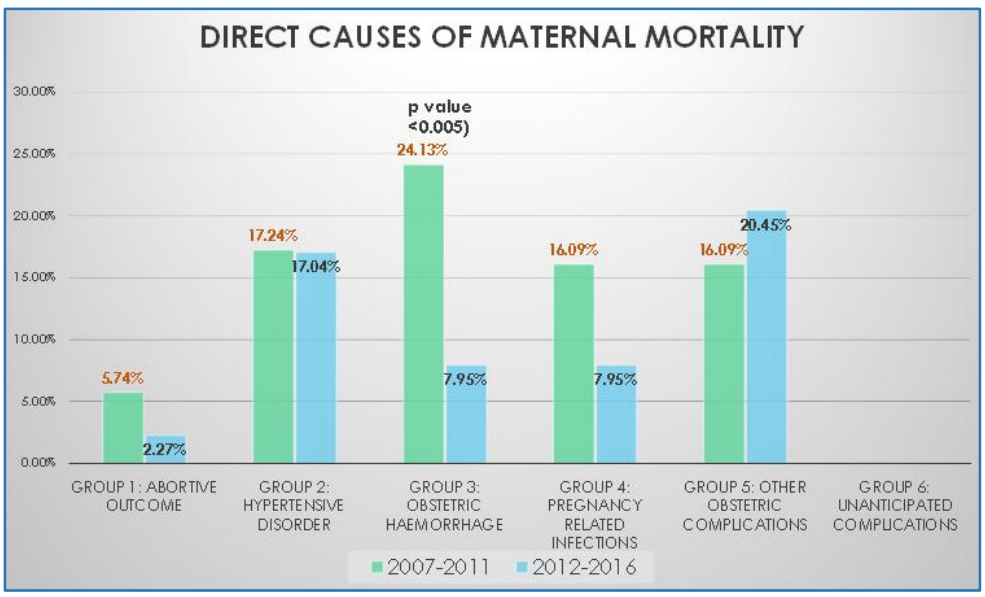

Figure 6. Direct Causes of Maternal Mortality

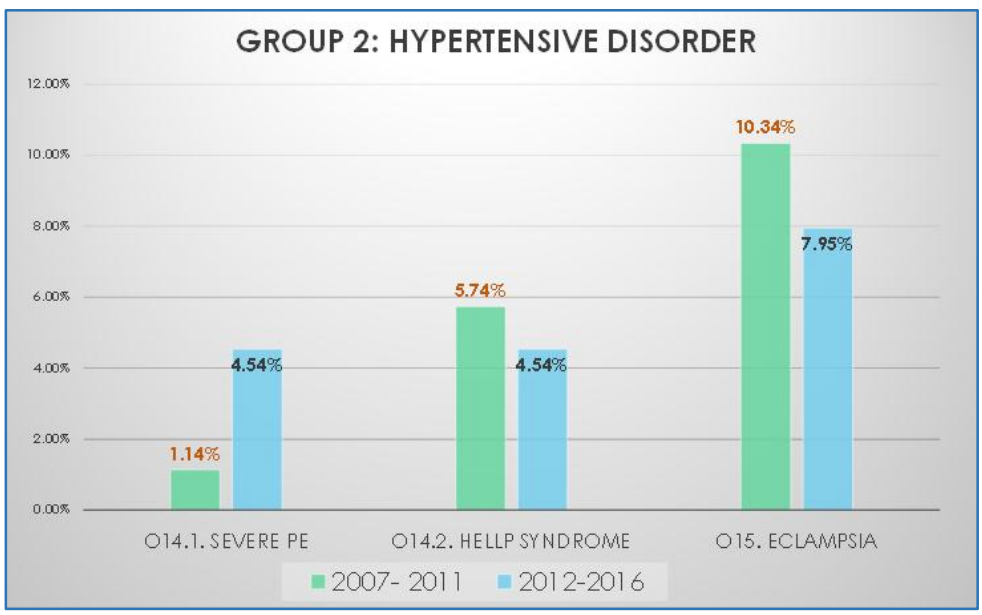

Figure 7. Hypertensive Disorders of Pregnancy as a Cause of Maternal Mortality

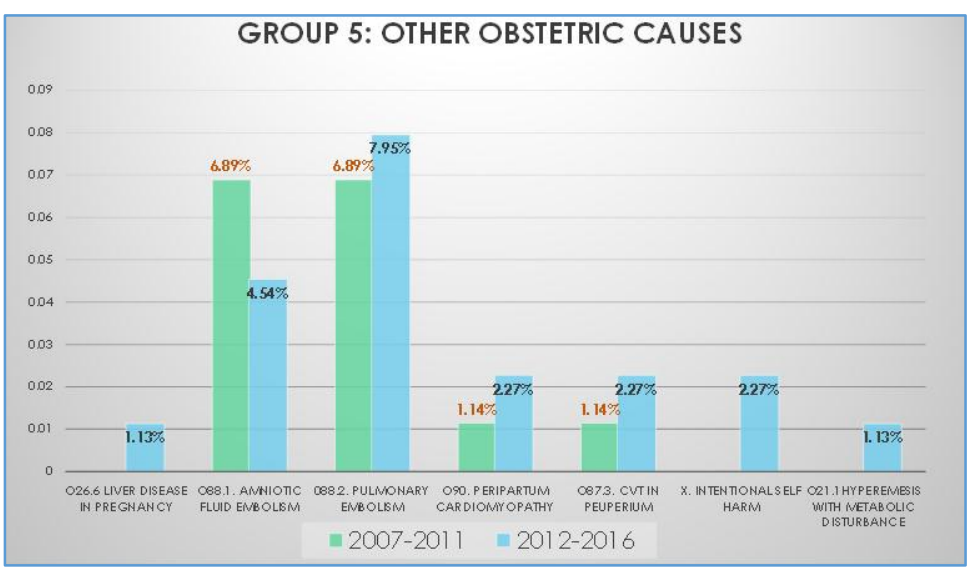

Figure 8. Other Obstetric Causes as a Cause of Maternal Mortality

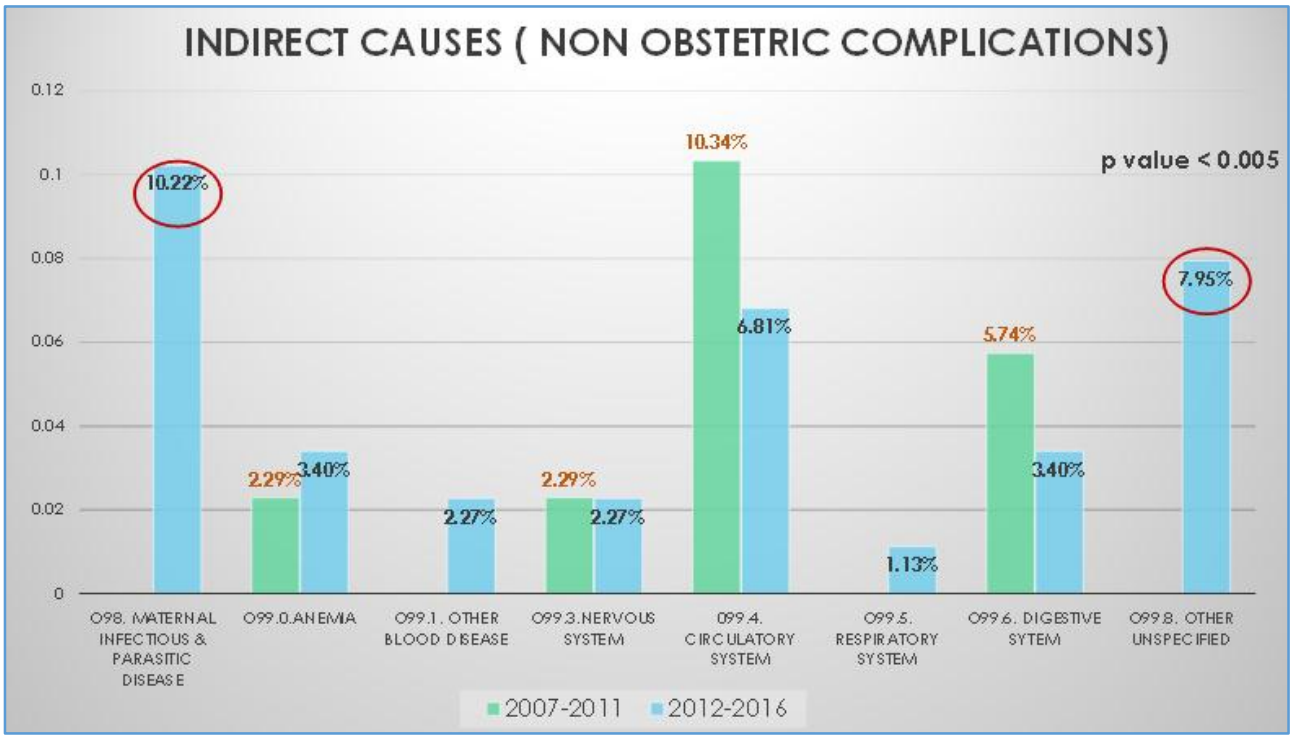

Figure 9. Non-Obstetric Causes as a Cause of Maternal Mortality

DISCUSSION

There is very little change in the trend of maternal age over the past 10 years. The majority of cases of maternal death (67% to 65%) have still occurred in the 20-29 yrs. age group, most likely due to the high fertility amongst this population. There is a fall in the number of grand multi deaths. However, grand multis are more at risk of maternal death than primigravida and multigravida (OR 9.93, p value <0.0001 (2007-11) and 4.93 (2012-16), p value <0.005). By 2012-16, the deaths in the antepartum period had increased substantially to 26% (p value <0.005) keeping in trend with national studies.[7] This rise maybe in tune with the rise in indirect causes of maternal mortality suggesting that more women with known medical disorders are getting married and attempting pregnancy. Maximum deaths were still in the postpartum period (69%) with the majority occurring after 24 hrs. of delivery. There is no statistical change in postpartum deaths.

Direct causes constituted 79% in 2007-11 and 56% in 2012-16. Montgomery et al in 2014 re-examined the causes of maternal mortality in India and found that direct obstetric causes account for over 80% of maternal deaths in India.[8,9] Reddy et al in their article 'India's Progress Towards Millennium Development Goals' reported the trend in maternal mortality ratio in Kerala for the period of 1997-2009.[10,11] Their findings illustrate very little decline in maternal mortality ratio during this period. There is a changing trend in this study in the causes of maternal mortality with a shift from the triad of haemorrhage, hypertension and sepsis.[12] The last 5 years show more mortality with other obstetric complications (Group 5) and non-obstetric complications (Group 7). There is a drastic decline in haemorrhage-related deaths signifying the success of preventive measures targeted at PPH management. Although, group 2 (hypertensive disorders) causes remain almost constant, there is a shift in the pathology with more cases of severe preeclampsia contributing to death. The stagnation in hypertensive causes leading to death is raising a finger at our management of gestational hypertension and ensuing complications. However, the decline in eclampsia and HELLP related deaths is heartening.

Even with the rampant use of antithrombotic measures, the incidence of pulmonary thrombosis is on the rise. The need to study the prothrombotic trend in our population is therefore essential.

The rise in non-obstetric complications calls for training of tertiary centre staff in high-risk intensive care unit management and separate protocols to prevent further mortality. The incidence of pre-existing medical disorders in reproductive age groups needs to be studied. Prenatal diagnosis of medical disorders should be a norm.

Maternal mortality ratio is much higher than state levels. This can be explained by the referral status of our centre with inflow of complicated cases, thus causing a skewing of maternal mortality ratio to higher side. Nevertheless, the maternal mortality ratio is lower than national level.

CONCLUSION

Maternal mortality ratios for both 5 year periods during the 10 years study period are comparable. The sociodemographic profile has also remained constant. There is a definite decline in deaths due to haemorrhage while mortality due to other obstetric causes and non-obstetric causes are rising and there is no significant decrease in deaths due to hypertensive disorders of pregnancy in spite

of our aggressive management. Steps have to be taken to provide health education on the early recognition of potentially hazardous medical conditions as part of an enhanced antenatal care program.

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