**Temporal Patterns of Maternal Deaths in Major States of India (2007-09 to 2015-17)**

**Abhipsa Samal**

Ph.D. Scholar

Department of Geography

Ravenshaw University, Cuttack,

Odisha, India

Email: abhipsasamal12@gmail.com

**Binodini Majhi**

Assistant Professor

Department of Geography

Ravenshaw University, Cuttack,

 Odisha, India

Email: binodini2007 @gmail.com

**ABSTRACT**

Maternal mortality remains a pressing issue in India, with significant regional disparities and socioeconomic implications. According to data from the World Health Organization (WHO), India accounted for nearly 17% of global maternal deaths in 2017. In India maternal mortality is still very high in some states which is more than the national average, where as there are also states like Kerala have very low maternal deaths. There various factors which contributes to variations in maternal deaths across states and regions in India. Considering this an important issue, the present work is intended to understand the temporal patterns of maternal deaths in major states of India. The study is based on secondary sources of data obtained from Special Bulletin on Maternal Mortality in India for five time period such as- (2007-09,2010-12,2011-13,2014-16 and 2015-17). The study result revealed that drastic change in maternal death from 2007-09 to 2015-17has been seen in the states of Uttarakhand, Uttar Pradesh and Jharkhand which recorded a decrease of (-181), (-112) and (-92) respectively followed by Chhattisgarh and Bihar indicating a change of (-78) and (- 53) respectively. The lowest change is found out in the states of Kerala, Haryana and Tamil Nadu, indicating a change of (-6), (-7) and (-8) respectively.

1. **INTRODUCTION**

Maternal mortality is a significant public health concern worldwide, and India, as the second most populous country, faces substantial challenges in addressing this issue. Maternal mortality refers to the death of a woman during pregnancy or within 42 days of childbirth or termination of pregnancy (WHO). Maternal mortality remains a significant global health concern, especially in low- and middle-income countries. According to the World Health Organization, approximately 295,000 women died during pregnancy and childbirth in 2017, and the majority of these deaths occurred in sub-Saharan Africa and South Asia (WHO, UNICEF, UNPFA). Efforts to reduce maternal deaths include improving access to skilled healthcare during childbirth, offering better antenatal care, and enhancing family planning services. However, disparities in healthcare quality, socio-economic status, and educational opportunities often contribute to high maternal mortality rates in some regions.

Maternal mortality in Asian countries varied widely depending on the level of development, healthcare infrastructure, and access to maternal services. South Asia, including countries like Afghanistan, Pakistan, and Nepal, has higher maternal mortality rates compared to East Asian nations like Japan, South Korea, and Singapore. As revealed from Fig-1(Global pattern of Maternal Mortality) showing a high level of disparities in healthcare facilities which results in high rate of MMR in developing countries and Sub-Saharan Africa in comparison to the developed counties which falls below 20 MMR per 10000 live births.

 **Figure 1:** Global pattern of Maternal Mortality Ratio (MMR)

 Source: Trends in Maternal Mortality 2000 to 2017 Estimates by WHO, UNICEF, World Bank

India has made significant strides in reducing maternal mortality since 2005, but challenges remain. According to the Sample Registration System (SRS) by the Registrar General of India, the Maternal Mortality Ratio (MMR) fell from 374 per 100,000 live births in 2000-04 to 113 per 100,000 live births in 2016-18. Despite notable progress in recent years, India continues to grapple with high maternal mortality rates, highlighting the need for comprehensive measures to improve maternal healthcare services and outcomes across the country. Maternal mortality remains a pressing issue in India, with significant regional disparities and socioeconomic implications. According to data from the World Health Organization (WHO), India accounted for nearly 17% of global maternal deaths in 2017. The latest available data from the Registrar General of India estimates the Maternal Mortality Ratio (MMR) at 113 per 100,000 live births, indicating a decline from previous years but still falling short of national and global targets.

**Causes of maternal deaths in India:**

The key causes of maternal deaths in India often include the followings:

* *Haemorrhage:* Excessive bleeding during or after childbirth remains a leading cause.
* *Hypertensive Disorders:* Conditions such as preeclampsia and eclampsia are significant concerns. This can be fatal if not managed well.
* *Sepsis:* Infections post-childbirth or following unsafe abortions can lead to maternal death. Infections can lead to severe complications and death if not treated promptly.
* *Obstructed Labour:* Difficulty in labour and delivery due to the baby's position can result in complications. Often due to a lack of timely medical intervention.
* *Unsafe Abortions:* Lack of access to safe abortion facilities can lead to life-threatening situations. Such type of practices contributes to maternal mortality.
* *Lack of Skilled Care:* Insufficient access to qualified medical professionals during pregnancy and childbirth.

 Based on SRS-2001-03 data, Fig.2 gives idea about the major causes of maternal mortality in India, out all *haemorrhage* constitutes 38% of total maternal deaths followed by *sepsis* (11%) and *abortion* (8%).

**Figure: 2** Causes of Maternal Mortality Ratio in India, showing percentage share of MMR by causes

 Source: Prepared by authors based on SRS 2001-03

One striking feature of maternal mortality in India is the substantial regional variations. States in northern and central India have consistently reported higher MMRs compared to the southern and north-eastern regions. Socioeconomic factors, limited access to quality healthcare services, low literacy rates, and cultural practices often contribute to these disparities. States such as Uttar Pradesh, Bihar, Rajasthan, and Madhya Pradesh have been identified as high-burden states, requiring focused interventions to address the underlying causes of maternal deaths.Multiple factors contribute to maternal mortality in India. Delayed or inadequate access to antenatal care, lack of skilled birth attendants, limited availability of emergency obstetric care, and delays in accessing appropriate medical interventions are significant factors. Poor infrastructure, including inadequate transportation and healthcare facilities in remote areas, exacerbates the problem. Additionally, social determinants, such as poverty, low educational attainment, and gender disparities, play a role in hindering women's access to quality healthcare and contributing to adverse maternal outcomes.

 There are notable disparities in maternal mortality rates across Indian states, reflecting variations in healthcare infrastructure, literacy rates, and socio-economic conditions. States like Kerala, Maharashtra, and Tamil Nadu generally have lower Maternal Mortality Ratios (MMRs), thanks in part to better healthcare facilities and higher literacy rates among women. On the other hand, states like Uttar Pradesh, Bihar, and Assam often have higher MMRs. These states face challenges such as limited access to quality healthcare, lower levels of female literacy, and socio-cultural factors that may hinder women from seeking timely medical care.

Bottom of Form

1. **REVIEW OF LITERATURE**

Pandey et al. (2014**)** adopted data from the Census of India, 2011, and the Annual Health Survey (AHS), 2010-13, to examine the level and trend in the coverage gap of a set of interventions for maternal and child health services. They also looked at the variation in usage of health services for mothers and children in the districts of high focus states of India. According to study's results, Madhya Pradesh has the lowest coverage gap (21%) while Uttar Pradesh has the highest (37%). The study also noted that the absolute change in coverage difference between 2009 and 2013 and there is a negative correlation between socioeconomic development and the gaps in coverage (r=0.49, p=0.01). The utilization of child and maternal medical facilities across Indian districts has been shown to vary significantly. When it comes to using medical care, resource- rich people (urban residents) much outpace marginalized people (rural residents).

Choudhury et al. (2015)evaluates the risk variables for pregnancy- related mortality in India's nine Empowered Action Group (EAG) states, namely, Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh and Uttarakhand. It was discovered that maternal mortality in India's EAG states is significantly higher than the country's average. The observed risk factors highlight the necessity of raising the standard of maternity care. An important finding of the study was that universal access to parental and postpartum care could reduce the danger associated with poor socio-economic background.

Prusty et al. (2015**)** used the most recent District Level Household and Facility Survey (DLHS-III, 2007-08) to assess the level and pattern of maternal healthcare service utilization among various subgroups of women in Odisha with a focus on the regional, economic and educational inequality. The study found out that use of maternal healthcare facilities in Odisha is unevenly distributed among different groups, and that it is especially prevalent in underprivileged areas that are inhabited by the poor and illiterate.

Another study conducted by Sundari et al. (2016)sought to identify the factors that could reduce maternal mortality and figure out the causes of maternal death, including whether or not they are preventable. In order to do this, a retrospective analysis of the deaths of mothers from January 2015 to December 2015 was conducted. In accordance to the study's outcomes, there were a total of 56 maternal fatalities out of 6976 live births, yielding MMR of 802 (802 deaths/ 1000 live births). Ages 21 to 25 accounted for the bulk of deaths. Pregnancy- related hypertension was discovered to be one of the primary direct causes of death, based on the study. While there were a lot of bookings, more than 90% of maternal deaths might have been avoided with proper use of IV fluids, blood products, and medications, health education of women, early detection of PIH and care of it and early detection of anemia.

Similar to the previous study, Garg (2016)conducted a retrospective and prospective analysis of all maternal facilities from January 2001 to December 2005. They discovered a total of 204 maternal deaths out of 24,620 live births, providing the MMR of 828.59 per 100,000 live births. The survey also showed that 74% of mother's deaths occurred in unreported cases. The age group of 25-29 years old witnessed the greatest number of deaths. Out of 204 mothers who died, direct causes accounted for 72.06% of the deaths. The leading cause of dying was hemorrhage (36%) followed by pregnancy-related toxemia (19%) and sepsis (13%). Hemorrhage, pregnancy-related toxemia, and sepsis were determined to be the main and direct causes of death. Deaths among mothers was also being caused by anemia and other indirect factors such jaundice, malaria, and heart disease.

Along with aforementioned problem, it was crucial to be concerned about its prevention. In this context, Cornwell et al. (2019)study indicated that Indonesia has used the strategy over the past few decades to lower maternal deaths by boosting the availability of midwives. The provision of midwife services at village health posts has been shown to reduce mortality of mothers, and these reductions have been shown to continue over time. Additionally, it was suggested by the authors that further reductions in maternal mortality in Indonesia might necessitate a change in strategy to improve access to hospitals and the availability of doctors. The authors also recommended gathering information on maternal death in a subsequent census so that it can be useful for research in Indonesia and other nations.

A different study from Indonesia, conducted by Baharuddin et al. (2019), looked at the hospital-based maternal deaths by using data from blinded medical records of 90 women who passed away in 11 hospitals between January and June 2014, and specialists from the Indonesian Society of Obstetrics and Gynecology reviewed the records to determine the causes of death and identify contextual factors for these deaths. The study found that 75 of the 90 maternal deaths were due to unintentional causes.

In rural India, Chauhan and Ali (2020)looked at the level of inequalities in three areas of maternal health care: complete antenatal care (full ANC), skilled birth attendants (SBA) and postnatal care (PNC). It was found out that there was a sizable disparity in the use of maternal health care across socioeconomic groups, but between 2005 and 2016, this gap had significantly shrunk in rural India and there has been a noticeable improvement in the use of maternal health care, particularly the use of skilled attendants at birth (SBA). The study's conclusion is that the government should make additional efforts to help the north-eastern states, along with states like Uttar Pradesh, Bihar and Jharkhand, in order to provide basic maternal health care services to women with low socio-economic status.

1. **MATERIALS AND METHODS**

The main objectives of the present paper are to study the Spatio- temporal trends in maternal deaths in major

 states of India and to find out the change in maternal deaths from 2007-09 to 2015-17. The present study is based on secondary sources of data which are collected from Sample Registration System, Census of India, 2011. The data related to maternal death are collected from Special Bulletin on Maternal Mortality in India for five time period such as- (2007-09,2010-12,2011-13,2014-16 and 2015-17). Apart from this books, journals and government reports have been referred for the study. The methodologies used for analysis in the study are comparisons and change detection. The study of the study has been presented in tabular forms, bar diagrams and maps

1. **RESULTS AND DISCUSSIONS**
2. **Spatial and Temporal Trends in Maternal Death**

It has been observed from the table-1 that the maternal mortality of India in the year 2007- 09is quite high, which is about 926 deaths. It has been seen that Kerala is having lowest number of maternal mortalities which accounts for only 12 deaths followed by Tamil Nadu, Haryana and Punjab i.e., about 22 deaths whereas it is extremely high in the states of Uttar Pradesh and Uttarakhand accounting for 194 deaths.

**Table 1- Trends of Maternal Death in major states of India (****2007-09 to 2015-17)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **States** | **2007-09** | **2010-12** | **2011-13** | **2014-16** | **2015-17** |
| Assam | 48 | 84 | 39 | 29 | 23 |
| Bihar | 100 | 42 | 81 | 62 | 28 |
| Jharkhand | 100 | 84 | 81 | 62 | 47 |
| Madhya Pradesh | 89 | 75 | 72 | 64 |  8 |
| Chhattisgarh | 89 | 75 | 72 | 64 | 56 |
| Odisha | 53 | 47 | 44 | 35 | 11 |
| Rajasthan | 87 | 68 | 65 | 46 | 33 |
| Uttar Pradesh | 194 | 156 | 152 | 106 | 43 |
| Uttarakhand | 194 | 156 | 152 | 106 | 82 |
| Andhra Pradesh | 31 | 25 | 21 | 12 | 13 |
| Telangana |  NA |  NA |  NA |  9 | 12 |
| Karnataka | 41 | 32 | 29 | 25 |  8 |
| Kerala | 12 | 10 | 9 |  7 | 23 |
| Tamil Nadu | 22 | 20 | 18 | 15 |  6 |
| Gujarat | 36 | 29 | 26 | 23 | 14 |
| Haryana | 22 | 21 | 18 | 15 | 22 |
| Maharashtra | 23 | 18 | 14 | 14 | 15 |
| Punjab | 22 | 19 | 17 | 11 | 13 |
| West Bengal | 44 | 35 | 33 | 25 | 11 |
| **India** | **181** | **150** | **122** | **101** | **82** |

 **Source-** Sample Register System (SRS :2007-09 to 2015-17)

The maternal mortality is found less in Kerala due to proper health care facilities, high per capita income, skilled attendants, high number of hospitals, doctor- patient ratio is also high etc. whereas the reasons behind high maternal deaths because lack of awareness, poor economic conditions, social stigma, unskilled attendants, lack of nutritional food etc. There are only two states of India which are having higher maternal mortality than the national average and the states are Uttar Pradesh and Uttarakhand. Out of 19 states, 13 states are having lower maternal mortality than the national average (181) and the states are Assam, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Odisha, Rajasthan, Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, Gujarat, Haryana, Maharashtra, Punjab and West Bengal.

The maternal mortality of India in the year 2010- 12 is still quite high, which is about 767 deaths as revealed from Table-1. It has been seen that Kerala is having lowest number of maternal mortalities which accounts for only 10 deaths followed by Maharashtra and Punjab which accounts for only 18 and 19 respectively whereas it is extremely high in the states of Uttar Pradesh and Uttarakhand accounting for 156 deaths as like the earlier time period having higher maternal mortality than the national average. Out of 19 states, 13 states are having lower maternal mortality than the national average (150) and the states are Assam, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Odisha, Rajasthan, Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, Gujarat, Haryana, Maharashtra, Punjab and West Bengal.

**Table -2 Categorization of States based on Maternal Deaths in Major states of India**

|  |  |
| --- | --- |
| **Study Periods****(Years)** | **Categorization of States** |
| **Very Low**  **(0-40)** | **Low** **(40-80)** | **Medium** **(80-120)** | **High** **(120-160)** | **Very High** **(160-200)** |
| **2007-2009** | Kerala, Tamil Nadu, Haryana, Punjab, Maharashtra, Andhra Pradesh and Gujarat. **(07 states)** |  Karnataka, West Bengal, Assam and Odisha. |  Rajasthan Madhya Pradesh, Chhattisgarh, Bihar andJharkhand. |  NIL | Uttar Pradesh and Uttarakhand. |
| **2010-2012** | Kerala, Maharashtra, Punjab, Tamil Nadu, Haryana, Andhra Pradesh, Gujarat, Karnataka and West Bengal. **(09 States)** |  Bihar, Odisha, Rajasthan, Madhya Pradesh andChhattisgarh. |  Assam and Jharkhand |  Uttar Pradesh  and Uttarakhand. |   NIL |
| **2011-2013** | Kerala, Maharashtra, Punjab, Tamil Nadu, Haryana, Andhra Pradesh, Gujarat, Karnataka, West Bengal and Assam. **(10 states)** |  Odisha, Rajasthan, Madhya Pradesh and Chhattisgarh |  Bihar and Jharkhand | Uttar Pradesh and Uttarakhand. |   NIL |
| **2014-2016** | Kerala, Telangana, Punjab, Maharashtra, Andhra Pradesh, Haryana, Tamil Nadu, West Bengal, Karnataka, Assam and Odisha. **(11 states)** | Rajasthan, Bihar, Jharkhand, Madhya Pradesh andChhattisgarh |  Uttar Pradesh and Uttarakhand |   NIL |   NIL |
| **2015-2017** | Tamil Nadu, Madhya Pradesh, Karnataka, Odisha, West Bengal, Telangana, Andhra Pradesh, Punjab, Gujarat, Maharashtra, Haryana, Assam, Kerala, Bihar and Rajasthan. **(15 states)** |  Uttar Pradesh and Jharkhand. |  Uttarakhand |   NIL |  NIL |

Source: Computed by Authors based on Table-1

The maternal mortality of India in the year 2011- 13is still quite high, which is about 767 deaths. Kerala is still seen having lowest number of maternal mortality accounting for 9 deaths followed by Maharashtra and Punjab which accounts for only 14 and 17 respectively whereas it is extremely high in the states of Uttar Pradesh and Uttarakhand accounting for 152 deaths. Uttar Pradesh and Uttarakhand are continuing with higher maternal mortality than the national average (122). Out of 19 states, 13 states are having lower maternal mortality than the national average and the states are Assam, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Odisha, Rajasthan, Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, Gujarat, Haryana, Maharashtra, Punjab and West Bengal. Though some states like Odisha, Chhattisgarh, Haryana and Rajasthan need to be improved in terms of hospitals, skilled attendants, proper education, provision of nutritional food etc. as majority parts of these states are dominated by tribal population.

The maternal mortality of India in the year 2014- 16is declining but it is still high, which is about 556 deaths. Kerala is still seen having lowest number of maternal mortality accounting for 7 deaths followed by Telangana accounting only 9 deaths whereas it is extremely high in the states of Uttar Pradesh and Uttarakhand accounting for 106 deaths. Out of 16 states, 14 states are having lower maternal mortality than the national average and the states are Assam, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Odisha, Telangana, Rajasthan, Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, Gujarat, Haryana, Maharashtra, Punjab and West Bengal.

It has been observed from the above table (Table-1) that the maternal mortality of India in the year 2015- 17is declining but it is still high, which is about 525 deaths. Kerala is still seen having lowest maternal mortality accounting for 6 deaths followed by Telangana accounting only 8 deaths whereas it is extremely high in the state of Uttarakhand accounting for 82 deaths followed by Chhattisgarh which accounts for 56 deaths. Out of 16 states, 15 states are having lower maternal mortality than the national average and the states are Assam, Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Odisha, Telangana, Rajasthan, Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, Gujarat, Haryana, Maharashtra, Punjab and West Bengal. Although 15 are coming under national average but many of these states i.e., Assam, Rajasthan, Chhattisgarh, Odisha, West Bengal etc. needs to be taken care of. As these states constitutes some tribal areas, inadequate qualified staffs, teen pregnancy, inadequate equipment for emergency etc. The spatial pattern of maternal deaths for all the study period has been depicted in Figure-3, which clearly revealed the interstate disparity and its changing pattern over time.

1. **Spatio-Temporal Change in Maternal Death**

It has been observed that the change in maternal death from 2007-09 to 2010-12are seen mainly in the states of Uttar Pradesh and Uttarakhand which recorded a decrease of -38 women from the base year taken followed by Rajasthan (-19) and Bihar and Jharkhand (-16). These are the top three states which recorded the highest change and this may be due to the upgradation in the facilities, proper management of government in implementing policies, some change in economic condition, increase in doctor- patient ratio etc. Thus, it is noticed that the states of Uttar Pradesh, Uttarakhand, Rajasthan, Bihar and Jharkhand set down the highest number of maternal deaths. Whereas, the lowest changes are found out in the states of Haryana, Kerala & Tamil Nadu and Punjab indicating a change of (-1), (-2) and (-3) respectively.

The change in maternal death from 2010-12 to 2011-13are seen mainly in the states of Uttar Pradesh, Uttarakhand, Andhra Pradesh and Maharashtra which recorded a decrease of -3 followed by Assam, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Odisha, Rajasthan, Karnataka, Gujarat and Haryana -2. The lowest changes are found out in the state of Kerala indicating a change of (-1). The lowest change is seen may be due to proper pregnancy care, more births in hospitals or with skilled health care providers present, greater availability of antibiotics, and treatments for complications, knowledge of good personal hygiene practices to prevent infection etc. This change in maternal death mainly depicts the lowering of mothers' deaths by incorporating various means and different strategies.

The major change in maternal death from 2011-13 to 2014-16are seen in the states of Uttar Pradesh and Uttarakhand which recorded a decrease of (-46) followed by Bihar, Jharkhand and Rajasthan (-19). The lowest change is found out in the state of Kerala indicating a change of (-2). Maharashtra has been recorded no change i.e., death took place same as before may be because overall the facilities were maintained and upgradation were done accordingly. The main reason behind sudden decrease in the mortality may be due to an increase in the economic conditions, construction of hospitals, prenatal counselling to use a skilled birth attendant, prenatal counselling to recognize signs of complications, skilled attendance etc.

**Table- 3 Change in Maternal Death**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **States** | **2007-09** **to** **2010-12** | **2010-12** **to** **2011-13** | **2011-13** **to** **2014-16** | **2014-16****to** **2015-17** | **2007-09****to** **2015-17** |
| Assam | -6 | -3 | -10 | -1 | -20 |
| Bihar | -16 | -3 | -19 | -15 | -53 |
| Jharkhand | -16 | -3 | -19 | -54 | -92 |
| Madhya Pradesh | -14 | -3 | -8 | -8 | -33 |
| Chhattisgarh | -14 | -3 | -8 | -53 | -78 |
| Odisha | -6 | -3 | -9 | -2 | -20 |
| Rajasthan | -19 | -3 | -19 | -3 | 44 |
| Uttar Pradesh | -38 | -4 | -46 | -24 | -112 |
| Uttarakhand | -38 | -4 | -46 | -93 | -181 |
| Andhra Pradesh | -6 | -4 | -9 | 0 | -19 |
| Telangana | N.A | N.A | N.A | -1 |  |
| Karnataka | -9 | -3 | -4 | -2 | -18 |
| Kerala | -2 | -1 | -2 | -1 |  -6 |
| Tamil Nadu | -2 | -2 | -3 | -1 |  -8 |
| Gujarat | -7 | -3 | -3 | -1 | -14 |
| Haryana | -1 | -3 | -3 | 0 |  -7 |
| Maharashtra | -5 | -4 | 0 | -1 | -10 |
| Punjab | -3 | -2 | -6 | 0 | -11 |
| West Bengal | -9 | -2 | -8 | -2 | -21 |

 **Source**- Sample Register System (Census- 2011)

The major change in maternal death from 2014-16 to 2015-17is seen in the states of Uttarakhand which recorded a decrease of (-93) followed by Jharkhand and Chhattisgarh indicating a change of (-54) and (-53) respectively. The lowest change is found out in the states of Assam, Telangana, Kerala, Tamil Nadu, Gujarat, and Maharashtra indicating a change of (-1). Andhra Pradesh, Haryana and Punjab have been recorded no change as it had same number of deaths as previous year i.e., 2014-16

A drastic change in maternal death from 2007-09 to 2015-17is seen in the states of Uttarakhand, Uttar Pradesh and Jharkhand which recorded a decrease of (-181), (-112) and (-92) respectively followed by Chhattisgarh and Bihar indicating a change of (-78) and (- 53) respectively. The lowest change is found out in the states of Kerala, Haryana and Tamil Nadu, indicating a change of (-6), (-7) and (-8) respectively. But an increase is noticed in the state of Rajasthan accounting for 44 deaths of mother. Rajasthan was witnessing a decrease in all the years that has been taken in the study but a sudden increase was seen during the calculation of overall difference. This increase is mainly noticed due to poor health conditions of expecting women, infections in the virginal area, blood loss, anesthesia reaction or injury to other organs during surgery, not due to the facilities related to hospitals, health care centers, shortage of doctors, skilled health workers etc. It is also noticed overall decline in maternal mortality is found in all the major states of India.

****

**Figure: 3 Showing Spatial patterns of Maternal deaths in Major States of India during 2007-09,2010-12,**

 **2011-13,2014-16 and 2015-17.**

Recognizing the urgency of the issue, the Government of India has implemented several initiatives to reduce maternal mortality and improve maternal healthcare services. The National Health Mission (NHM), with its flagship program, the Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A), aims to provide comprehensive care and interventions across the maternal health continuum. Other initiatives include Janani Suraksha Yojana (JSY) and Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA), which focus on ensuring safe deliveries, antenatal care, and strengthening healthcare infrastructure. The (Table-4) gives an overview of important programmes implemented by central government to reduce maternal mortality in India. Each state often tailors these national programs to their specific needs and may have additional state-specific programs to address local challenges.

**Table 4 Programmes implemented for reduction of Maternal Mortality and Maternal Health Care Services**

|  |  |  |
| --- | --- | --- |
| **Name of Program** | **Year of Launched** | **Objectives** |
| National Health Mission (NHM) | **2005** | This umbrella program includes the National Rural Health Mission and the National Urban Health Mission, aiming to improve healthcare infrastructure and reach. |
| Janani Suraksha Yojana (JSY) | **12th April, 2005** | To reduce maternal and infant mortality by promoting institutional delivery. This scheme offers financial incentives to encourage pregnant women to give birth in healthcare institutions. It also provides a cash incentive to the healthcare provider. |
| SABLA (Scheme for Asolescent Girls) | **19th November, 2010** | Focused on adolescent girls, it aims to improve their nutritional and health status, thereby impacting future maternal health positively. |
| Janani Shishu Suraksha Karyakram (JSSK) Mother and Child Tracking System (MCTS) | **1st June,2011** | This initiative provides free antenatal care, institutional deliveries, and postnatal care including free medications, diagnostics, and food.A digital system to monitor and ensure healthcare services to pregnant women and children. |
| Rashtriya Kishore Swasthya Karyakram (RKSK) under NHM | **7th January,2014** | To improve nutrition, sexual and reproductive health and enhance mental health (10-19 years including married). |
| Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) | **2016** | Provides free antenatal health check-ups for pregnant women on the 9th of every month, focusing on high-risk pregnancies. |
| Pradhan Matru Vandana Yojana (PMMVY) | **September, 2017** | Cash incentives for first living child and provide partial compensation for wage loss. Improve health seeking behaviour. The target groups include all pregnant women and lactating mothers (excluding employed in state/central govt. and PSUs. |
| LaQshya Program (under NHM)(Labour Room Quality Improvement Initiative) | **11th December,2017** | To reduce maternal and newborn morbidity and mortality.Aims to improve the quality of maternity care in labour rooms and operation theatres by training healthcare providers and improving facilities. |
| Surakshit Matritiva Aashwasan (SUMAN) | **10th October,2019** |  An initiative for Zero Preventable Maternal and Newborn deaths. |

Source: Compiled by the authors

Reducing maternal deaths in Indian states requires multi-faceted strategies that address healthcare infrastructure, social norms, and education. Here are some potential approaches:

1. Improve Healthcare Access: Increase the number of healthcare facilities equipped for maternal care, especially in rural and remote areas.
2. Skilled Birth Attendance: Train healthcare professionals, including nurses and midwives, in emergency obstetric care.
3. Antenatal and Postnatal Care: Ensure that women have access to quality antenatal and postnatal services to identify and manage risks early.
4. Awareness Programs: Educate communities about the importance of antenatal care, nutrition, and birth planning through mass media and community outreach.
5. Financial Incentives: Programs like Janani Suraksha Yojana offer cash incentives to encourage institutional deliveries. More such programs could be considered.
6. Emergency Services: Strengthen emergency response systems for maternal care, including timely transportation to healthcare facilities.
7. Family Planning: Make contraception widely available and educate communities about its use to avoid unwanted pregnancies and unsafe abortions.
8. Cultural Sensitivity: Address cultural barriers that prevent women from seeking timely healthcare by involving community leaders and using culturally appropriate communication strategies.
9. Telemedicine: Use technology to provide consultations and follow-up care to pregnant women who can't easily access healthcare facilities.
10. Legislation and Policy: Ensure that maternal health is prioritized in healthcare policies and budgets.
11. **Challenges and the Way Forward**

Despite the efforts made, numerous challenges persist in addressing maternal mortality in India. Inadequate availability and utilization of healthcare services, especially in rural and remote areas, pose a significant obstacle. Health workforce shortages, insufficient infrastructure, and weak referral systems need to be addressed. Additionally, addressing social determinants of health, empowering women, improving education, and raising awareness about maternal health are crucial aspects of any comprehensive strategy. To make substantial progress in reducing maternal mortality, a multi-pronged approach is required. Strengthening healthcare systems, ensuring skilled birth attendance, promoting comprehensive antenatal care, and investing in emergency obstetric care are crucial steps. Collaboration between government bodies, healthcare providers, NGOs, and the community is essential to address the systemic and social factors contributing to maternal deaths.

1. **CONCLUSION**

The status of maternal mortality and maternal deaths in India remains a matter of concern, but concerted efforts are being made to address this issue. Although progress has been made in recent years, regional disparities and socioeconomic factors continue to impact maternal health outcomes. By implementing evidence-based interventions, improving access to quality healthcare and addressing social determinants, India can work towards achieving its goal of reducing maternal mortality and ensuring a healthier future for its women and children.

Top of Form

**REFERENCES**

Acharya A., Kaur R., Prasuna J., & Rasheed N. (2015). Making Pregnancy Safer-Birth Preparedness and Complication Readiness Study among Antenatal Women Attendees of a primary health centre, Delhi. *Indian Journal of Community Medicine*, 40(2), 127- 134.

Agarwal, S., Sethi, V., Srivastava, K., Jha, P. K., & Baqui, A. H. (2010). Birth Preparedness and Complication Readiness among Slum Women in Indore City, India. *Journal of health, population, and nutrition*, *28*(4), 383.

Aggarwal R., & Krawczynski K. (2000). Hepatitis E: An Overview and Recent Advances in Clinical and Laboratory *Research. Journal of Gastroenterology and Hepatology,* 15(1), 9–20.

Ahmad. D., Hazra. A., Irani. L., Kumar. S., Mann. N., Mavalankar. D., Neogi.S. B., Ruducha. J & Singh. R. (2019). Utilization of maternal health services and its determinants: a cross-sectional study among women in rural Uttar Pradesh, India. *Journal of Health, Population and Nutrition*, 38(13).

Annual Report, MOHFW, 2019-20 <https://main.mohfw>. gov.in/sites/default/files/Annual%20Report%202019-2020%20English.pdf Accessed on 20/08/2021

Akalin MZ., & Maine D. (1995). Strategy of Risk Approach in Antenatal Care: Evaluation of the Referral Compliance. *Social Science and Medicine*, 41(4), 595–596.

Allen, L. H. (2000). Anemia and Iron Deficiency: Effects on Pregnancy Outcome*. The American journal of clinical nutrition, 71*(5), 1280S-1284S.

Ali, B., & Chauhan, S. (2020). Inequalities in the Utilisation of Maternal Health Care in Rural India: Evidences from National Family Health Survey III & IV. *BMC Public Health*, *20*(1), 1-13.

Ashok, V., Santosh, M., & Anupa, S. (2008). A Study on Maternal Mortality. *The Journal of Obstetrics and Gynecology*, *58(3)*, 226-9.

Awasthi, A., Pandey, C. M., Chauhan, R. K., & Singh, U. (2016). Disparity in Maternal, New-born and Child Health Services in High Focus States in India: A District-Level Cross-Sectional Analysis. *BMJ open*, *6*(8).

Baharuddin, M., Amelia, D., Suhowatsky, S., Kusuma, A., Suhargono, M. H., & Eng, B. (2019). Maternal Death Reviews: A Retrospective Case Series of 90 Hospital‐ based Maternal Deaths in 11 hospitals in Indonesia. *International Journal of Gynecology & Obstetrics*, *144*, 59-6

Bedi, N., Kambo, I., Dhillon, B. S., Saxena, B. N., & Singh, P. (2001). Maternal Deaths in India–Preventable Tragedies (An ICMR-Task Force Study). *The Journal of Obstetrics and Gynecology India*, 51(2), 86-92.

Cameron, L., Contreras Suarez, D., & Cornwell, K. (2019). Understanding the Determinants of Maternal Mortality: An Observational Study using the Indonesian Population Census. *PloS one*, *14*(6), e0217386.

Dewi, A., Bekti, N. K., & Supriyatiningsih, S. (2019). Maternal Mortality Evaluation: A Case Study in Bantul, Yogyakarta. *Journal of Maternal and Child Health*, *4*(5), 332-340.

General, R. (2006). Sample Registration System Maternal Mortality in India: 1997-2003 Trends, Causes and Risk Factors. *New Delhi: Registrar General and Centre for Global Health Research University of Toronto*.

Gheit, S. A., Noah, O., Shoukry, M., & Sedky, M. (2012). Maternal Mortality Rate: A Tertiary Care University Hospital Experience. *Journal of Evidence-Based Women’s Health Journal Society*, *2*(2), 64-67.

Hamal, M., Dieleman, M., De Brouwere, V., & de Cock Buning, T. (2018). How do Accountability Problems Lead to Maternal Health Inequities? A Review of Qualitative Literature from Indian Public Sector. *Public health reviews*, *39*(1), 1-27.

Horwood, G., Opondo, C., Choudhury, S. S., Rani, A., & Nair, M. (2020). Risk Factors for Maternal Mortality among 1.9 million Women in Nine Empowered Action Group States in India: Secondary Analysis of Annual Health Survey data. BMJ open, 10(8), e038910.

Isyaku, A. M., Tilde, B. Y., & Isah, S. (2015). Maternal Mortality in Developing Countries: A Threat to the Millennium Development Goal. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*, *4*(5), 17-21.

ICMR [Internet]. Estimates of maternal mortality ratios in India and its states a pilot study. Available from: <https://main.icmr.nic.in/sites/default/files/reports/> Final\_Pilot\_Report.pdf Accessed date 22/09/21

Khumanthem, P. D., Chanam, M. S., & Samjetshabam, R. D. (2012). Maternal Mortality and its Causes in a Tertiary Centre. *The Journal of Obstetrics and Gynecology of India*, *62*(2), 168-171.

Maternal Mortality in India Special Bulletin, Office of the Registrar. General of India, New Delhi.

Ministry of Women and Child Development, Maternal Mortality Rate.202, https://www.pib.gov.in/PressReleasePage.aspx?PRID=1697441 Accessed 24/07/2021

Ministry of Women and Child Development [Internet]. Reduction in maternal mortality rate;

2020 Sep 8. Available from: https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1656242 Accessed on 5/08/2021

Maternal Health Task Force. Sustainable Development Goals and Maternal Mortality https://www.mhtf.

org/topics/the-sustainable-development-goals-andmaternal-mortality/ Accessed on 20/08/2021

MoHFW [Internet]. Maternal and adolescent health care. Annual Report 2017-18; 2018 [cited 2021 Aug

16]. Available from: <https://main.mohfw.gov.in/sites/> default/files/03Chapter.pdf

National Family Health Survey (NFHS-3), Mumbai, International Institute for Population Services, Vol.1. 2005-2006.

NHP [Internet]. National Health Policy 2017. Available from: https://www.nhp.gov.in/nhpfiles/national\_health\_policy\_2017.pdf Accessed on 3/08/2021

Prusty, R. K., Gouda, J., & Pradhan, M. R. (2015). Inequality in the Utilization of Maternal Healthcare Services in Odisha, India. *International Journal of Population Research*, *2015*.

Simkhada, B., Van Teijlingen, E., Porter, M., & Simkhada, P. (2006). Major Problems and Key Issues in Maternal Health in Nepal. *Kathmandu University medical journal*, *4*(2), 258-263.

Sundari, K. M., & Priya, R. P. (2017). Maternal Mortality: Analysis of Causes and Preventable Factors. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, *5*(6), 1719-1721.

State Fact Sheet, NCT Delhi, NFHS1http://rchiips.org/ nfhs/nfhs1.shtml Accessed on 2/08/21

UNICEF [Internet]. Maternal health: UNICEF’s concerted action to increase access to quality maternal health

services; 2021. Available from: <https://www.unicef>. org/india/what-we-do/maternal-health Accessed on18/9/ 21

Vora, K. S., Mavalankar, D. V., Ramani, K. V., Upadhyaya, M., Sharma, B., Iyengar, S., ... & Iyengar, K. (2009). Maternal Health Situation in India: A Case Study. *Journal of health, population, and nutrition*, *27*(2), 184.

World Health Organization. (2010). Trends in Maternal Mortality: 1990 to 2008.

WHO. World Health Day Safe Motherhood, <https://www.who.int/docstore/world-health-day/en/> documents1998/whd98.pdf Accessed 5/ 08/2021

WHO [Internet]. Maternal Health; 2020. Available from: Accessesed on 2/08/21. <https://www.who.int/> health-topics/maternal-health#tab=tab\_2

WHO, UNICEF, UNPFA, Worl Bank. Trends in Maternal Mortality https://www.who.int/reproductivehealth/

publications/maternal-mortality-2000-2017/en/Accessed on 25/08/2021