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MATERNAL MORTALITY RATIO (MMR) IN ASSAM: SPATIOTEMPORAL VARIATION AND ITS DETERMINANTS



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ABSTRACT

Maternal mortality Ratio is highest in Assam in India a northeastern state. This paper focuses on spatiotemporal variation in maternal mortality ratio among all the districts of Assam. It has also tried to find the probable causative factors for such a high maternal mortality ratio in the state. To find out the probable causative factor for high maternal mortality rate the ordinary least square (OLS) regression is done. Out of all independent variables only effective female literacy rate comes out to be significant factor for causing high MMR in Assam.

KEYWORDS :Maternal Mortality ratio (MMR), Maternal Mortality Rate, Life time risk, Institutional delivery, Antenatal checkup (ANC), Post natal Checkup (PNC).

INTRODUCTION:

Reduction of maternal mortality is an area of concern for the governments across world. Recognizing this fact, the universal declaration for human rights of 1948 in article 25 stressed that "Motherhood and childhood are entitled to special care and assistance". Providentially, the maternal health issues continue to be at the forefront of global and- national health policies in the last few years. The International Conference on Population and Development in 1994 had recommended reduction in maternal mortality by at least 50 percent of the 1990 levels by the year 2000 and further one half by the year 2015. The Millennium Development Goal 5 (MDG 5) calls for - a three-fourth reduction in the maternal mortality ratio (MMR) by 2015 compared to 1990 levels.

In India, Maternal and child health has remained an integral part of the Family Welfare Programme since the time of the First and Second Five-Year Plans (1951-56 and 1956-61) when the Government of India took steps to strengthen maternal and child health services. As part of the Minimum Needs Programme initiated during the Fifth Five-Year Plan (1974-79), maternal health, child health, and nutrition services were integrated with family planning services. In 1992-93, the Child

Survival and Safe Motherhood Programme continued the process of integration by bringing together several key child survival interventions with safe motherhood and family planning activities (Ministry of Health and Family Welfare, 1992). In 1996, safe motherhood and child health services were incorporated into the Reproductive and Child Health Programme (RCH). The National Population Policy adopted by the Government of India in 2000 reiterates the government's commitment to safe motherhood programmes within the wider context of reproductive health (Ministry of Health and Family Welfare, 2000). Several of the national socio-demographic goals for 2010 specified by the policy pertain to safe motherhood. For 2010, the goals are that 80 percent of all deliveries should be institutional, 100 percent of deliveries should be attended by trained personnel, and the maternal mortality ratio should be reduced to a level below 100 per 100,000 live births (NFHS 3). But even at present these targets are far from reality. India accounts for more than one-fourth of all maternal deaths from causes related to pregnancy and childbirth worldwide (WHO 2004b).

Maternal Mortality Ratio (MMR) is defined as 'the number of women who die as a result of pregnancy and childbirth complications per 100,000 live births in a given year whereas Maternal Mortality Rate is maternal deaths to women in the ages 15-49 per lakh of women in that age group,' (MMR Bulletin, 2011-13). Maternal mortality ratio (MMR) in India is estimated to have declined from about 398 to 301 maternal deaths per lakh live births between 1997-98 and 2001-03 and to 254 between 2004 and 2006. It further declined to 167 between 2011-13 with wide geographical variations ranging from 61 per lakh live birth for Kerala to 301 for Assam (SRS-2015). Nine states including eight EAG states i.e. Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttaranchal, and Uttar Pradesh and Assam accounted for majority of maternal deaths in India. The main causes are known and more than 80% of maternal deaths could be prevented or avoided through either increasing the institutional deliveries or by improving the quality of care provided to the women. Unfortunately, as late as in 2005-2006, the institutional deliveries in rural India were reported to be 28.9%. The Government of India gave high priority to promote institutional deliveries to improve maternal survival as part of national policy and also being a signatory for MDGs (4). Therefore, a well-known scheme Janani Suraksha Yojana or JSY was launched in April 2005 under the umbrella of National Rural Health Mission (NRHM) of India (Gupta et. al., 2012). As a result of this programme the institutional deliveries in 2013 increased to 74.4% though rural urban differentials were there. In rural areas the percentage of institutional deliveries was 69.7% while in urban areas it was 92.1%. But there were wide variation present across the states. It varies from 99.1 percent in Kerala to 58.2 percent in Uttar Pradesh and 51.2 percent in Jharkhand.

It is well established that giving birth under the care and supervision of trained health-care providers promotes child survival and reduces the risk of maternal mortality (Mishra and Rutherford 2008; WHO 2004a, 2005). State-level data also indicates that the MMR decreases with an increase in the percent of institutional deliveries. For example, the MMR in Kerala with 97% institutional deliveries was estimated to be 110 maternal deaths per 1,00,000 births in comparison with 517 in Uttar Pradesh with about 10% institutional deliveries in 2001-03. (Jain, 2010)

Antenatal care is hypothesized to have a positive effect on the likelihood of receiving professional assistance at delivery, in as much as women receiving antenatal care come in contact with health-care providers who are likely to encourage them to seek professional assistance at delivery or to give birth in a medical facility. A complicating factor is that women with pregnancy complications are more likely than other pregnant women both to receive antenatal check-ups and to receive professional medical assistance at delivery because of the pregnancy complication.

Maternal health refers to the health of women during pregnancy, childbirth and the

postpartum period. Antenatal care (ANC) refers to pregnancy-related health care, which is usually provided by a doctor, an ANM, or another health professional. Ideally, antenatal care should monitor a pregnancy for signs of complications, detect and treat pre-existing and concurrent problems of pregnancy, and provide advice and counseling on preventive care, diet during pregnancy, delivery care, postnatal care, and related issues. In India, the Reproductive and Child Health Programme aims at providing at least three antenatal check-ups which should include a weight and blood pressure check, abdominal examination, immunization against tetanus, iron and folic acid prophylaxis, as well as anaemia management (Ministry of Health and Family Welfare, 2005) (NFHS-3).

The Table 1 shows that Empowered Action Group states (EAG) along with Assam are the worst performing states in India in terms of maternal mortality ratio. The status of southern states is somewhat better except Karnataka. In other states only Maharashtra is better performing state.

Table 1: Maternal Mortality Ratio in Major states of India 2012-13.

State	Maternal Mortality Ratio (MMR)	95 % CI	Maternal Mortality Rate	Life Time Risk
Assam	301	(205-394)	19.6	0.7%
Bihar / Jharkhand	208	(163-253)	21.4	0.7%
Madhya Pradesh/ Chattisgarh	221	(170-272)	20.2	0.7%
Orissa	222	(156-287)	15.1	0.5%
Rajasthan	244	(185-303)	23.9	0.8%
Uttar Pradesh/ Uttarakhand	285	(240-330)	27.6	1.0%
EAG and Assam	246	(223-268)	22.1	0.8%
Andhra Pradesh	92	(52-131)	5.9	0.2%
Karnataka	133	(84-181)	7.5	0.3%
Kerala	61	(22-101)	3.2	0.1%
Tamil Nadu	79	(43-116)	4.5	0.2%
South sub total	93	(73-114)	5.4	0.2%
Gujarat	112	(69-155)	8.7	0.3%
Haryana	127	(68-185)	10.0	0.4%
Maharashtra	68	(32-103)	4.1	0.1%
Punjab	141	(73-209)	8.2	0.3%
West Bengal	113	(75-151)	6.3	0.2%
Other States	126	(98-153)	7.1	0.2%
Other subtotal	115	(99-132)	7.0	0.2%

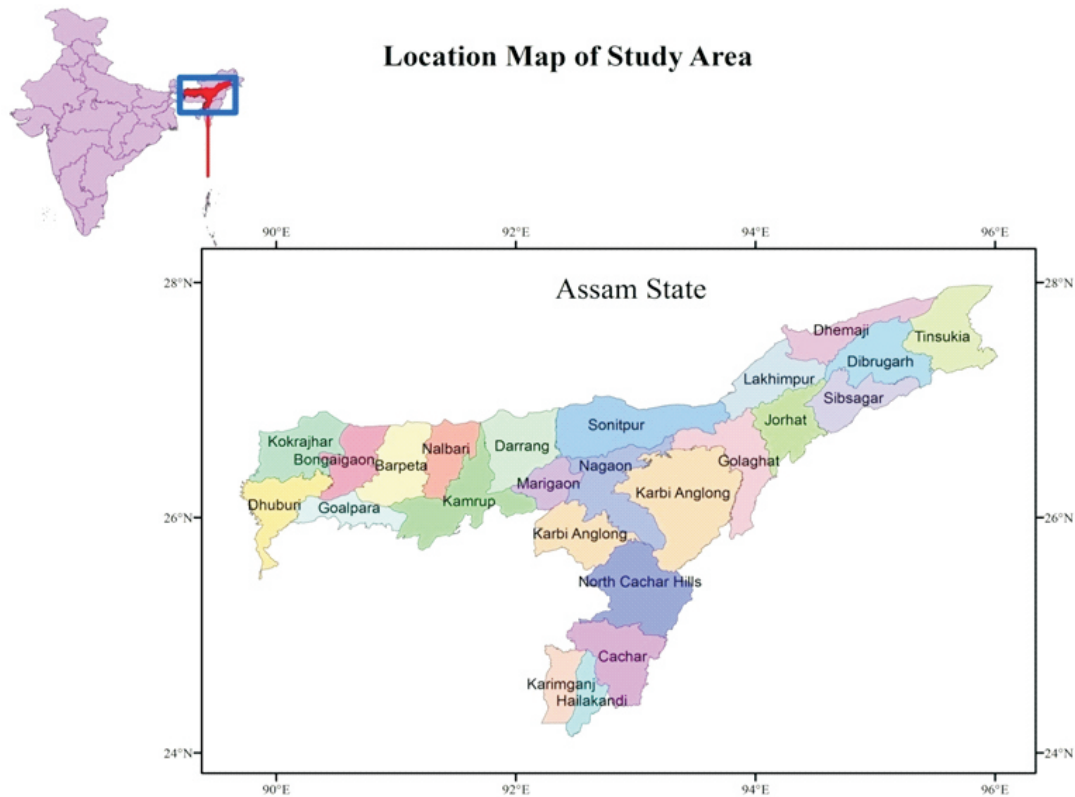
Source: MMR Bulletin 2011-13, SRS, Office of Registrar General of India

AREA OF THE STUDY:

Assam is a state in northeastern India. Located south of the eastern Himalayas, Assam comprises the Brahmaputra Valley and the Barak Valley along with the Karbi Anglong and Dima Hasao districts with an area of 78,438 km². Assam, along with Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Meghalaya, is one of the Seven Sister States. Geographically, Assam and these states are connected to the rest of India via a 22 kilometer strip of land in West Bengal called the Siliguri Corridor or "Chicken's Neck". Assam shares an international border with Bhutan and Bangladesh; and its culture, people and climate are similar to those of South-East Asia. The above table shows that in

Assam Maternal mortality ratio is highest among all states in India. So in this paper Assam is selected for the study and an attempt is made to explain the causative factor.

Figure1: Location map of Study area.



OBJECTIVES OF THE STUDY:

The objective of this paper is to understand and analyse the spatiotemporal variation in maternal mortality ratio among all the districts of Assam. Though in 2011 census the number of districts increased from 23 to 27 but this study is based on secondary data collected from Annual Health Survey. This survey recorded data for 23 districts and hence the study is based on the administrative boundaries of previous 23 districts.

The other important objective of the study is to find the probable causative factor for such a high maternal mortality ratio in the state.

DATA FOR THE STUDY:

The data for the study is used from the state fact sheet of Annual Health Survey available online on Census of India website. The Annual health survey (AHS), one of the largest demographic surveys in the world, was carried out by the Government of India with the objective to monitor the performance and outcome of various health interventions of the Government including those under National Rural Health Mission (NRHM) at closer intervals through these benchmark indicators. The survey was confined to the 284 districts (as per 2001 Census) of the 8 Empowered Action Group States (Bihar, Jharkhand, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh, Odisha and Rajasthan) and Assam for a three year period starting from 2010-11. These 9 high focus States with relatively high

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fertility and mortality account for about 48 percent of the total population in the country. A representative sample of 20,694 statistically selected Primary Sample Units (PSUs - Census Enumeration Blocks in case of urban areas and villages or a segment thereof in case of larger villages in rural areas) based on 2001 Census has been drawn from these AHS States which would cover about 18 million population and 3.6 million households each year. Despite being restricted to 9 States, the AHS is the largest demographic survey in the world and covers two and a half times that of the Sample Registration System (SRS).

METHODOLOGY:

The analysis carried out in this paper is of two types: univariate analysis and multivariate analysis. In univariate analysis levels of maternal mortality rate are discussed through map and table. Under multivariate analysis linear regression is carried out to find effect of various maternal health indicators during and after pregnancy.

RESULT:

Table 2: Maternal Mortality Ratio in Districts of Assam

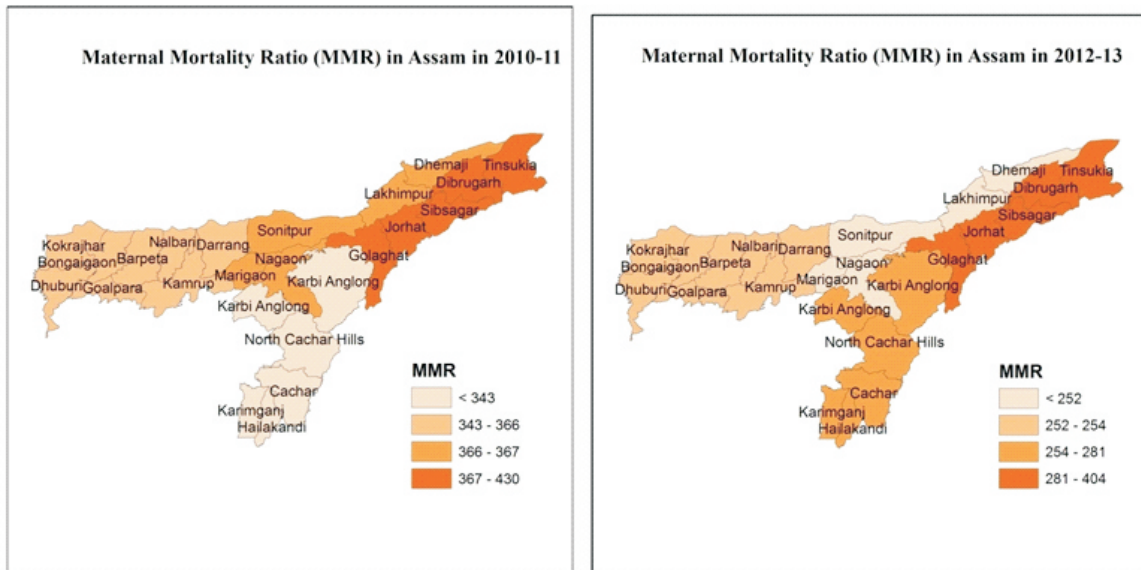
District	Maternal Mortality Ratio		
	2010-11	2011-12	2012-13
Barpeta	366	325	254
Bongaigaon	366	325	254
Cachar	342	288	281
Darrang	366	325	254
Dhemaji	367	314	251
Dhubri	366	325	254
Dibrugarh	430	436	404
Goalpara	366	325	254
Golaghat	430	436	404
Hailakandi	342	288	281
Jorhat	430	436	404
Kamrup	366	325	254
Karbi Anglong	342	288	281
Karimganj	342	288	281
Kokrajhar	366	325	254
Lakhimpur	367	314	251
Marigaon	367	314	251
Nagaon	367	314	251
Nalbari	366	325	254
North Cachar Hills	342	288	281
Sibsagar	430	436	404
Sonitpur	367	314	251
Tinsukia	430	436	404
Assam	381	347	301

Source: Annual Health survey 2012-13, Office of registrar General and census commissioner, India

The Table 2 shows that there is wide variation across all the districts of Assam but almost all districts are worst performing in comparison to other parts of India. In 2010-11 the MMR varies from

342 per lakh live birth in Cachar, Hailakandi, Karbi Anglong, Karimganj and North Cachar hills to 430 per lakh live birth in Dibrugarh, Golaghat, Jorhat, Sibsagar and Tinsukia District. From the year 2010-11 to 2011-13 drastic improvement occurred in Lower Assam Division in the district Barpeta. Bongaigaon, Darrang, Dhubri, Goalpada, Kamrup, Kokrajhar ad Nalbari from 366 per lakh live birth in 2010-11 to 325 in 2011-12 and further 254 in the year 2012-13. Similarly in North Assam Division. i.e. Marigaon, Nagaon, Sonitpur, Lakhimpur and Dhemaji districts also MMR declined sharply.

Figure 2: Maternal Mortality Ratio in Assam in 2010-11 and 2012-13



The figure 2 shows that the differences in four divisions of Assam i.e. Hills and Barak Valley Division (Karbi Anglong, North Cachar Hills, Cachar, Karimganj, Hailakandi), Lower Assam Division (Kokrajhar, Dhubri, Goalpara, Darrang, Bongaigaon, Barpeta, Kamrup, Nalbari), North Assam Division (Marigaon, Nagaon, Sonitpur, Lakhimpur, Dhemaji) and Upper Assam Division (Tinsukia, Dibrugarh, Sibsagar, Jorhat, Golaghat) are clearly visible in terms of Maternal mortality ratio. The MMR is highest i.e. 430 per lakh live birth in upper Assam division in 2010-11 followed by North Assam division in the range of 366 to 367 per lakh live birth. Among all the division of Assam State the relative situation of Hills and Barak valley division is somewhat better. But in the year 2012-13 the districts in North Assam division were better performing districts and MMR improved to less than 213 per lakh live birth.

To find out the probable causative factor for high maternal Mortality rate the ordinary least square (OLS) regression carried out among 23 districts of Assam. The MMR is considered as dependent variable and Mothers who received at least one Tetanus Toxoid (TT) injection (%), Mothers who received ANC from Govt. Source (%), Institutional Delivery (%), Delivery at home conducted by skilled health personnel (%), Mothers who received Postnatal Check-up within 48 hrs. of delivery (%), Effective Female Literacy, Mothers who availed financial assistance for delivery under JSY (%) and Mothers who consumed IFA for 100 days or more (%) considered as predictor variable.

Table 3: Linear Regression result with MMR as Dependant Variable.

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	105.551	534.376		0.198	0.846
Mothers who received at least one Tetanus Toxoid (TT) injection (%)	3.96	5.059	0.235	0.783	0.447
Mothers who received ANC from Govt. Source (%)	-0.469	0.866	-0.134	-0.541	0.597
Institutional Delivery (%)	-1.383	5.269	-0.376	-0.263	0.797
Delivery at home conducted by skilled health personnel (%)	2.316	1.327	0.32	1.746	0.103
Mothers who received Postnatal Check-up within 48 hrs. of delivery (%)	2.284	3.762	0.597	0.607	0.553
Effective Female Literacy	-3.681	1.85	-0.37	-1.99	0.046*
Mothers who availed financial assistance for delivery under JSY (%)	0.494	2.384	0.114	0.207	0.839
Mothers who consumed IFA for 100 days or more (%)	0.793	2.457	0.096	0.323	0.752

* Significant at the 0.05 level (2-tailed).

Adjusted R² = 0.42 (F= 2.98*)

The above table shows that out of all independent variables only effective female literacy comes out to be significant factor for causing high MMR. The result shows that with one unit change in effective female literacy rate the MMR would be declined by 2 point keeping other variables constant. The institutional delivery which comes out to be significant in other studies is not found significant in this study. Since Adjusted R square is not very high (42%) so studies based on primary data should be done to find the real causative factor for high MMR in Assam region.

CONCLUSION:

There is wide variation in MMR across all districts of Assam. The MMR is highest i.e. 430 per lakh live birth in upper Assam division in 2010-11 followed by North Assam division in the range of 366 to 367 per lakh live birth. Some of the variables which affect MMR significantly are generally taken in most research to check the causative factors of MMR. These are Mothers who received at least one Tetanus Toxoid (TT) injection, Mothers who received ANC from Govt. source, Institutional Delivery, Delivery at home conducted by skilled health personnel, Mothers who received Postnatal Check-up within 48 hrs. of delivery, Effective Female Literacy, Mothers who availed financial assistance for delivery under JSY and Mothers who consumed IFA for 100 days or more. One of the most important variables is institutional delivery which affects MMR. In this paper these variables were considered but are not found significant. The only variable which is significant is effective female literacy rate. Hence to

understand this pattern further research is needed so as to find out why the other variables have not come out to be significant.

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