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Maternal and Child Health Indicators: An Analysis of Indian States

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1. Introduction

Health is perhaps the most important aspect of human well-being. Women's health assumes significance because they form about half of the population. Women's health is often shaped by the physiological hormonal milieu and environmental, societal and economic circumstances. Maternal mortality is the typical health problem especially in developing countries. Children suffer most when mother dies, as children whose mother died, are three times more likely to receive less health care and also more likely to die. The event of maternal death is a concern to the family, children, community, state and nation as it affects the national productivity. The Government delivers reproductive and other health services through its network of Primary Health Centres (PHCs), Sub centres and other health facilities in rural areas and in urban areas and they are available through Government or Municipal hospitals, urban health posts, hospital and nursing homes operated by Non-Governmental Organizations (NGOs) and private nursing and maternity homes.

The study examines the trends in maternal and child health nationally, the maternal healthcare-delivery system at different states, and the implementation of national maternal health programmes, including recent innovative strategies. It identifies the causes for limited success in improving maternal and child health and suggests measures to rectify them. It recommends better reporting of maternal deaths and implementation of evidence-based, focused strategies along with effective monitoring for rapid progress. It also stresses the need for regulation of the private sector and encourages further public-private partnerships and policies, along with a strong political will and improved management capacity for improving maternal and child health.

2. Objectives

The study aims to examine the trends in maternal and child health nationally, the maternal healthcare-delivery system at different states, and the implementation of national maternal health programmes, including recent innovative strategies and programs.

In the paper, we identify the causes for limited success in improving maternal and child health and suggest measures to rectify them.

We have also recommended better reporting of maternal deaths and implementation of evidence-based, focused strategies along with effective monitoring for rapid progress.

The research paper aims to present a comprehensive picture of the trends in maternal and child healthcare indicators in the major Indian states.

3. Maternal and child health indicators

Maternal healthcare is a major challenge to the global public health system, especially in developing countries. Saving the millions of women, new born and children who die each year from preventable causes presents a formidable challenge in developing countries. Millions of women who survive childbirth suffer from pregnancy-related injuries, infections, diseases and disabilities, often with lifelong consequences. The environment plays a great role in a child's growth and health. Micro environmental conditions such as poor housing and sanitation have been implicated in the synergism of malnutrition and infection. The influence of macro environment, including social, economic and cultural variables on child rearing practices is well established. In addition to these, various maternal attributes have been shown to be the most important cause of malnutrition. The truth is that most of these deaths and conditions are preventable – research has shown that approximately 80 per cent of maternal deaths could be averted if women had access to essential maternity and basic health-care services. Globally, 289 thousand women die every year during pregnancy or delivery or shortly thereafter.

Trends in child mortality, maternal mortality, and fertility in India reveal wide variation across states. As a whole, India performs worse than many other low- and middle-income countries, although its rates of improvement have recently increased. Differences in health systems and adopted policies may account for some of the variation across Indian states (Munshi, Yamey and Verguet, 2016). India still performs poorly on mortality rates for children under age five, with a national average of 48 deaths per 1,000 live births in 2015 (World bank, 2016)

Within the domain of reproductive health, maternal health care is of immense significance. The present study is an attempt to build knowledge regarding provisioning, accessibility and utilisation of maternal and child health care services by women, new born and children. The need for this study arises from the fact that though our country has a constitutional responsibility for promoting maternal and child health; the healthcare delivery services in India are inadequate and often are inaccessible, as can be perceived from the available literature. Mothers' health has many consequences. The poor health of the mother leads to high rates of miscarriages and stillbirths along with high perinatal, neo-natal, post-neonatal and infant deaths. Often, complications lead to higher incidence of maternal mortality. Therefore, survival of both

mother and child depend upon the health status of the mother. The health status of the mother depends upon the nature of general health of the mother, antenatal and postnatal care; place and assistance during delivery. Good health of both mother and the child is also essential for successful implementation of family planning programme, since improvement in maternal and child health can boost the acceptance of family planning programme among the people

Maternal and child health has remained on the top priority of the family welfare programme in India since the 1st and 2nd five year plan. When the government of India integrated maternal health with family planning, as a part of the minimum needs programme initiated during the Fifth five year plan. Maternal health plays a very key role in the health status of a nation. As mothers are the forerunners to healthcare of communities. Maternal health has a direct relationship with her family health status especially, with her newborn heath. A newborn whose mother dies during childbirth rarely survives. Mothers are more likely than fathers to support their children healthcare needs, which can lead to a healthy nation with more productive labour force.

a) Institutional Deliveries and Assistance

During Delivery From the standpoint of maternal health, it is crucially important that the place of delivery/childbirth is clean and safe. Institutional deliveries are the deliveries that happened in a healthcare centre by a skilled health professional. Majority of maternal deaths or complications during pregnancies are due to the lack of institutional deliveries or failure to get timely care for the complications at the time of delivery. Thus it is very essential that the delivery should be conducted in a healthcare centre under proper hygienic conditions with the assistance of a trained healthcare practitioner. At present the percentage of institutional deliveries is 76.6 percent (Rapid Survey on Children, 2013-14)

b) Antenatal Care

Antenatal care is the clinical assessment of mother and fetus during pregnancy. It traditionally involves a number of routine visits approximately 12-16 for assessment of pregnant women before and during pregnancy. The objective of antenatal care is to ensure the supervision of maternal and fatal well being during pregnancy, identify and treat conditions that may threaten the health of the fetus/ newborn and mother. Also making available all appropriate choices to fulfill optimal potential, and providing all necessary support and preparation for a high quality life after birth. Another objective of antenatal-care is to help a women approach pregnancy and birth as positive experiences.. Despite the high emphasis on ANCs by the government, only 19.7 percent of pregnant women have full antenatal visit in India.

c) Postnatal Care

Postnatal care is the care received women after birthing. The 48 hours after the delivery is very sensitive for many bacterial and organism infection and critical for the newborn and maternal survival.

d) Tetanus Toxoid Injection

Tetanus is an important cause of death among maternal deaths and infants deaths. Tetanus is caused by the infection of newborn. Tetanus is very common among the deliveries that take place in an unhygienic condition, with non-sterilised medical instruments for cutting the umbilical cord of newborn. Tetanus is preventable with two doses of tetanus toxoid injection. One month apart during the early stage of pregnancy, two doses of tetanus toxoid is given to the pregnant women which is nearly hundred percent effective in preventing tetanus among the mothers and the newborn.

4. Data Analysis and Interpretation

In this paper, an attempt has been made to present a comprehensive picture of major Indian states with respect to the condition of MCH indicators and services available.

The data related to maternal healthcare service utilization in India in some major states has been collected from secondary sources and analysed thereafter. We have calculated the Coefficient of Correlation between maternal and child health indicators.

Maternal Health Indicators

The data related to maternal healthcare service utilization in India and in some major states. The percentage of mothers received Tetanus Toxoid (TT) in India is about 89.8; while among the states- Andhra Pradesh has the highest percentage of TT (97.1 percent), followed by Tamil Nadu (96.4 percent), Punjab(95.3 percent), Orissa (95.8 percent), and Assam (90.2 percent). It is indicated by the data, that all the remaining states have also received Tetanus Toxoid Injection for more than 80 percent of births. The proportion of institutional deliveries in India is about 78.7 percent and81.1percent births, which take place in a medical facility and assisted by health professionals. The inter-state variations in the proportion of institutional deliveries and in deliveries assisted by health professionals. Among the states, Kerala has the highest percentage of institutional deliveries (99.4 percent), followed by Tamil Nadu (99.3 percent), Maharashtra (90.3 percent), Karnataka (92 percent), and Andhra Pradesh (91.1 percent). The institutional deliveries assisted by health professional. The percentage of institutional deliveries is low in Uttar Pradesh (62.1 percent) and Bihar (65.3 percent). The pattern of variation in the percentage of institutional deliveries assisted by health professionals is similar to the variation in institutional deliveries in India and her states.

Maternal health Services by States

States	Institutional Deliveries	Full ANC*	Deliveries (HP)**	TT*** injection	PNC**** (48 Hrs of Delivery)
AP	91.1	38.2	93.3	97.1	77.9
ASM	74.2	25.2	74.9	90.2	7
BR	65.3	9.6	68.4	88.6	6.4

GUJ	87.9	25.7	89.6	87.6	47.5
HAR	76.4	9.7	78.6	85.1	23.5
KAR	92	33.4	92.6	93.2	75.6
KER	99.4	53.6	99.5	95.1	94
MP	78.1	12.1	79	88.9	60.3
MAH	90.3	24.4	93	89.9	77.1
ORS	81.3	24.6	83.7	95.8	10.5
PUJ	80.4	15.5	85.4	95.3	15.6
RAJ	82.7	8.6	85.8	82.6	9.5
TN	99.3	35.2	99.5	96.4	94.7
UP	62.1	2.7	65.1	81.3	12.1
WB	76.3	21.2	78.9	96	9.1
INDIA	78.7	19.7	81.1	89.8	39.3

(Table No. 1)

Child Health and Process Indicators

Infant mortality rate (IMR) is a sensitive indicator in monitoring child health and survival. It is influenced by many factors that are in turn likely to be influenced by health status of the mother and child such as socioeconomic conditions, antenatal and post natal care, sickness, and the environment in which they are living (Kaur et al, 2017). In 2010, IMR is 47 in India which declined to 40 in 2013. The states of Kerala (12), Tamil Nadu (21) have the lowest infant mortality rate (IMR). The states of Assam (54), Madhya Pradesh (54), Bihar (42), Orissa (51), and Uttar Pradesh (50) have the IMR above the national level (40).

Under Five Mortality Rate (U5MR)- The probability of a child born in a given year dying per thousand live births before reaching the age of five. According to the Sample Registration Survey (SRS), in 2010, the U5MR is 59 per thousand live births in India. Within a span of three years, U5MR has declined to 49 in2013 (SRS, 2013). As in the case of IMR, Kerala has the lowest IMR (12), for U5MR also the lowest number ofU5MR is in the Kerala (12). The states of Assam (73), Bihar (54), Orissa (66) and Uttar Pradesh (64) have the under five mortality rate above the national level (49).

Child Health Indicators by States

States	AP	ASM	BR	GUJ	HAR	KAR	KER	MP	MAH	ORS	PUJ	RAJ	TN	UP	WB	INDIA
NNM	27	29	28	28	28	23	7	39	18	39	17	35	15	37	22	29
IMR	39	54	42	36	41	31	12	54	24	51	26	47	21	50	31	40
U5MR	41	73	54	45	45	35	12	69	26	66	31	57	23	64	35	49

(Table No. 2)

Correlation coefficient matrix of maternal and child health indicator

	ID	3FANC	DHF	TT	PNC	NNM	IMR	U5MR
ID	1							
3FANC	0.835005	1						
DHF	0.993832	0.804725	1					
TT	0.562817	0.72018	0.568726	1				
PNC	0.838746	0.739338	0.809276	0.414251	1			
NNM	-0.62878	-0.66786	-0.63982	-0.53441	-0.5574	1		
IMR	-0.69542	-0.64047	-0.71803	-0.50982	-0.6241	0.951444	1	
U5MR	-0.71119	-0.62675	-0.73752	-0.5016	-0.64589	0.924997	0.987473	1

(Table No. 3)

5. Results

The coefficient correlation between maternal and child healthcare variables has been calculated and results complied in (Table No.4) Almost all of the maternal healthcare indicators have a high negative correlation with child mortality indicators. The negative sign before the correlation value indicates the inverse relationship. That is, the better the maternal healthcare services, the child mortality (IMR, U5MR, NNM) will be improved, or the influence of maternal healthcare services is in reverse direction. The correlation between ANC mortality is -0.66, between ANC and infant mortality is -0.64, with under five mortality it is -062. The correlation between institutional deliveries and neonatal mortality is -0.62, with infant mortality it is -0.69, with under five mortality it is -0.71. Correlation coefficient between infant mortality rate and other maternal healthcare indicator have also a strong negative correlation. The correlation between IMR and deliveries by health professionals is -0.71, with tetanus toxoid it is -050, with postnatal care within 48 hours of delivery it is -0.62. It is noted that the women delivered in a medical institution by health professionals and received 3 full antenatal care have comparatively high correlation with infant mortality and others measures of child mortality. There is a significant correlation between infant deaths and maternal healthcare indicators, but the values of correlation are lower as compared to infant mortality and under five mortality rate. This indicates that there is need for some more effective maternal health care programmes, because neonatal mortality is mainly affected by

the biological factors. Government should take some more fruitful steps to increase the institutional deliveries by health professionals

.

Affect of Poverty on MMR and IMR:

States	No. of persons (lakh)	% of BPL Population (Tendulkar Methodology)	MMR	IMR
AP	78.78	9.2	92	39
ASM	101.27	31.98	300	54
BR	358.15	33.74	208	42
GUJ	102.23	16.63	112	36
HAR	28.83	11.16	127	41
KAR	129.76	20.91	133	31
KER	23.95	7.05	61	12
MP	234.06	31.65	221	54
MAH	197.92	17.35	68	24
ORS	138.53	32.59	222	51
PUJ	23.18	8.26	141	26
RAJ	102.92	14.71	244	47
TN	82.63	11.28	79	21
UP	11.6	11.26	285	50
WB	184.98	19.98	113	31
INDIA	2697.83	21.92	167	40

(Table No. 4)

Effect of Female Literacy on Maternal and Child Health:

Female education plays a vital role in her health status, and her family, especially to the child health. A well educated mother takes care of her baby, better than an uneducated mother. Education plays a significant role in improving health status. Education makes people more aware about the health issues. A literate woman is more aware about the maternal and child health care services running in the country, so she can use them more efficiently than an unaware woman. Literacy level makes her empowered enough to take right decision regarding contraception, birth spacing, access to healthcare centres, and other health concern issues, that might affect the health of the mother as well as child. Table below shows the data on female literacy level and MMR, IMR in India and her states.

MMR and IMR according to Female Literacy in Indian States

States	AP	ASM	BR	GUJ	HAR	KAR	KER	MP	MAH	ORS	PUJ	RAJ	TN	UP	WB	INDIA
LR (F)	59.15	66.27	51.5	69.68	65.94	68.08	92.07	59.24	75.87	64.01	70.73	52.12	73.44	57.18	70.54	64.64
MMR	92	300	208	112	127	133	61	221	68	222	141	244	79	285	113	167
IMR	39	54	42	36	41	31	12	54	24	51	26	47	21	50	31	40

(Table No. 5)

According to the SRS, 2013 data, female literacy level is 64.64 percent at the national level. The states of Kerala (62.07) and Maharashtra (75.87) have the highest female literacy level. The states of Rajasthan (52.12), Uttar Pradesh (57.18), and Bihar (51.5) are among the states of low female literacy level. The states with low level of female education level have the highest number of maternal and child mortality rate as compared to the states with high level of female education.

Correlation coefficient matrix of Maternal and Child Health Indictors with BPL families and female literacy level

	Literacy Rates (F)	% BPL families	MMR	IMR
Literacy Rates (F)	1			
% BPL families	-0.41	1		
MMR	-0.67	0.55	1	
IMR	-0.80	0.61	0.86	1

(Table No. 6)

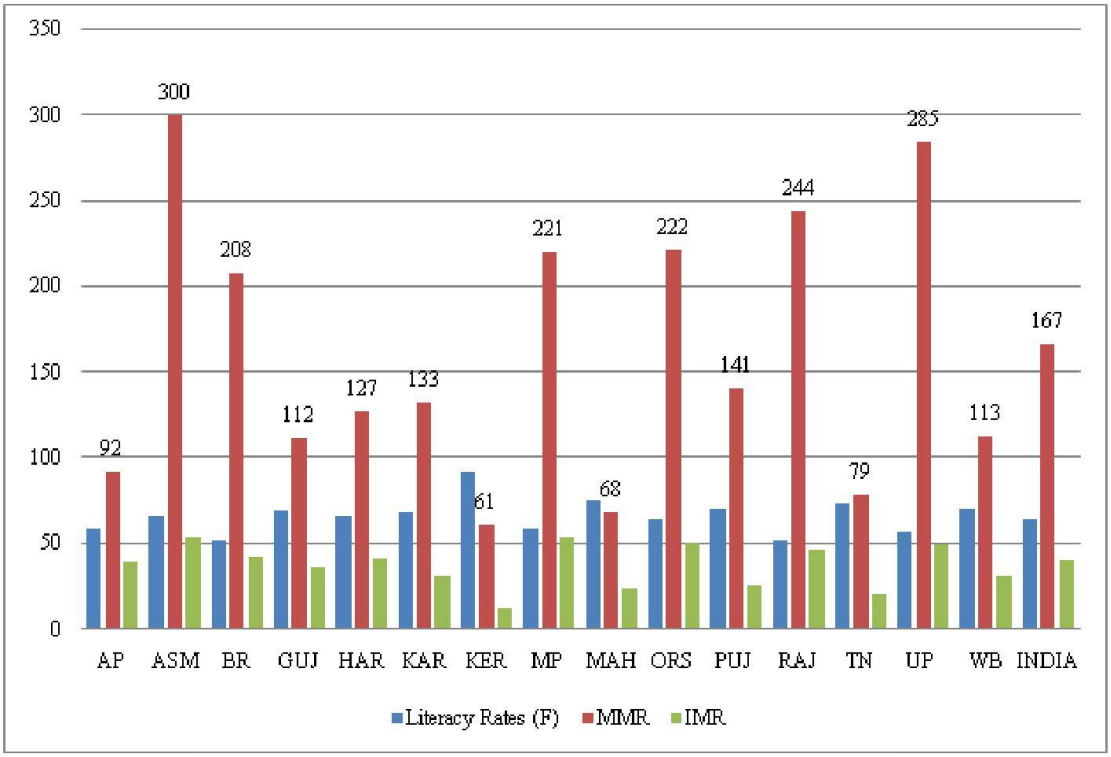
6. Findings

The coefficient correlation between BPL population and health indicators of maternal and child health. It is clear that correlation coefficient between the poverty and maternal and child health indicators are significant, but the values are lower, when compared with the correlation value of maternal health indicator MMR and child health indicator. The maternal and child health care indicator has a positive value with the poverty indicator. The positive sign indicates the influence in same direction. That is, lower the BPL population; lower the maternal mortality and infant mortality. The correlation between BPL population and MMR is 0.55, with IMR it is 0.61. The correlation between MMR and IMR is comparatively higher with

a positive value. There is a strong correlation between the maternal health and child health. The coefficient correlation between the maternal health indicator and child health indicator is 0.86.

The correlation coefficient matrix shows that the women education has a high correlation with maternal mortality and infant mortality. The correlation between female literacy and MMR is -0.67, with IMR it is -0.80.. It is noted that the correlation between maternal mortality rate and infant mortality has a positive value. The correlation between MMR and IMR has a comparatively high value of 0.86 which indicate that maternal health has a direct effect on the child health. The association between female literacy rate and maternal mortality rate is significant, but the value of correlation is lower as compared to the value between female literacy level and infant mortality rate. Female literacy level has also affected the child health condition. Government should try to increase the education level among women through some effective measures.

Figure below show the bar graph of female literacy level and Maternal and Child mortality indicator. The red bar shows the MMR level, while the blue bar for literacy level and green bar is for IMR.



7. Conclusion

Current performance in health outcomes varies widely across states in India. Further research is needed at the state level in India to look at how the quality of care and public health interventions in successful states might affect child and maternal mortality metrics over different periods of time. For large countries such as India, these types of sub national analyses may provide critical insights to help low-performing regions catch up with high-performing regions. This would in turn reduce inequality and help the country as a whole achieve desired health outcomes associated with high quality of care as quickly as possible and in a fair manner.

The above findings create a space for developing a strong programme with respect to maternal health and child health. There are various causes of the high IMR, NNM, U5MR, and MMR such as, low birth weight, unsafe delivery, neonatal tetanus, and high fertility rate. Hence there is a need to promote maternal healthcare services which will accelerate the declining of the rate of the child mortality indicators.

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