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A Comparative Study of Maternal Mortality Rate of Major Indian States with Reference to SDG-3 (Target -1): An Analysis of the SRS from 2007 to 2022

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Abstract

Maternal health is an important dimension for development of any country. The survival and wellbeing of mothers is not only important in their own right but for future also in solving broader economic, social and developmental challenges. The health of women and children is vital to creating a healthy world because as we know children are the future of the generations while on the other hand, women are the biological mother. From data availability, it is experienced that despite of many progresses in the field of health sectors, there are still too many mothers and children dying mostly from treatable and curable causes. The target of Sustainable Development Goal: Goal -3 (goal -3.1) by 2030 is to reduce the global maternal mortality ratio to less than 70 per 100,000 live births. But, in India, there are many complications. The major complications that account for nearly two-thirds of all maternal deaths are severe bleeding (mostly bleeding after childbirth), infections (usually after childbirth), high blood pressure during pregnancy (pre-eclampsia and eclampsia), complications from delivery and unsafe abortions. Research into the clinical causes of maternal morbidity and death has led to some improvements in the care of women during the ante partum period and labour and delivery. Thus, the main focus of this study is an attempt to analyse the comparative status of MMR of major Indian states with reference to sustainable development goal-3 (Target-1) and to examine whether Indian states achieved the target-1 of SDG-3 by 2030 related to MMR.

Keywords: MMR, SDG 3, MDG, Status Index

Introduction

There are many ways and reasons for death but there is only one way to come in the world i.e., through mother. When a female becomes a mother, it is a moment of unimaginable joy that every mother should have the right to experience when a newborn baby is placed on her arms. But, from various treatable and preventable causes, many of the pregnant women in India will never experience this joyful moment. The moment of giving birth or pregnancy duration is often frightening. The health of women and children is vital to creating a healthy world because as we know children are the future of the generations while on the other hand, women (female reproductive age between 15-49 years) are the biological mother. From

data availability, it is experienced that despite of many progresses in the field of health sectors, there are still too many mothers and children dying mostly from treatable and curable causes. In 2017, according to latest data estimation, there are over 800 women died each day from complications in pregnancy and childbirth. According to new mortality estimates released by UNICEF, WHO, the United Nations Population Division, UNFPA and the World Bank Group, every 11 seconds, a pregnant woman or newborn dies somewhere around the world, mostly of preventable causes. 99% of these deaths occur in developing countries. As per the latest report of the National Sample Registration System (SRS) data MMR of India for the period 2016-18, is 113/100,000 live births, declining by 17 points from 130/100,000 live births in 2014-16. Hence, maternal mortality is considered a key indicator of health and the direct and indirect causes of death of pregnant women. The major complications of nearly 2/3rd of the maternal deaths are severe bleedings (mostly bleeding after pregnancy), infections after childbirth, high blood pressure during pregnancy, complications from delivery and unsafe abortions.

Maternal health is defined as the health condition of women during pregnancy, child birth and the post-natal period. Massive and strategic investments on maternal health have been made under the national health mission by the government for their improvement. Maternal health is an important dimension for development of any country. The survival and wellbeing of mothers is not only important in their own right but for future also in solving broader economic, social and developmental challenges. A significant reduction in the number of maternal deaths can see from the estimation from 1990 to 2013. Globally, there is an attempt made for maternal mortality that is, Millennium Development Goal Goal-5: Improve Maternal Health- the rate of decline is less than half of what is needed to achieve the MDG target of a three quarters reduction in the mortality ratio between 1990 and 2015. The Goal-5 of MDG is to reduce the number of maternal deaths; women need access to good quality reproductive health care and effective interventions. While on the other hand, the extension version of MDG in the form of Sustainable Development Goal, Goal-3 is related to health and well-being. The target of SDG Goal -3 (goal -3.1) by 2030 is to reduce the global maternal mortality ratio to less than 70 per 100,000 live births. But, in India, there are many complications. The major complications that account for nearly two-thirds of all maternal deaths are severe bleeding (mostly bleeding after childbirth), infections (usually after childbirth), high blood pressure during pregnancy (pre-eclampsia and eclampsia), complications from delivery and unsafe abortions. Research into the clinical causes of maternal morbidity and death has led to some improvements in the care of women during the ante partum period and labor and delivery. In this light, present paper is an attempt to analyse the comparative status of MMR of major Indian states with reference to sustainable development goal-3 (Target-1) and to examine whether Indian states achieved the target-1 of SDG-3 by 2030 related to MMR.

Thus, in the light of above facts, the study is divided into 4 sections. **Section (I)** is related to objectives of the study and methodology, **Section (II)** is related to comparative status of Indian States in terms of MMR, **Section (III)** reveals the status of SDG Goal -3 (Target-1 related to MMR) of 15 major Indian States on the basis of regression analysis and **Section (IV)** concludes the study with important suggestions.

Section (I)

Objectives of the Study

The objectives of this study are:

- A comparative analysis of Maternal Mortality Rate of Indian states with the help of status indices from Sample Registration System (SRS) report 2007-09 to 2018-20;
- To examine whether Indian states achieved the target number 1 of SDG-3 by 2030 related to MMR.

Methodology

This study is mainly Analytical and Descriptive research in nature. The study is based upon the secondary data collected from Sample Registration System (SRS) and also from various books, journals, articles, magazines and government publications. The SRS is based on a dual record system and was introduced by the Registrar General's Office under the Ministry of Home Affairs in the year 1964-65 (it become fully operational during 1969-70) with the objective of registering the statistics of births and deaths. Since then, SRS has been providing the data regularly. The SRS is a demographic survey for providing reliable annual estimates of infant mortality rate, birth rate, death rate and other fertility and mortality indicators at the national and sub-national levels. The MMR data has been taken from SRS Statistical reports for comparison from 2007 to 2022. For analytical study, many statistical tools are used like mean (average), standard deviation, and Linear Regression model etc. All the value for regression analysis is calculated by statistical software SPSS. For the comparative study of Indian states, Status Index is used for MMR. The methodology for computing the Status Index is as under:

Status Index (SI)= $\frac{X_i - X_{min}}{X_{max} - X_{min}}$

Where-

$\mathbf{X_i}$ stands for actual value of MMR

$\mathbf{X_{min}}$ stands for minimum value of *'i'* variable of Indian states.

$\mathbf{X_{max}}$ stands for maximum value of *'i'* variable of Indian states.

It is expressed as the value of status index lies between 0 to 1. Negative indicators like MMR have indices value near 1 shows worst status and indices value close to 0 shows better status of the Indian. **On the basis of the indices values, these Indian states can be categorised as:**

Indices value	Categorised status of Indian states
	For Negative Indicators (MMR)
0.75 - 1.0	Most Worst Status
0.50 - 0.75	Worst Status
0.25 – 0.50	Moderate Status
0.0 - 0.25	Better Status

Section (II)

Comparative Status of Indian States in Terms of MMR

MMR are the most important indicators in health sector. This study consists of 15 major states i.e., Assam, Bihar, MP, Orissa, and Rajasthan, UP, AP, Karnataka, Kerala, Tamil Nadu, Gujarat, Haryana, Maharashtra, Punjab, and West Bengal. With the help of status index, the comparative picture of MMR of these states is given in Table 1.

Table 1: Comparative picture of MMR of major Indian states

S.no.	States	MMR (per 1 lakh live births)			
		2018-20	INDEX	2007-09	INDEX
1	**India**	**97**	**0.4431818**	**212**	**0.4239482**
2	Assam	195	1	390	1
3	Bihar	118	0.5625	261	0.5825243
4	MP	173	0.875	269	0.6084142
5	Orissa	119	0.5681818	258	0.5728155
6	Rajasthan	113	0.5340909	318	0.7669903
7	UP	167	0.8409091	359	0.8996764
8	AP	45	0.1477273	134	0.171521
9	Karnataka	69	0.2840909	178	0.3139159
10	Kerala	19	0	81	0
11	TN	54	0.1988636	97	0.0517799
12	Gujarat	57	0.2159091	148	0.2168285
13	Haryana	110	0.5170455	153	0.2330097
14	Maharashtra	33	0.0795455	104	0.0744337
15	Punjab	105	0.4886364	172	0.2944984
16	West Bengal	103	0.4772727	145	0.2071197

Source: Sample Registration System (SRS) reports 2007-09 and 2018-20
Note: Status Index is calculated by Status Index Formula

Table 2: Comparative status of MMR of major Indian states

Indices Value Range	Status	Comparative status of MMR (2007-09)	Comparative status of MMR (2018-20)
0.75 - 1.0	Most Worst Status	Assam>UP>Rajasthan	Assam >MP>UP
0.50 - 0.75	Worst Status	MP> Bihar>Orissa	Orissa>Bihar>Rajasthan>Haryana
0.25– 0.50	Moderate Status	Karnataka>Punjab	Punjab>West Bengal>Karnataka
0.0 - 0.25	Better Status	Kerala>TN>MH>AP>West Bengal>Gujarat>Haryana	Kerala>MH> AP> TN> Gujarat

Source: Calculated from Table 1

Table 2 reveals that as per the indices value Assam, MP and UP have very worst status in MMR in comparative terms in the year 2018-20 while that of Assam, Uttar Pradesh and Rajasthan in the period of 2007-09. All the Indian states have reduced MMR in absolute terms but Assam and Uttar Pradesh have very high MMR in comparative terms. As per the indices value, Orissa, Bihar, Rajasthan and Haryana have worst MMR status in the period of 2018-20 while in the period of 2007-09, MP, Bihar and Orissa have worst MMR status comparatively. On the other hand, Punjab, West Bengal and Karnataka having moderate indices value in the year 2018-20 while in the year 2007-09, Karnataka and Punjab had have moderate MMR status. As per the comparative status of MMR indices value, in the year of 2018-20,

Kerala, MH, AP, TN, Gujarat have Better MMR status while in the year 2007-09, Kerala, TN, MH, AP, West Bengal, Gujarat and Haryana are in Better MMR status.

As per the indices value of MMR (2007-09), Assam, UP and Rajasthan are in very worst status as compare to that of MP, Bihar and Orissa. Kerala, TN, MH, AP, West Bengal, Gujarat and Haryana are in the better status of MMR in 2007-09 with indices value having 0- 0.25. While on the other hand, the comparative status of MMR in 2018- 20, Assam, MP and UP are in the very worst status having indices value 0.75- 1 as compare to that of Orissa, Bihar, Rajasthan and Haryana with indices value 0.75- 0.50 and the better status are Kerala, MH, AP, TN and Gujarat with indices value 0-0.25.

Section (III)

Status of SDG Goal -3 (Target-1 related to MMR) of 15 major Indian states

Sustainable Development Goal 3 is regarding **"Good Health and Well-being"** is one of the 17 SDGs established by the United Nations in 2015 including targets related to reduction of maternal mortality, infant and child mortality rate, fight communal diseases and promote mental health, reduce road injuries and deaths, access to sexual and reproductive care, family planning and education, etc. The official wording is: "to ensure healthy lives and promote well-being for all at ages". The UN has defined **13 targets and 28 indicators for SDG 3**. The targets cover a wide range of issues including communal diseases and non-communal diseases. Out of 13 targets, this study is based on SDG Goal – 3.1 by 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births.

Table 3: Status of SDG Goal- 3.1 (targeted by 2030) achieved by 15 major states with help of regression model

S.No.	States	Current status of MMR (2018-2020)	Model	SDG 3.1 by 2030 of MMR (less than 70 per 100000 live births	
				Target achieved Year	Status
1	Assam	195	$X=2029.753-0.054Y_1$	2025	Achieved
2	Bihar	118	$X=2029.341-0.078Y_1$	2023	Achieved
3	Madhya Pradesh	173	$X=2034.909-0.098Y_1$	2028	Achieved
4	Orissa	119	$X=2029.423-0.076Y_1$	2024	Achieved
5	Rajasthan	113	$X=2026.981-0.057Y_1$	2022	Achieved
6	Uttar Pradesh	167	$X=2028.308-0.237Y_1$	2024	Achieved
7	Andhra Pradesh	45	$X=2026.051-0.129Y_1$	2017	Achieved
8	Karnataka	69	$X=2027.401-0.105Y_1$	2020	Achieved

9	Kerala	19	X=2024.579-0.187Y_1	2012	Achieved
10	Tamil Nadu	54	X=2032.308-0.237Y_1	2015	Achieved
11	Gujarat	57	X=2027.512-0.126Y_1	2018	Achieved
12	Haryana	110	X=2031.855-0.142Y_1	2021	Achieved
13	Maharashtra	33	X=2025.008-0.155Y_1	2014	Achieved
14	Punjab	105	X=2037.456-0.166Y_1	2025	Achieved
15	West Bengal	103	X=2036.906-0.195Y_1	2023	Achieved
	India	**97**	**X=2028.547-0.093Y_1**	**2022**	**Achieved**

Source: Sample Registration System (SRS)from 2007 to 2022

Note:

* Coefficient and constant value of the regression model are calculated with the help of statistical software SPSS (See Annexure 1 & 2).
* Y_1 = Estimated Value of MMR, X= Year
* The value of Y_1in calculation is taken as 70 per 1 lakh live births targeted by 2030.

Table 3 gives the results of regression analysis. Table 3 reveals that in case of MMR, all the Indian states can achieve the SDG target goal 3.1 by 2030. As per current status, many of the states like Andhra Pradesh, Karnataka, Tamil Nadu, Gujarat, Maharashtra and Kerala have already achieved the target (SDG Goal 3.1: MMR below 70 per 100,000 live births) and most of the states like UP, Bihar, MP, Rajasthan, Orissa, Haryana, West Bengal and Assam can achieve the target of SDG Goal 3.1 by 2030. As per regression analysis, all major Indian states will achieve the target of SDG Goal 3.1 by 2030.

Section (IV)

Suggestions

- There is a need to make awareness about the complications related to maternal health not only to the pregnant women but also to peoples who belongs to her surroundings like husbands, sisters, in - laws, and teenagers too.
- There should be a mandatory rule for pregnant women to keep them under the supervision of professional, educated and practitioners before, during childbirth and after delivery so that both mother and child are saved from preventable and treatable causes and complications.
- There is no much more sufficient scheme related to maternal health and also there is no better implementation of these schemes at remote areas.
- There is necessarily need to reduce the cost of hospitals charges not only in government hospitals but also in the private hospitals. There must be a minimum and maximum criterion of fee and charges of the medical terms so that people can prefer their need and treatment where to go for better facilities.

- As we know India has a dense and populated country along with socially and economically backward condition of many states. Only India's 68.9% of the total population is literate but among this percentage, yet most of the people were not aware of health situation and related government policies. Hence, there must be need to conduct campaigns to aware the people.

Conclusion

Initially, many efforts are taken by the govt related to maternal and child health care at national, state and global level. In the Millennium Development Goal (goal-5) will be considered only on reducing maternal mortality by half in the three quarters till 2015. While on the other hand, the extend version of MDG, that is, Sustainable Development Goal (SDG Goal -3) include not only direct emphasis on reduction of maternal mortality but also highlighting the importance survival of maternal health and efforts to improve the accessibility and quality of care. Globally, the target has been set for MMR 70 per 100,000 live births by 2030. In India, many states have had already achieved the target at present like Kerala (19 per lakh live births), followed by Maharashtra (33) and Telangana (43) while many of the states have high MMR like in Assam with 195, followed by Madhya Pradesh and Uttar Pradesh with 173 and 167 respectively. The reason behind these differences in statistical data among states is that there are adequate provisional differences of basic health and educational facilities. For betterment of these poor condition of the states, government should take special initiatives and better implementation of the policies at ground level especially in remote areas where illiteracy among people is maximum and awareness related to maternal and child health is minimum.

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ANNEXURE:1

COEFFICIENT OF MMR							
S.No.	Model	Unstandardized Coefficients			Standardized Coefficients	t	Sig.
		B		Std. Error	Beta		
1	India	(Constant)	2028.547	.390		5207.716	.000
		YEAR	-.093	.003	-.998	-34.721	.000
2	Assam	(Constant)	2029.753	.875		2319.962	.000
		YEAR	-.054	.003	-.990	-16.784	.000
3	Bihar	(Constant)	2029.341	.486		4172.959	.000
		YEAR	-.078	.003	-.997	-29.386	.000
4	Madhya Pradesh	(Constant)	2034.909	2.448		831.346	.000
		YEAR	-.098	.012	-.957	-8.051	.000
5	Orissa	(Constant)	2029.423	.689		2944.532	.000
		YEAR	-.076	.004	-.993	-20.846	.000
6	Rajasthan	(Constant)	2026.981	.521		3889.236	.000
		YEAR	-.057	.002	-.994	-23.058	.000
7	Uttar Pradesh	(Constant)	2028.323	.972		2086.611	.000
		YEAR	-.054	.004	-.984	-13.679	.000
8	Andhra Pradesh	(Constant)	2026.051	.693		2924.307	.000
		YEAR	-.129	.008	-.989	-16.058	.000
9	Karnataka	(Constant)	2027.401	.384		5278.878	.000
		YEAR	-.105	.003	-.997	-32.343	.000
10	Kerala	(Constant)	2024.579	.753		2687.651	.000

		YEAR	-.187	.014	-.982	-12.921	.000
11	Tamil Nadu	(Constant)	2032.308	1.114		1823.810	.000
		YEAR	-.237	.015	-.988	-15.412	.000
12	Gujarat	(Constant)	2027.512	.397		5113.405	.000
		YEAR	-.126	.004	-.997	-31.596	.000
13	Haryana	(Constant)	2031.855	3.519		577.435	.000
		YEAR	-.142	.030	-.888	-4.735	.003
14	Maharashtra	(Constant)	2025.008	.708		2861.427	.000
		YEAR	-.155	.011	-.986	-14.327	.000
15	Punjab	(Constant)	2037.456	2.410		845.590	.000
		YEAR	-.166	.018	-.967	-9.224	.000
16	West Bengal	(Constant)	2036.906	6.142		331.644	.000
		YEAR	-.195	.055	-.821	-3.518	.013
a. Dependent Variable: YEAR							

Annexure: 2

MODELS SUMMARY OF MMR					
S.No.	States	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	India	.998[a]	.995	.994	.29015
2	Assam	.990[a]	.979	.976	.59543
3	Bihar	.997[a]	.993	.992	.34249
4	Madhya Pradesh	.957[a]	.915	.901	1.20008
5	Orissa	.993[a]	.986	.984	.48116
6	Rajasthan	.994[a]	.989	.987	.43555
7	Uttar Pradesh	.984[a]	.969	.964	.72678
8	Andhra Pradesh	.989[a]	.977	.973	.62175
9	Karnataka	.997[a]	.994	.993	.31137
10	Kerala	.982[a]	.965	.960	.76798
11	Tamil Nadu	.988[a]	.975	.971	.64716
12	Gujarat	.997[a]	.994	.993	.31869
13	Haryana	.888[a]	.789	.754	1.89461
14	Maharashtra	.986[a]	.972	.967	.69486
15	Punjab	.967[a]	.934	.923	1.05822
16	West Bengal	.821[a]	.673	.619	2.35609
a. Predictors: (Constant), MMR					