

A Comparison of the Various Maternal Health Indicators and its Association to Infant Mortality Rate in the BIMARU States Built on the NFHS-4 and NFHS-5 Data

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Abstract:

Aim: The present research aims to compare the maternal health indicators and its association to infant mortality rate in the BIMARU states built on the NFHS-4 and NFHS-5 Data. It also presents an uphill or downhill growth pattern in the BIMARU states.

Material Method: The methodology that was applied to do the research work was a narrative, descriptive. The NFHS 4&5 fact sheets for the BIMARU states namely Bihar, Rajasthan, Madhya Pradesh and Uttar Pradesh were used. From the last NFHS-4 and the recent NFHS-5 data, a comparison was done for the BIMARU states for the various maternal health indicators.

Result and Discussion: The various tables display the various health indicators.

Conclusion: There has been a consistent improvement made by the BIMARU states in the field of maternal health indicators as per NFHS-5 compared to NFHS-4 data. The comparative result shows a decrease of Infant Mortality Rate in the BIMARU states. However, there is still a vast scope for improvement in the health parameters of the pregnant women all the BIMARU states. However, Uttar Pradesh needs major efforts to improve their NMR and IMR data.

Keywords: Maternal health conditions, BIMARU, NFHS, women, infant mortality rate, maternal health indicators.

1. Introduction:

The word BIMARU came into existence with a paper submitted by Ashish Bose to the then Prime Minister Rajiv Gandhi in the late 1980s, which had this acronym. Bihar, in Hindi originally refers to being sick, has a similar meaning to BIMARU. Although at that time it was coined to describe the bad economic condition of the backward states Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh. But the economic and other conditions have direct or indirect on varied other factors, one among them is maternal health conditions. The Indian subcontinent combines many customs, cultures, social practices, geographic factors, and other things therefore an understanding of maternal health conditions within the four BIMARU states - including Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh - gives a better portrait of the maternal conditions within India and its association on infant mortality rate than a combined or universal view.

2. Aim:

The present research aims to compare the maternal health indicators and its association to infant mortality rate in the BIMARU states based on the NFHS-4 and NFHS-5 Data. It also presents a uphill or downhill growth pattern in the BIMARU states.

3. Material Method:

The methodology that was applied to do the research work was a narrative, descriptive. The NFHS 4&5 fact sheets for the BIMARU states namely Bihar, Rajasthan, Madhya Pradesh and Uttar Pradesh were used. From the last NFHS-4 and the recent NFHS-5 data, a comparison was done for the BIMARU states for the various maternal health indicators. The various indicators taken into consideration were-

I Maternal Indicators

- a. Percentage of women (22-24 years) who were married off before they could reach the age of 18 years
- b. Nutritional status of women based on their BMI. Value of BMI < 18.5Kg/m² were considered as below normal and categorised as malnourished.
- c. Percentage of women who had their hemoglobin level below 12 gm/dl were considered as anemic.
- d. The maternal and child health indicators were the next. This included fraction of pregnant ladies who attended the ANC visit in the first trimester and ladies who had a minimum of at least 4 ANC visits, mothers who were protected against the tetanus, had consumed over a 100 and 180 iron and folic acid tablets, mothers who made their Mother and Child Protection (MCP) Card, percentage of women who received post-natal care.
- e. Percentage of women showing delivery care. These criteria included the fraction of pregnant ladies who had institutional birth, public and private caesarean cases and percentage of birth attended by skilled health personals.

II. Infant Mortality Rate

- a. In this section only Neonatal and Infant mortality was considered for per 1000 live births.

III. Statistical Tool applied

A variety of statistical tools were used namely- percentage and regression.

Percentage-

$$\text{Percentage (\%)} = \frac{\text{Value}}{\text{Total Value}} \times 100$$

4. Result and Discussion:

Table 1 shows that in all BIMARU there is a drop in the percentage of women in the range of 20-24 years getting married before the of 18years. However, the greatest achievement among these states was achieved by Madhya Pradesh with a drop of 28.70. An early marriage and childbearing can negatively affect one’s health on social and physical level has been stated by Kennedy, E., Gray, N., Azzopardi, P., & Creati, M. (2011)¹; Hamed, A., & Yousef, F. (2017)² and Berliana, S. M. *et al.*, (2021)³.

Table 1: Percentage of women age 20-24 years married prior to the age of 18 years

States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	42.5	40.8	-4

Madhya Pradesh	32.4	23.1	-28.70
Rajasthan	35.4	25.4	-28.24
Uttar Pradesh	21.1	15.8	-25.11

Table 2 depicts nutritional status of women. Here too the BIMARU states have made an improvement for providing the nourishment for the expectant women. However, the greatest achievement was done by state of Rajasthan which has reduced from 27.0 in NFHS-4 to 19.0 in NFHS-5 data. Research was done by Lenders, C. M., McElrath, T. F., & Scholl, T. O. (2000)⁴; Jensen, R., & Thornton, R. (2003)⁵; Rah, J. H. (2013)⁶; Ghose, B., Yaya, S., & Tang, S. (2016)⁷. It is believed that low educational status, low income, domestic abuse and low nutritional intake impact and influence anemia.

Table 2: Nutritional Status of women

Pregnant ladies with Body Mass Index below normal (BMI<18.5Kg/m ²)			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	30.4	25.6	-15.78
Madhya Pradesh	28.4	23.0	-19.01
Rajasthan	27.0	19.6	-27.40
Uttar Pradesh	25.3	19.0	-24.90

Table 3 shows the percentage of women between the age of 15-49 years who are anemic. Again, the data shows a considerable improvement by all the BIMARU states. However, Madya Pradesh has done maximum progress in bringing their scale down by 7.60 percentage. Varied research done states that that low iron stores during pregnancy increases the risk of becoming anemic during delivery for every woman. Kassa, G. M. *et al.*, (2017)⁸; Gari, W., Tsegaye, A., & Ketema, T. (2020)⁹.

Table 3: Percentage of pregnant ladies between the age of 15-49 years who had anemia(<12gm/dl)

States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	63.1	58.3	-7.60
Madhya Pradesh	54.6	52.9	-3.11
Rajasthan	46.6	46.3	-0.64
Uttar Pradesh	51.0	45.9	-10

Table 4 shows the fraction of women undertaking maternal and child health indicators. There was a consistent jump in the parameters for all the BIMARU states however, the greatest advancement was done by the state of Bihar. The second criteria were the minimum 4 ANC visits. Here too Bihar topped among all the BIMARU states. Meta-analytic research done to establish the problems associated with inequalities in the use of maternal health facilities in developing countries by Pappagallo, S., & Bull, D. L. (1996)¹⁰; Viteri, F. E. (1997)¹¹; Pallikadavath, S., Foss, M., & Stones, R. W. (2004)¹²; Say, L., & Raine, R. (2007)¹³;

Seck, B. C., & Jackson, R. T. (2008)¹⁴; Kozuma, S. (2009)¹⁵; Mithra, P *et al.*, (2014)¹⁶ and Petry, N. *et al.*, (2016)¹⁷ in north India stated that anemia is often detected late in pregnancy because of insufficient hospital visits, resulting in women entering into labour with inadequate iron stores Makate, M., & Makate, C. (2017)¹⁸; Yan, J. (2017)¹⁹; Swaminathan, S. *et al.*, (2019)²⁰; John, S., & Sharma, P. C. (2020)²¹ were also in constant with the results.

Table 4: Percentage of women undertaking maternal and child health indicators

Percentage who attended ANC in the first trimester			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	34.6	52.9	52.89
Madhya Pradesh	53	75.4	42.26
Rajasthan	63	76.3	21.11
Uttar Pradesh	45.9	62.5	36.16
Percentage who had at least 4 ANC visits			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	14.4	25.2	75
Madhya Pradesh	35.7	57.5	61.06
Rajasthan	38.5	55.3	43.63
Uttar Pradesh	26.4	42.4	60.60

Table 5 shows the fraction of women who were protected from neonatal tetanus and consumption of iron tablets as well as folic acid tablets. It showed a very marginal increase in all the BIMARU states. Hence a greater effort is needed in this area. A similar study done in Guntur district of India by Sudarsi, M. G., Vasundhara, R., & Miryani, J. (2018)²² almost half of the pregnant women were unaware that anemia is cause by iron deficiency and folic acid deficiency and that it can be rectified if they consume these tablets timely Peña-Rosas, J. P. *et al.*, (2015)²³; Rai, R. K. *et al.*, (2016)²⁴; Varghese, J. S. *et al.*, (2019)²⁵ and Desta, M. *et al.*, (2019)²⁶ also authenticate our research.

Table 5: Percentage of women who were protected from neonatal tetanus and consumption of iron tablets and folic acid tablets

Women whose last birth protected against neonatal tetanus			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	89.5	89.6	0.11
Madhya Pradesh	89.8	95	5.79
Rajasthan	89.7	93.4	4.12
Uttar Pradesh	86.5	92.1	6.47

Women who consumed iron and folic acid for 100 days			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	9.7	18	92.22
Madhya Pradesh	23.5	51.4	118.72
Rajasthan	17.3	33.9	95.95
Uttar Pradesh	12.9	22.3	72.86
Women who consumed iron and folic acid for 180 days			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	2.3	9.3	304.34
Madhya Pradesh	9.2	31.8	245.65
Rajasthan	6	14.4	140
Uttar Pradesh	3.9	9.7	148.71

Table 6: Percentage of registered pregnancies or which the mothers received Mother and Child Protection (MCP)Card

<i>Percentage of registered pregnancies or which the mothers received Mother and Child Protection (MCP)Card</i>			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	79.9	89.5	12.01
Madhya Pradesh	92.2	96.7	4.88
Rajasthan	92.3	98.1	6.28
Uttar Pradesh	79.8	95.7	19.92

Table 7 states the percentage of mothers who received post-natal care from Doctor/Nurse/LHV/ANM/Midwife/other health personnel. It also showed that the BIMARU states have shown a good increase in providing health care facilities to the pregnant women. However, among all the states Madhya Pradesh showed a greater percentage increase of 52.09%.

Table 7: Percentage of mothers who received post-natal care from Doctor/Nurse/LHV/ANM/Midwife/other health personnel

States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	42.3	57.3	35.46
Madhya Pradesh	54.9	83.5	52.09
Rajasthan	63.7	85.3	33.90
Uttar Pradesh	54	72	33.33

Table 8 shows the percentage of women showing delivery care. The table showed a positive sign of increase however, the area of concern was a increase in the cases of caesarean section, more so in public sector.

Table 8: Percentage showing delivery care

Percentage showing Institutional Births			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	63.8	76.2	19.43
Madhya Pradesh	80.8	90.7	12.52
Rajasthan	84	94.9	12.97
Uttar Pradesh	67.8	83.4	24.18
Percentage of births delivered by Caesarean Section			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	6.2	9.7	56.45
Madhya Pradesh	8.6	12.1	40.69
Rajasthan	8.6	10.4	20.93
Uttar Pradesh	9.4	13.7	45.74
Percentage of births delivered by Caesarean Section (Public Sector)			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	2.6	3.6	38.46
Madhya Pradesh	5.8	8.2	46.15
Rajasthan	6.1	7.2	18.03
Uttar Pradesh	4.7	6.2	31.91
Percentage of births delivered by Caesarean Section (Private Sector)			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	31	39.6	27.74
Madhya Pradesh	40.8	52.3	28.18
Rajasthan	23.2	26.9	15.94
Uttar Pradesh	31.3	39.4	25.87
Percentage of births attended by Skilled health personnel			
States	NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	70	79	12.85
Madhya Pradesh	78	89.3	14.48
Rajasthan	86.6	95.6	10.39
Uttar Pradesh	70.4	84.8	20.45

Table 9 shows the Infant mortality rate (per1000 births). As all the above tables showed an increase in providing greater care and nourishment and nutrition for the pregnant women, hence it automatically showed a decrease in the infant mortality rate. The greatest achievement done in the field is the state of Rajasthan with a whopping decrease of 32.21% (NMR) and 26.63% (IMR). Murphy, J. F *et al.*, (1986)²⁷; Little, M. P., Brocard, P., Elliott, P., & Steer, P. J. (2005)²⁸; Zhang, Q. *et al.*, (2008)²⁹; Malhotra, M. *et al.*, (2002)³⁰; Chumak, E. L., & Grijbovski, A. M. (2011)³¹ and Purisch, S. E., & Gyamfi-Bannerman, C. (2017)³²; Zavaleta, N., & Astete-Robilliard, L. (2017)³³ and Chen, H. Y., Blackwell, S. C., & Chauhan, S. P. (2022)³⁴ have also associated the adverse effect specially the neonatal and perinatal mortality with moderate and severe anemia.

Table 9: Infant mortality rate (per1000 births)

States		NFHS-4	NFHS-5	Increase/decrease in NFHS-5 compared to NFHS-4 (in %)
Bihar	NMR	36.7	34.5	-5.99
	IMR	48.1	46.8	-2.70
Madhya Pradesh	NMR	36.9	29	-2.14
	IMR	51.2	41.3	-19.14
Rajasthan	NMR	29.8	20.2	-32.21
	IMR	41.3	30.3	-26.63
Uttar Pradesh	NMR	45.1	35.7	-20.84
	IMR	63.5	50.4	-20.62

5. Conclusion:

There has been a consistent and constant improvement made by the BIMARU states in the field of maternal health indicators in the NFHS-5 as compared to the NFHS-4 data. Comparison of the data shows a decrease in Infant Mortality Rate in the BIMARU states. However, there is still vast scope for improvement for all the states in particular for the state of Uttar Pradesh with respect to NMR and IMR.

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