Chapter 8
Issues Evolving Around Maternal Health Care in West Bengal

Sudarshana Sinha and Anindya Basu

Abstract The World Health Organization defines health as a state of complete well-being and not just the absence of disease or infirmity. Women's health is of crucial importance as it is a reflection of their social status in society. There is a dearth of literature that talks about the inter-district disparity and changes in the usage of maternal health care services in West Bengal from 2015 to 2020. Hence, the objectives of this chapter are to analyse the evolution of maternal health care services (MHCS) which are available in West Bengal, and to bring out the inter-district disparity with regards to the usage of these services. The data have been obtained from NFHS-4,5 records and census records for 2001 and 2011. For the analysis, 14 sub-indicators were chosen which were clubbed under 4 broad domains, namely, awareness index, maternity care index, delivery care index and postnatal care index, which were used for computing maternal health index. Intra-zone-wise analysis was conducted along with its correlation between children per women and their educational level, and analysis regarding location of various health care services was also performed to bring out the inter-district comparison for 2015–2016 and 2019–2020. The results show the presence of huge intra- and inter-zonal disparity. This disparity is stark between the northern and southern zones. It can be observed that among all the districts only Bankura has recorded a decrease in the maternal health index, whereas Uttar Dinajpur has recorded the highest net increase in this category this is due to the differentials in the concentration of medical facilities in this area.

Keywords Maternal health · Delivery care · Postnatal care · Awareness

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8.1 Introduction

The health of women is innately linked to their societal status. Maternal health (MH) is an umbrella term for women's health before and after their pregnancy (WHO 2017). The fifth goal of the Millennium Development Goals (MDG) emphasizes the need to improve MH (UN. 2015), and the third and fifth goals of the Sustainable Development Goals (SDG) aim to achieve good health, well-being and gender equality, respectively (UNDP 2017). SDG had aimed to reduce the global maternal mortality ratio (MMR) to less than 70 per 100,000 live births by 2030, and most of such deaths were reported from Sub-Saharan Africa and Southern Asian regions (Mishra et al. 2021). As stated by Navaneetham and Dharmalingam (2002), there is an accord among scholars speaking in favour of improving maternal health care services (MHCS), reducing maternal mortality and improving reproductive health of women. In spite of its importance, Aliyu (2018) has observed that access to MHCS continues to be a key challenge faced by most public health care systems among most developing countries. Saxena et al. (2013) have observed that despite the overall progress, wide range of inter- and intra-state disparities exist within the boundaries of the Indian sub-continent, resulting in intensified disparity between different regions.

Calculations and the analysis solely concerning the changing life expectancy of females are insufficient to analyse MH. In this context, The George Institute for Global Health (2016) has observed that although the life expectancy of women has increased over the years in India owing to the improvement in their living conditions, the World Health Organization(WHO) has still estimated that India contributes to roughly about 20% of the global maternal deaths (Mavalankar et al. 2008). Women residing in wealthier countries tend to enjoy higher life expectancy compared to those living in low-income countries; additionally, developing countries face the highest burden of morbidity and mortality during their reproductive years, and they are the most vulnerable ones owing to the lack of infrastructural facilities (WHO 2009). This gap in MHCS between the developed and developing countries has created a significant health divide (UNICEF 2008).

The importance of women's health during their reproductive years also has a momentous impact on future generations (Dharmalingam et al. 2010). In India, women aged between 15 and 49 years make up 26% of the entire population (Ali and Chauhan 2020). Nair and Panda (2011) have observed that despite the previously adopted safe motherhood policies, MH continues to be risky in India; moreover, the prevailing socio-economic differentials and inequalities in medical facilities that are available to the women make them prone to a higher risk of morbidity and mortality (Baru et al. 2010; Singh et al. 2012). However, there is a dearth of literature that talks about the change in the usage of MHCS from 2015 to 2020 in the context of West Bengal considering the inter- and intra-district disparity. Hence, the objective of this chapter is to, firstly trace the evolution of MHCS in West Bengal from 2015 to 2020 and, secondly, to trace the inter- and intra-zonal differences regarding the usage of MHCS.

8.2 Literature Review

In India, MH comprises an array of indicators that can be grouped under ante-natal, maternity, delivery and post-natal care. According to National Guidelines, ante-natal services comprise a set of professional pregnancy check-ups, immunizations, regular, provision of iron and folic acid supplements, whereas post-natal care involves the treatment of various postpartum complications (Saxena et al. 2013). Singh et al. (2019), Kesterton et al. (2010) and Rani et al. (2008) opined that proper utilization of ante-natal and post-natal care services is important as these factors can significantly reduce maternal mortality ratio (MMR); maternity care includes various obstetric examinations throughout the gestation period, delivery care comprises of various types of medical facilities which are available to the mother during childbirth, and post-natal care includes appropriate medical assistance that should be available to women after childbirth (Paswan et al. 2020). Apart from these, MHCS is also evaluated based on the availability of such services; it is a multi-dimensional concept as it involves several factors that are intricately related to each other (Nair and Panda, 2011). Chaudhuri and Mandal (2020) have mentioned about the importance of evaluation of non-monetary factors like travel time, waiting time and travel distance in MHCS as well (Nair and Panda 2011).

Forty-four per cent decline in MMR has resulted in a reduction of 169 maternal deaths per 100,000 live births over the past 25 years, and 99% of such deaths have occurred in developing nations, and since 2015, India has accounted for 45,000 maternal deaths (WHO 2015). Although in India, MMR is on a declining trend and it has reduced from 211 in 2007–2009 to 167 in 2011–2013, significant inter- and intra-state difference continues to flourish (Singh et al. 2019). According to NITI Aayog (2021), MMR per 100,000 live births has decreased to 113 and 98 in case of India and West Bengal, respectively.

However, significant socio-economic discrepancies persist, and various studies have suggested that women are extremely vulnerable in certain regions and communities where even the most basic MHCS is unavailable to a significant share of women (Kowsalya and Manoharan, 2017). Although life expectancy of women is higher than their male counterparts, it does not necessarily imply that they enjoy a healthier lifestyle (WHO 2009); rather it has been observed by WHO (2009) that women are more prone to various sorts of deficiencies and tend to succumb to various sorts of illness as compared to their male counterparts. Studies conducted in India revealed that an incubus of myriad factors dealing with differentials in the socio-economic condition of women, utilization of ante-natal care facilities, access to health services and education levels tend to have a momentous impact on the MH of women in India (Pallikadavath et al. 2004). WHO (2009) has identified sexually transmitted diseases and complications owing to their limited knowledge, unwanted pregnancies, unsafe abortions during the gestation period and absence of skilled personnel during childbirth as the leading causes of death among women during their reproductive stages; other than this, 38% of maternal deaths are caused due to anaemia and post-partum haemorrhages, 11% due to sepsis and 5% due to obstructed

labour, and majority of such health issues could have been averted if women would have opted for institutional deliveries, medical care and appropriate ante-natal help during their pregnancy (Singh et al. 2019).

Availability and access to good-quality MHCS are also lacking in certain parts of the country Kanchanachitra et al. (2011), Salsberg and Grover (2006) and Lehmann et al. (2008) stated that access to health care professionals in remote, rural areas has become a matter of concern over the years; Dussault and Franceschini (2006) and Rao et al. (2011) have observed that maldistribution of medical professionals tends to negatively impact primary health care services among developing countries such as India. NITI Aayog (2021) had stated that India and West Bengal have recorded the availability of only 37 and 27 health care professionals, respectively. Bhan et al. (2020), Nair and Panda (2011) have stated that unavailability of medical professionals has also hampered the progress of Indian states towards the attainment of MH targets which had been predetermined by the Sustainable Development Goals (SDG), and this discrepancy continues to be acute in rural areas.

Pathak et al. (2010) observed that educational and socio-economic status of mothers in India determines their ability to utilize MHCS; Jat et al. (2011) have observed that various niche factors such as community-based discriminations tend to impact the acquisition and implementation of MHCS in India; Sanneving et al. (2013) observed that gender discrimination and domestic violence also negatively impact the MH conditions. Early marriages, under-aged childbirth, deficiency in nutrition and lack of awareness regarding family planning method (FPM) also contribute to the high rate of MMR in India (Kowsalya and Shanmugam 2017). Vora et al. (2009) have mentioned that mothers belonging to the low-income group do not have access to the most basic MHCS (Bandyopadhyay et al. 2020; Mukherjee et al. 2014), and this situation is worse for illiterate women (Jarris et al. 2016). Women belonging to the marginalized section tend to experience greater levels of difficulty while accessing the required MHCS (Houweling et al. 2007; Marmot and Allen 2014).

Despite various endeavours undertaken by the Government of India, implementation of MHCS continues to be low (Paul et al. 2019). The imbalance of supply and demand of MHCS has been exacerbated by the inequity in their knowledge and dissemination (Sanneving et al. 2013). Seeking institutional delivery by economically disadvantaged section continues to be a relentless challenge (Houweling et al. 2007; Jeffery and Jeffery 2010; Mishra and Mohanty 2019; Mishra and Syamala 2020; Mohanty and Srivastava 2013; Prinja 2015), and financial crunch is considered to be a barrier preventing pregnant women from opting for institutional deliveries and utilization of necessary MHCS in India (Gwatkin et al. 2004; Mohanty and Kastor 2017)

Previously, inequality in the utilization of MHCS in case of rural India has been documented by Ali and Chauhan (2020); the situation of rural areas has been documented in case of Uttar Pradesh by Mishra and Syamala (2020); Gujarat by Saxena et al. (2013); and southern India by Navaneetham and Dharmalingam (2002). Awareness about various maternal and child health care schemes had been observed in the context of Majuli, Assam, by Dutta and Barman (2017). The impact of Janani

Suraksha Yojna on Indian women has been observed by Mishra et al. (2021). In case of West Bengal, impact of pre-natal and delivery care on child birth from 2005 to 2006 was observed by Chaudhuri and Mandal (2020), MH status among women living in select slums of Kolkata has been observed by Bandhopadhay et al. (2020), factors causing deaths during pregnancy and childbirth was observed by Kumar et al. (2020), determinants influencing the selection of caregivers during childbirth in select villages of West Bengal have been observed by Bose (2019), analysis of MHCS services in select rural areas has been observed by Wagner et al. (2018), demand for MHCS based on NFHS-3 data records has been observed by Mandal (2015) and factors causing MMR in tertiary-level hospital were observed by Jain et al. (2013). After reviewing the literature, it can be concluded that there is a dearth of literature that talks about the change in the usage of MHCS from 2015 to 2020 in the context of West Bengal considering the inter- and intra-district disparity.

8.3 Objectives

The objectives of this study are:

1. To trace the evolution of MHCS in West Bengal from 2015 to 2020.
2. To trace the inter- and intra-zonal differences regarding the usage of MHCS.

8.4 Method and Methodology

8.4.1 Data Source

The work is entirely based on secondary data sources. Notable ones used are National Family Health Survey (NFHS-4,5) records for 2015–2016 and 2019–2020, respectively, and Census of India records for 2001 and 2011.

8.4.2 Statistical Analysis

Fourteen sub-indicators have been considered for the inter-zonal analysis which has been clubbed under four broad domains, i.e., awareness index (AI), maternity care index (MCI), delivery care index (DCI) and post-natal care index (PNCI) (Fig. 8.1), and these broad domains were used in the composition of Maternal Health Index (MHI). The descriptive analysis details are mentioned in Table 8.1. Equal weightage is given to all the four indicators as each of them is equally important in the comprehensive analysis of MH. MHI was calculated for each districts which were later grouped under four zones depending on their spatial location (Table 8.1).

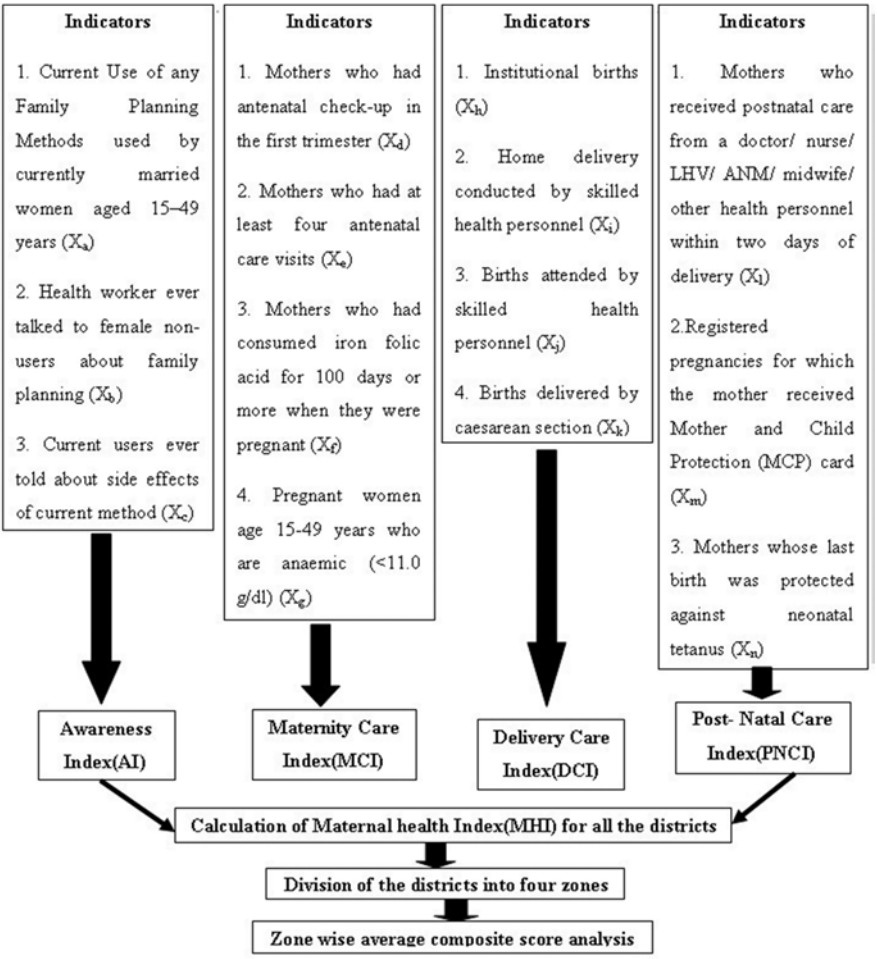


Fig. 8.1 Methodological framework

8.4.3 Justification for the Section of the Indicators

To calculate AI (Fig. 8.1), firstly, it is essential to know the number and category of people that use any type of family planning practices (Mustafa et al. 2015); secondly, it is important to understand whether any health worker has spoken to non-users about the different family planning method (FPM) as an effort to increase public awareness and break down various myths enshrouding the adoption of these practices (Kumar et al. 2020); from the literature review, it can be observed that complete information about FPM is often missing (Yadav and Dhillon 2015); hence, the third sub-indicator provides an insight into whether the current users have been informed about the adverse effects of these methods; it was therefore included for

Table 8.1 Descriptive analysis about the various sub-indicators

Sub-indicators ID	Variable name (in details)	2015–2016						2019–2020					
		Max (%)	Min (%)	Mean	CV	SD	Kurt.	Max (%)	Min (%)	Mean	CV	SD	Kurt.
AI													
CUFPM	Current use of any FPM used by currently married women aged 15–49 years	77.90	49.10	69.27	11.63	8.06	0.89	85.40	51.00	73.80	15.02	11.08	−0.91
NUFP	Health worker ever talked to female non-users about family planning	20.60	4.90	12.72	35.48	4.51	−0.77	23.50	6.40	16.90	26.72	4.52	−0.17
CSECM	Current users ever told about side effects of current method	64.40	27.50	48.56	26.21	12.73	−1.00	68.30	25.80	51.29	21.78	11.17	0.33
MCI													
ACUFT	Mothers who had ante-natal check-up in the first trimester	81.20	36.90	56.70	21.61	12.25	−0.55	85.00	52.60	72.97	11.02	8.04	1.25
MAFACV	Mothers who had at least four ante-natal care visits	91.60	43.10	75.50	16.02	12.09	1.97	89.90	56.80	74.95	12.46	9.34	−0.34
MCIFAP	Mothers who had consumed iron folic acid for 100 days or more when they were pregnant	46.70	6.10	29.70	34.41	10.22	−0.08	76.20	51.50	62.43	11.86	7.40	−1.01
PWAA	Pregnant women age 15–49 years who are anaemic (<11.0 G/Dl)	80.70	0.00	42.12	66.86	28.16	−0.98	84.40	0.00	50.86	54.24	27.59	0.07
DCI													
IB	Institutional births	94.80	47.00	78.31	18.32	14.34	0.10	98.40	76.90	92.24	5.61	5.17	2.71
HDCSHP	Home delivery conducted by skilled health personnel	14.10	0.40	5.85	70.41	4.12	−0.28	7.80	0.00	2.42	86.43	2.09	0.68
BASHP	Births attended by skilled health personnel	97.30	0.00	52.55	80.50	42.30	−1.84	99.30	84.70	94.29	3.95	3.73	0.79
BDCS	Births delivered by caesarean section	39.80	6.30	23.40	43.99	10.29	−1.06	58.20	11.90	32.15	35.98	11.57	−0.06
PNCI													

(continued)

Table 8.1 (continued)

Sub-indicators ID	Variable name (in details)	2015–2016						2019–2020					
		Max (%)	Min (%)	Mean	CV	SD	Kurt.	Max (%)	Min (%)	Mean	CV	SD	Kurt.
MPNC	Mothers who received postnatal care from a doctor/ nurse/LHV/ANM/Midwife/other health personnel within two days of delivery	84.60	35.70	64.23	20.74	13.32	−0.26	89.40	48.50	68.21	17.06	11.63	−0.44
RPMCP	Registered pregnancies for which the mother received mother and child protection (MCP) card	100.00	92.10	97.14	2.12	2.06	1.15	100.00	94.40	98.28	1.55	1.52	0.98
MLBPANT	Mothers whose last birth was protected against neonatal tetanus	99.50	88.20	94.66	3.58	3.39	−0.95	100.00	87.10	94.78	3.58	3.40	−0.26

Source: Computed by authors from NFHS-4,5.

assessing AI. While analysing MCI, antenatal check-ups are an integral part of such treatment as it ensures the well-being of the mother (Bharati et al. 2007; Chaudhuri and Mandal 2020; Konje et al. 2018; Manna et al. 2011; Warri and George 2020). As most of the miscarriages usually occur during the early months, an assessment about antenatal check-up (Ali et al. 2020; Paudel et al. 2017) and follow-up of such check-ups throughout the entire pregnancy are important to prevent complications during childbirth. Most of the pregnant women from developing countries tend to be anaemic, which leads to several complications during their pregnancy and childbirth (Suryanarayana et al. 2017); hence, an analysis about the number of pregnant women that had consumed iron–folic acid for at least 100 days during their entire pregnancy and an assessment about the number of pregnant women who were already anaemic is important. In order to analyse DCI, an increasing preference is given towards institutional births to minimize the risk enshrouding maternal deaths; hence, this indicator was chosen (Barman et al. 2020; Bharati et al. 2007; Bishanga et al. 2018; Chaudhuri and Mandal 2020); in order to minimize the chances of maternal mortality, Kumar et al. (2020), Manna et al. (2011) and Vellakkal et al. (2017) emphasized on the presence of competent medical professionals and institutional delivery; hence, these factors were chosen for analysis. Owing to the complications during childbirth, C-section delivery also finds its value (Tadevosyan et al. 2019). Hence, this factor was also considered to compute DCI. Analysis regarding PNCI is equally important, and Kumar et al. (2020) have observed that in India nearly three-fourths of maternal deaths occur (Bandyopadhyay et al. 2020, Nair and Panda 2011) due to direct obstetric causes, most of which can be prevented by improving the accessibility and utilization of emergency MHCS; hence, these sub-indicators were chosen for computing PNCI. Although variation in standard deviation (SD) exists between different sub-indicators (Table 8.1), most of them can be categorized under the low category.

During both the time frames, only pregnant women aged between 15 and 49 years who were anaemic could be categorized under the medium category, but their SD value had decreased by 0.57 from 2015–2016 to 2019–2020. Between 2015 and 2016, higher SDs can be detected in case of births attended by skilled health personnel, but between 2019 and 2020, none of the sub-indicators could be categorized under this category. It is evident that intra-sub-indicator differentials are decreasing with time; this could be attributed to the improvement in MHI.

The index is calculated with the help of the formula:

- $AI = [\sum(X_a + X_b + X_c) / N_{indicator}]$
- $MCI = [\sum(X_d + X_e + X_f + X_g) / N_{indicator}]$
- $DCI = [\sum(X_h + X_i + X_j + X_k) / N_{indicator}$
- $PNCI = [\sum(X_l + X_m + X_n) / N_{indicator}]$
- $MHI = [\sum(AI+ MCI+ DCI+ PNCI)/ N_{indicator}]$
- Zone-wise average composite score $= [\sum(MHI_1 + MHI_2 + ... + MHI_n)/ N_{indicator}]$.

One-way ANOVA and correlation analysis were conducted to assess the difference in the availability of basic MHCS and analyse the inter-relation among the sub-indicators.

8.4.3.1 One-Way ANOVA Analysis

One-way ANOVA analysis was calculated by:

- $F = (MST/ MSE)$
- $MST = [\sum^{k}_{i=1}(t_i/n_i)-G_2/n]/k-1$
- $MSE = [\sum^{k}_{i=1} \sum^{k}_{j=1} Y2_{ij}- \sum^{k}_{i=1}(t_i/n_i)] / (k-1)$, where
  - F = Variance ratio for the overall test
  - MST = Mean square due to treatments/groups (between groups)
  - MSE = Mean square due to error (within groups, residual mean square)
  - Y_{ij} = An observation
  - T_i = Group total
  - G = Grand total of all observations
  - n_i = The number in group i
  - n = Total number of observations

8.4.3.2 Correlation Analysis

Pearson correlation coefficient was calculated by:

$$r = \left[N\sum xy - \left(\sum x\right)^{*}\left(\sum y\right)\right] / \sqrt{\left\{\left[N\sum x^2 - \left(\sum x\right)^2\right]\left[N\sum y^2 - \left(\sum y\right)^2\right]\right\}} \text{where,}$$

- r = Pearson correlation
- N = Number of pairs of scores
- $\sum xy$ = Sum of the products of paired scores
- $\sum x$ = Sum of x scores
- $\sum y$ = Sum of y scores
- $\sum x2$ = Sum of squared x scores
- $\sum y2$ = Sum of squared y scores

8.5 Software

Statistical analysis was performed using SPSS (Statistical Package for Social Science Version 22), and mapping was performed using Arc GIS software (version 3.1).

8.6 Study Area

According to Census records, total number of districts in West Bengal was recorded at 18 in 2001, but as of first January 2002, Medinipur district was divided into Purba and Paschim Medinipur (Fig. 8.2). On seventh April 2017, Barddhaman district was bifurcated into Purba and Paschim Barddhaman. Location-based zonation was performed to obtain a regional overview of selected parameters (Table 8.2). West Bengal has witnessed an increase in the total and female population by 13.84% and 14.87%, respectively, from 2001 to 2011. The sex ratio has increased from 934 in 2001 to 950 in 2011, and population density has increased from 903 to 1028 from 2001 to 2011, respectively (Table 8.3). As per NFHS-4 and 5, total fertility rate has decreased from 1.8 to 1.6 children/woman.

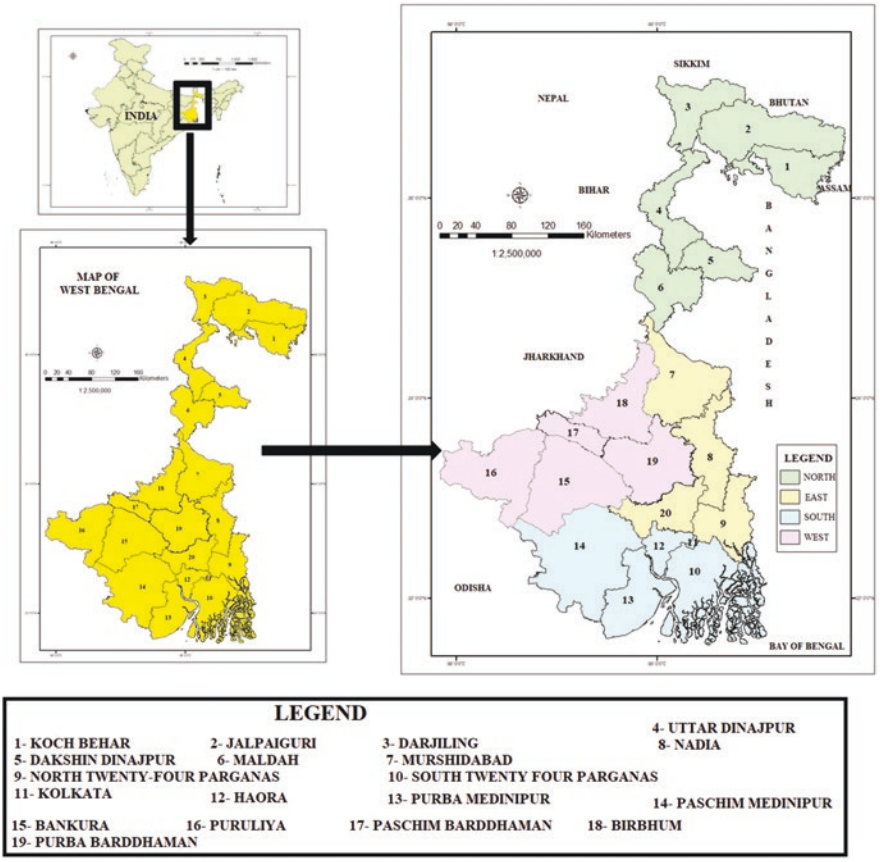


Fig. 8.2 Location map of the study area

Table 8.2 Location-based zonation of the districts of West Bengal

Zones			
North	East	West	South
Darjeeling	Murshidabad	Bankura	Haora
Jalpaiguri	Nadia	Birbhum	Kolkata
Koch Behar	Hugli	Puruliya	Purba Medinipur
Uttar Dinajpur	North Twenty-Four Parganas	Barddhaman [Paschim Barddhaman, Purba Barddhaman]	South Twenty-Four Parganas
Dakshin Dinajpur			Paschim Medinipur
Maldah			

Source: Computed by authors.

Table 8.3 Basic demographic characteristics of districts of West Bengal, India (2001–2011)

Districts	Area (km^2)	Tot. pop.		Female pop.		Literate female pop.	
		2001	2011	2001	2011	2001	2011
Bankura	6882	3,192,695	3,596,674	1,556,693	1,758,579	658,821	933,655
Bardhhaman	7024	6,895,514	7,717,563	3,307,138	3,750,674	1,746,661	2,329,168
Birbhum	4545	3,015,422	3,502,404	1,468,789	1,711,484	633,699	956,966
Darjeeling	3149	1,609,172	1,846,823	778,528	909,564	426,868	597,912
Haora	1467	4,273,099	4,850,029	2,031,201	2,349,210	1,248,277	1,662,382
Hugli	3149	5,041,976	5,519,145	2,452,351	2,704,492	1,450,514	1,866,611
Jalpaiguri	6227	3,401,173	3,872,846	1,650,028	1,889,782	727,508	1,102,158
Koch Bihar	3387	2,479,155	2,819,086	1,207,061	1,367,544	570,769	821,771
Kolkata	185	4,572,876	4,496,694	2,072,836	2,139,928	1,457,095	1,661,222
Maldah	3733	3,290,468	3,988,845	1,601,062	1,937,304	530,934	934,413
Purba Medinipur	4736	9,610,788	5,095,875	4,694,418	2,466,041	2,590,693	1,774,121
Paschim Medinipur	6308		5,913,457		2,905,572		1,811,499
Murshidabad	5324	5,866,569	7,103,807	2,861,569	3,476,243	1,117,814	1,878,647
Nadia	3927	4,604,827	5,167,600	2,237,974	2,513,832	1,155,423	1,601,689
North 24-Parganas	4094	8,934,286	10,009,781	4,295,530	4,890,392	2,710,779	3,552,647
Puruliya	6259	2,536,516	2,930,115	1,238,438	1,433,119	378,790	622,847
South 24-Parganas	9960	6,906,689	8,161,961	3,341,696	3,988,183	1,667,630	2,488,380
Uttar Dinajpur	3140	2,441,794	3,007,134	1,182,057	1,456,068	339,517	636,172
Dakshin Dinajpur	2219	1,503,178	1,676,276	732,843	819,077	332,183	487,211

Source: Computed by authors from Census of India (2001, 2011).

8.7 Results and Discussions

8.7.1 Overall Scenario

Net decrease in neonatal mortality rate (NNMR) by 44.64% can be detected from NFHS-4,5. There was a nominal net increase in awareness about the usage of various FPM among currently married women (3.5%), and among the various measures (Fig. 8.3), a greater rate of increase in the number of users could be noticed among those who have opted for condoms and intra-uterine devices/postpartum intrauterine contraceptive devices (IUD/PPIUD), but on the contrary, male sterilization has remained abysmally low. There has been a net increase in the number of health workers who have spoken to female non-users about FPM (5.2%) and among the current users who were informed about the adverse effects of the current FPM method (4%); thus, a gradual increase in women's awareness can be observed.

Net decrease in the average number of children per woman can be observed in case of India and West Bengal; however, the rate of decrease is greater in the case of the later (Table 8.3). With an increase in literacy level, a decrease in the average number of children per woman can be observed, although nearly all the categories (Table 8.4) have recorded a net decrease from 2001 to 2011; this shows that education positively impacts a higher level of awareness among women and a greater number of women are opting for preventive measures.

Although there is a declining trend in the number of children per woman in all categories, the highest rate of decline is recorded among women who are a part of the total main workers as opposed to those who are a part of the non-workers category (Table 8.5). This could be due to the increased awareness that may have occurred due to their interactions with people outside their community.

Increased awareness, changes in their educational level and economic status of women have significantly impacted the maternity, delivery and post-natal care of women from 2015–2016 to 2019–2020. In case of maternity care, there has been a net increase of 17.7% among mothers who had received ante-natal check-up in the first trimester; however, follow-ups of such check-ups after the first one remain

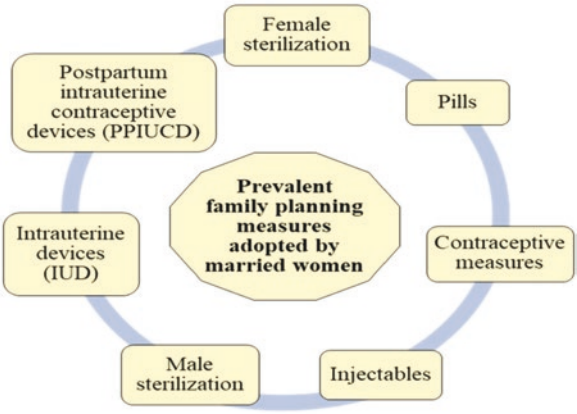


Fig. 8.3 Overview of prevalent FPM adopted by married women in West Bengal

Table 8.4 The impact of literacy on the childbearing, West Bengal, India (2001–2011)

	No. of children per women			
	West Bengal		India	
Educational level	2001	2011	2001	2011
Total	1.7	1.54	1.7	1.56
Illiterate	2.06	2.04	2.06	2.07
Literate	1.35	1.23	1.35	1.15
Below primary	1.37	1.46	1.37	0.92
Below middle	1.39	1.23	1.39	1.3
Below secondary	1.44	1.16	1.44	1.15
Below graduation	1.1	0.91	1.1	1.07
Graduation and above	1.03	0.86	1.03	1.05

Source: Computed by authors from data obtained from Census of India (2001, 2011).

Table 8.5 The impact of economic activity on the childbearing in West Bengal, India (2001–2011)

	Net change in no. of children per women, (2001–2011)	
Economic activity	India	West Bengal
Total main workers	−0.34	−0.43
Marginal workers	−0.22	−0.43
Non-workers	−0.05	−0.1

Source: Computed by authors from Census of India (2001, 2011).

Table 8.6 Correlation between educational level and number of children/women

	No. of children per women in West Bengal	
Educational level	2001	2011
Total	1.70`	1.54
Illiterate	2.06	2.04
Literate	1.35	1.23
Literate but below primary	1.37	1.46
Primary but below middle	1.39	1.23
Middle but below matric or secondary	1.44	1.16
Matric or secondary but below graduate	1.10	0.91
Graduate and above	1.03	0.86

Source: Census of India 2001, 2011, f-3 table, computed by authors.

abysmally low. However, a net increase can be noticed among mothers who consumed iron-folic acid for more than 100 days when they were pregnant (34.5%) and among mothers who consumed iron-folic acid for more than 180 days when they were pregnant (24.8%). In case of delivery care, 16.5% net increase can be noticed among mothers who have opted for institutional births this could be due to the net decrease in the average out-of-pocket expenses by Rs 5236 in the case of delivery in public facilities. Around 6.9% net increase can be noticed among mothers who received postnatal care from health personnel within 2 days of delivery.

Decrease in the number of children per woman in West Bengal can be noticed (Tables 8.6, 8.7). Net change in the number of children per woman has been the

Table 8.7 Zone-wise correlation between educational level and number of children per women

	No. of children per women							
	2001							
Category	Total	Illiterate	Literate	Literate but below primary	Primary but below middle	Middle but below matric or secondary	Matric or secondary but below graduate	Graduate and above
North	1.71	2.02	1.27	1.17	1.35	1.49	1.08	1.01
East	1.75	2.18	1.35	1.36	1.42	1.47	1.08	0.99
West	1.66	1.93	1.29	1.25	1.30	1.44	1.10	0.97
South	1.63	1.98	1.36	1.41	1.39	1.41	1.10	1.01
2011								
North	1.55	2.09	1.12	1.28	1.07	1.07	0.83	0.79
East	1.58	2.17	1.24	1.51	1.28	1.15	0.87	0.83
West	1.54	1.95	1.18	1.29	1.12	1.18	0.93	0.86
South	1.48	1.87	1.29	1.55	1.29	1.20	0.93	0.88

Source: Census of India 2001, 2011, f-3 table, computed by authors.

least (0.02%) in case of illiterate women; however, this change has been higher with the increase in their educational level. Highest net decrease (0.17%) in total number of children per woman has been observed in the eastern zone, whereas the western zone has recorded the least net decrease (0.13%).

8.7.2 Zone-Wise Analysis

8.7.2.1 AI

All the zones have recorded significant increase in AI (Tables 8.8, 8.9, 8.10 and Fig. 8.4). Highest net increase (25.65%) was recorded in the northern zone, whereas the lowest net increase (5.56%) was recorded by the southern zone. Inter-district disparity continues to prevail (Table 8.8), and the western zone has recorded the highest intra-zonal disparity where Bankura recorded a net decrease (10.13%), but Birbhum recorded the highest net increase (20.35%). AI has significantly improved (Table 8.10) as most of the districts in 2019–2020 form a part of the high category. Despite increase in the number of health workers talking to the non-users about various FPM, significant disparity lies among those who have been told about the adverse effects of modern methods. This indicates paucity in the availability of complete information among people.

Table 8.8 District-wise indices values for West Bengal

2015–2016						2019–2020					
Districts	AI	MCI	DCI	PNCI	MHI	Districts	AI	MCI	DCI	PNCI	**MHI**
North zone											
Darjeeling	25.58	47.38	54.10	91.47	54.63	Darjeeling	47.73	56.60	57.25	89.10	62.67
Jalpaiguri	25.14	40.43	48.08	85.77	49.85	Jalpaiguri	52.97	70.35	55.65	90.47	67.36
Koch Behar	28.44	54.50	26.93	86.87	49.18	Koch Behar	49.90	69.85	52.48	89.37	65.40
Uttar Dinajpur	23.80	38.95	32.50	77.10	43.09	Uttar Dinajpur	47.37	72.60	47.85	85.13	63.24
Dakshin Dinajpur	22.48	59.38	24.80	84.97	47.91	Dakshin Dinajpur	54.30	71.23	53.45	92.70	67.92
Maldah	19.82	41.88	18.10	75.77	38.89	Maldah	46.90	71.75	50.15	84.80	63.40
East zone											
Murshidabad	21.48	47.88	39.20	81.73	47.57	Murshidabad	50.90	65.08	53.53	79.40	62.23
Nadia	28.78	60.50	54.55	85.97	57.45	Nadia	47.47	62.23	63.63	94.50	66.95
Hugli	27.74	40.50	33.00	87.87	47.28	Hugli	49.30	54.08	61.13	82.50	61.75
North Twenty-Four Parganas	24.82	38.20	56.75	84.70	51.12	North Twenty-Four Parganas	55.73	74.55	60.95	94.73	71.49
West zone											
Bankura	47.70	67.18	48.65	85.17	62.17	Bankura	37.57	70.55	53.63	85.40	61.79
Barddhaman	31.14	59.75	29.10	83.70	50.92	Paschim Barddhaman	34.93	61.78	54.05	85.40	59.04
Birbhum	30.28	47.85	48.33	91.67	54.53	Purba Barddhaman	39.97	71.25	57.55	85.33	63.53
Puruliya	26.58	59.18	41.65	83.20	52.65	Birbhum	50.63	69.45	52.58	88.20	65.21
						Puruliya	34.30	60.63	48.93	80.23	56.02
South zone											
South Twenty-Four Parganas	29.92	49.80	37.43	81.50	49.66	South Twenty-Four Parganas	51.70	69.80	53.25	87.33	65.52
Paschim Medinipur	30.18	54.45	47.68	89.77	55.52	Paschim Medinipur	44.50	60.73	52.73	91.67	62.40
Purba Medinipur	22.02	50.93	29.23	85.30	46.87	Purba Medinipur	43.30	61.03	56.70	78.13	59.79
Haora	28.34	59.83	33.03	89.93	52.78	Haora	53.87	59.18	59.15	88.33	65.13
Kolkata	20.94	50.58	57.43	89.07	54.50	Kolkata	53.20	53.35	60.85	89.07	64.12
Max	47.7	67.18	57.43	91.67	62.17	*Max*	55.73	74.55	63.63	94.73	71.49
Min	19.82	38.2	18.1	75.77	38.89	*Min*	34.30	54.08	47.85	78.13	56.02
Mean	27.12	51.01	40.03	85.34	50.87	*Mean*	46.63	66.22	54.81	86.64	63.50
Standard Deviation	6.09	8.55	11.89	4.32	5.26	*Standard Deviation*	6.63	5.96	4.42	4.96	3.57

Source: Computed by authors from NFHS-4,5.

Table 8.9 Zone-based indices values for West Bengal

2015–2016						2019–2020				
Zones	AI	MCI	DCI	PNCI	MHI	AI	MCI	DCI	PNCI	MHI
North	24.21	47.08	34.08	83.66	47.26	49.86	68.73	52.8	88.59	65
East	25.71	46.77	45.88	85.07	50.85	50.85	63.98	59.81	87.78	65.61
West	33.93	58.49	41.93	85.93	55.07	39.48	66.73	53.35	84.91	61.12
South	26.28	53.12	40.96	87.11	51.87	49.31	60.82	56.54	86.91	63.39
Max	33.93	58.49	45.88	87.11	55.07	50.85	68.73	59.81	88.59	65.61
Min	24.21	46.77	34.08	83.66	47.26	39.48	60.82	52.8	84.91	61.12
Mean	27.53	51.36	40.71	85.44	51.26	47.38	65.06	55.62	87.05	63.78
Standard Deviation	4.35	5.58	4.9	1.46	3.22	5.3	3.44	3.24	1.58	2

Source: Computed by authors from NFHS-4,5.

8.7.2.2 MCI

Although all the zones recorded an increase in MCI (Tables 8.8, 8.9, 8.10 and Fig. 8.4), high inter-zonal disparity prevails where northern (21.65%) and eastern (17.21%) zones have recorded a high rate of net increase, whereas the southern and western zones had recorded a low rate of net increase. Despite improvement in the performance of various districts, inter-district disparity can be observed among all zones with the highest net increase being recorded by Jalpaiguri, whereas only Haora has recorded a net decrease in this category. These differentials is mainly due to an increasing number of pregnant women who continue to remain anaemic despite the increase in the number of pregnant women who had consumed iron supplements and due to a decrease in the number of mothers who had at least four antenatal care visits. This shows that a combination of factors such as dietary deficiency, lack of awareness and lack of affordability among pregnant women as some of the major causes.

8.7.2.3 DCI

All the zones have recorded an increase in DCI (Tables 8.8, 8.9, 8.10, Fig. 8.4). A low rate of inter-zonal differential prevails (Table 8.9), and the highest rate of net increase was recorded by the northern zone, whereas the lowest rate of net increase was recorded by the western zone. Intra-zonal disparity continues to be high among most districts (Table 8.8). Highest net increase was recorded by Dakshin Dinajpur, and the lowest was recorded by Darjeeling. This shows that despite increase in the number of institutional births and deliveries conducted by skilled personnel a significant section of people either do not have knowledge or affordability to opt for the necessary delivery care.

Table 8.10 Categorization of various districts of West Bengal based on the indexes

AI					
Low (19.82–31.79)		Medium (31.80–43.76)		High (43.77–55.73)	
2015–2016	2019–2020	2015–2016	2019–2020	2015–2016	2019–2020
Barddhaman			Puruliya	Bankura	Paschim Medinipur
Birbhum			Paschim Barddhaman		Maldah
Dakshin Dinajpur			Bankura		Uttar Dinajpur
Darjeeling			Purba Barddhaman		Nadia
Haora			Purba Medinipur		Darjeeling
Hugli					Hugli
Jalpaiguri					Koch Behar
Koch Behar					Birbhum
Kolkata					Murshidabad
Maldah					South Twenty-Four Parganas
Murshidabad					Jalpaiguri
Nadia					Kolkata
North Twenty-Four Parganas					Haora
Paschim Medinipur					Dakshin Dinajpur
Purba Medinipur					North Twenty-Four Parganas
Puruliya					
South Twenty-Four Parganas					
Uttar Dinajpur					
MCI					
Low (38.2–50.32)		Medium (50.33–62.43)		High (62.44–74.55)	
2015–2016	2019–2020	2015–2016	2019–2020	2015–2016	2019–2020
North Twenty-Four Parganas		Kolkata	Kolkata	Bankura	Murshidabad
Uttar Dinajpur		Purba Medinipur	Hugli		Birbhum
Jalpaiguri		Paschim Medinipur	Darjeeling		South Twenty-Four Parganas

(continued)

Table 8.10 (continued)

AI					
Low (19.82–31.79)		Medium (31.80–43.76)		High (43.77–55.73)	
Hugli		Koch Behar	Haora		Koch Behar
Maldah		Puruliya	Puruliya		Jalpaiguri
Darjeeling		Dakshin Dinajpur	Paschim Medinipur		Bankura
Birbhum		Barddhaman	Purba Medinipur		Dakshin Dinajpur
Murshidabad		Haora	Paschim Barddhaman		Purba Barddhaman
South Twenty-Four Parganas		Nadia	Nadia		Maldah
					Uttar Dinajpur
					North Twenty-Four Parganas
DCI					
Low (18.10–33.28)		Medium (33.29–48.45)		High (48.46–63.63)	
2015–2016	2019–2020	2015–2016	2019–2020	2015–2016	2019–2020
Maldah		South 24 Parganas	Uttar Dinajpur	Bankura	Puruliya
Dakshin Dinajpur		Murshidabad		Darjeeling	Maldah
Koch Behar		Puruliya		Nadia	Koch Behar
Barddhaman		Paschim Medinipur		North 24 Parganas	Birbhum
Purba Medinipur		Jalpaiguri		Kolkata	Paschim Medinipur
Uttar Dinajpur		Birbhum			South Twenty-Four Parganas
Hugli					Dakshin Dinajpur
Haora					Murshidabad
					Bankura
					Paschim Barddhaman
					Jalpaiguri
					Purba Medinipur
					Darjeeling
					Purba Barddhaman
					Haora

(continued)

Table 8.10 (continued)

AI					
Low (19.82–31.79)		Medium (31.80–43.76)		High (43.77–55.73)	
					Kolkata
					North Twenty-Four Parganas
					Hugli
					Nadia
PNCI					
Low (75.77–82.09)		Medium (82.10–88.41)		High (88.42–94.73)	
2015–2016	2019–2020	2015–2016	2019–2020	2015–2016	2019–2020
Maldah	Purba Medinipur	Puruliya	Hugli	Kolkata	Kolkata
Uttar Dinajpur	Murshidabad	Barddhaman	Maldah	Paschim Medinipur	Darjeeling
South Twenty-Four Parganas	Puruliya	North Twenty-Four Parganas	Uttar Dinajpur	Haora	Koch Behar
Murshidabad		Dakshin Dinajpur	Purba Barddhaman	Darjeeling	Jalpaiguri
		Bankura	Paschim Barddhaman	Birbhum	Paschim Medinipur
		Purba Medinipur	Bankura		Dakshin Dinajpur
		Jalpaiguri	South Twenty-Four Parganas		Nadia
		Nadia	Birbhum		North Twenty-Four Parganas
		Koch Behar	Haora		
		Hugli			
MHI					
Low (38.89–49.76)		Medium (49.77–60.62)		High (60.63–71.49)	
2015–2016	2019–2020	2015–2016	2019–2020	2015–2016	2019–2020
Maldah		Jalpaiguri	Puruliya	Bankura	Hugli
Uttar Dinajpur		Barddhaman	Paschim Barddhaman		Bankura
Purba Medinipur		North Twenty-Four Parganas	Purba Medinipur		Murshidabad
Hugli		Puruliya			Paschim Medinipur
Murshidabad		Haora			Darjeeling
Dakshin Dinajpur		Kolkata			Uttar Dinajpur

(continued)

Table 8.10 (continued)

AI					
Low (19.82–31.79)		Medium (31.80–43.76)		High (43.77–55.73)	
Koch Behar		Birbhum			Maldah
South Twenty-Four Parganas		Darjeeling			Purba Barddhaman
		Paschim Medinipur			Kolkata
		Nadia			Haora
					Birbhum
					Koch Behar
					South Twenty-Four Parganas
					Nadia
					Jalpaiguri
					Dakshin Dinajpur
					North Twenty-Four Parganas

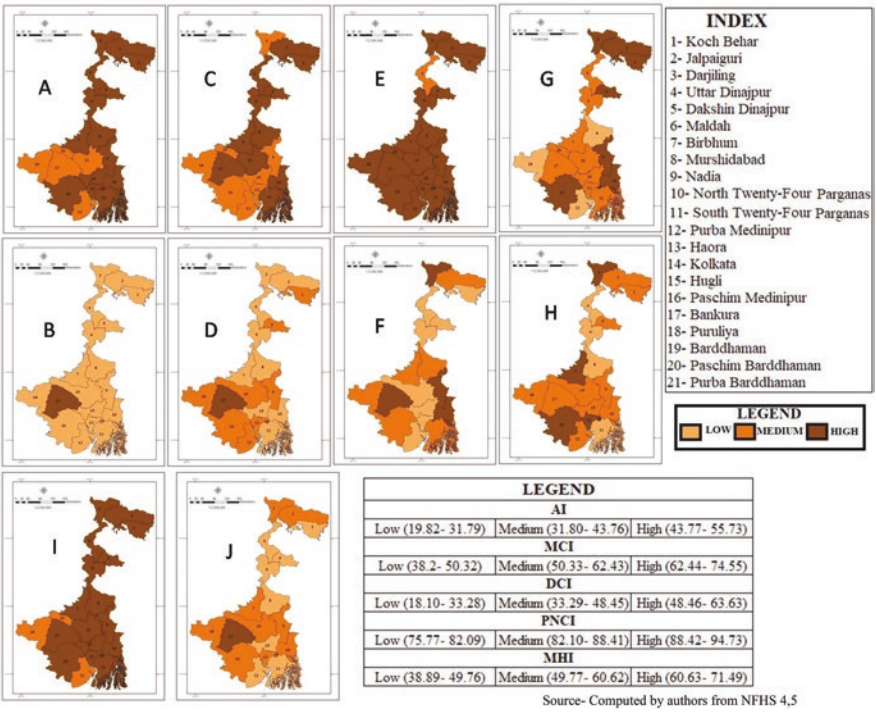
Source: Computed by authors from NFHS-4,5.

8.7.2.4 PNCI

PNCI has recorded a minimum net change over the years (Tables 8.8, 8.9, 8.10, Fig. 8.4). Only the northern and eastern zones have recorded a net increase in this category, whereas the western and southern zones have recorded a decrease. The highest intra-zonal disparity can be observed in the southern zone; Purba Medinipur has recorded the highest net decrease. This differential can be attributed to the lack of significant increase in the number of women receiving postnatal care from any health personnel within two days of delivery such measures are extremely vital for the well-being of both the mother as well as the child.

8.7.2.5 MHI

All the zones have recorded a net increase in MHI (Tables 8.8, 8.9, 8.10, Fig. 8.4) with the highest net increase being recorded by the northern zone (17.74%) and the lowest net increase being recorded by the western zone (6.05%). Significant inter-district disparity runs high, where on one hand only Bankura has recorded a net decrease in MHI (−0.39%) and the highest net increase was recorded by Maldah (24.51%). These differentials could be attributed to several reasons – firstly, the western zone has also ranked low in MCI, DCI and PNCI; secondly, this zone also corresponds to the lowest number of medical facilities (Table 8.13), which proves



LEGEND		
AI		
Low (19.82- 31.79)	Medium (31.80- 43.76)	High (43.77- 55.73)
MCI		
Low (38.2- 50.32)	Medium (50.33- 62.43)	High (62.44- 74.55)
DCI		
Low (18.10- 33.28)	Medium (33.29- 48.45)	High (48.46- 63.63)
PNCI		
Low (75.77- 82.09)	Medium (82.10- 88.41)	High (88.42- 94.73)
MHI		
Low (38.89- 49.76)	Medium (49.77- 60.62)	High (60.63- 71.49)

Source- Computed by authors from NFHS 4,5

Fig. 8.4 The district-wise mapping of the various indexes; A- AI 2015–2016; B- AI 2019–2020; C- MCI 2015–2016; MCI 2019–2020; DCI 2015–2016; DCI 2019–2020; PNCI 2015–2016; PNCI 2019–2020; MHI- 2015–2016; MHI- 2019–2020

that there is a definite lack of infrastructural facilities in this region. Among the four indexes used to calculate MHI, the highest net increase can be observed in case of AI followed by DCI, MCI; however, least increase has been noticed in case of PNCI (Tables 8.8, 8.9, 8.10). The western zone has ranked lowest in most of the indices, i.e., AI, MCI, DCI and MHI. After analysing MHI, it can be noticed that the highest rate of net increase has been mostly recorded in the northern zone whereas the lowest rate of net increase can be noticed among the districts lying in the western zone. From the analysis, it can be inferred that in case of 2015- 16 dataset a high rate of inter-zonal variance existed, but c from 2019- 2020 dataset the variance has reduced in the cases of the MCI (2.14%), DCI (1.66%) and MHI (1.22%), whereas it has intensified in case of AI and PNCI. Improvement in awareness, medical facilities, educational status, would help to reduce such variances.

Correlation between the sub-indicators was tested at 0.05 and 0.01 significance levels using Pearson's correlation coefficient (Tables 8.11, 8.12). Positive correlation exists between mothers who use any sort of FPM and among those users who were informed about the adverse effects of these methods, among those who have received antenatal check-up and among those whose last birth was protected against neonatal tetanus. Increase in births delivered by caesarean section is positively

Table 8.13 One-way ANOVA identifying intra-zonal and inter-zonal difference with regard to the various indicators(AI, MCI, DCI and PNCI) to assess MH Index (2015–2016 and 2019–2020)

		2015–2016					2019–2020				
Domains		Sum of squares	*df*	Mean square	F	*P* value	Sum of squares	*df*	Mean square	F	*P* value
AI											
CUFPM	Between zones	703.49	3.00	234.50	7.55	< 0.05	679.10	3.00	226.37	2.19	< 0.05
	Within zones	465.61	15.00	31.04			1654.95	16.00	103.43		
	Total	1169.10	18.00				2334.05	19.00			
NUFP	Between zones	82.28	3.00	27.43	0.45	> 0.05	76.00	3.00	25.33	0.30	> 0.05
	Within zones	284.02	15.00	18.93			311.52	16.00	19.47		
	Total	366.31	18.00				387.52	19.00			
CSECM	Between zones	248.80	3.00	82.93	3.87	< 0.05	1593.90	3.00	531.30	10.95	< 0.05
	Within zones	2666.76	15.00	177.78			776.22	16.00	48.51		
	Total	2915.56	18.00				2370.13	19.00			
MCI											
ACUFT	Between zones	71.88	3.00	23.96	0.14	> 0.05	109.65	3.00	36.55	0.52	> 0.05
	Within zones	2630.26	15.00	175.35			1119.58	16.00	69.97		
	Total	2702.14	18.00				1229.23	19.00			
MAFACV	Between zones	1130.44	3.00	376.81	3.76	< 0.05	162.18	3.00	54.06	1.58	< 0.05
	Within zones	1502.10	15.00	100.14			1495.55	16.00	93.47		
	Total	2632.54	18.00				1657.73	19.00			
MCIFAP	Between zones	270.11	3.00	90.04	1.84	< 0.05	126.88	3.00	42.29	1.74	< 0.05
	Within zones	1609.75	15.00	107.32			914.64	16.00	57.17		
	Total	1879.86	18.00				1041.52	19.00			
PWAA	Between zones	2700.27	3.00	900.09	1.17	< 0.05	2303.77	3.00	767.92	1.01	< 0.05
	Within zones	11575.14	15.00	771.68			12154.14	16.00	759.63		
	Total	14275.41	18.00				14457.91	19.00			
DCI											

(continued)

Table 8.13 (continued)

Domains		2015–2016					2019–2020				
		Sum of squares	*df*	Mean square	F	*P* value	Sum of squares	*df*	Mean square	F	*P* value
IB	Between zones	326.76	3.00	108.92	2.48	< 0.05	45.21	3.00	15.07	1.52	< 0.05
	Within zones	3376.71	15.00	225.11			463.05	16.00	28.94		
	Total	3703.47	18.00				508.27	19.00			
HDCSHP	Between zones	67.81	3.00	22.60	0.43	> 0.05	4.98	3.00	1.66	0.34	> 0.05
	Within zones	237.86	15.00	15.86			78.13	16.00	4.88		
	Total	305.67	18.00				83.11	19.00			
BASHP	Between zones	1994.52	3.00	664.84	2.33	< 0.05	60.99	3.00	20.33	1.60	< 0.05
	Within zones	30217.03	15.00	2014.47			203.09	16.00	12.69		
	Total	32211.55	18.00				264.09	19.00			
BDCS	Between zones	792.15	3.00	264.05	3.55	< 0.05	1257.63	3.00	419.21	5.22	< 0.05
	Within zones	1114.81	15.00	74.32			1285.10	16.00	80.32		
	Total	1906.96	18.00				2542.73	19.00			
PNCI											
MPNC	Between zones	331.97	3.00	110.66	3.58	< 0.05	209.54	3.00	69.85	2.47	< 0.05
	Within zones	2861.79	15.00	190.79			2361.83	16.00	147.61		
	Total	3193.76	18.00				2571.38	19.00			
RPMCP	Between zones	23.51	3.00	7.84	0.22	> 0.05	5.65	3.00	1.88	0.49	> 0.05
	Within zones	53.02	15.00	3.53			38.18	16.00	2.39		
	Total	76.52	18.00				43.83	19.00			
MLBPANT	Between zones	82.31	3.00	27.44	3.30	< 0.05	21.46	3.00	7.15	1.58	< 0.05
	Within zones	124.56	15.00	8.30			197.78	16.00	12.36		
	Total	206.86	18.00				219.23	19.00			

Source: Computed by authors from NFHS-4,5

related to increase in institutional births. Positive correlation exists between births attended by skilled professionals and those who had received postnatal care from any health professional. Positive correlation also exists between mothers who had received neonatal tetanus and those who had received postnatal care within two days of delivery by any medical professionals. Result shows the coexistence of

Table 8.11 Correlation matrix (2015–2016)

Variables	CUFPM	NUFP	CSECM	ACUFT	MAFACV	MCIFAP	PWAA	IB	HDCSHP	BASHP	BDCS	MPNC	RPMCP	MLBPANT
CUFPM	1.00													
NUFP	−0.07	1.00												
CSECM	−0.04	0.69	1.00											
ACUFT	0.28	0.12	0.15	1.00										
MAFACV	0.53	0.13	0.30	0.54	1.00									
MCIFAP	0.44	0.03	−0.09	0.76	0.59	1.00								
PWAA	−0.10	0.46	0.06	−0.40	−0.24	−0.14	1.00							
IB	0.44	−0.02	0.11	0.74	0.69	0.68	−0.54	1.00						
HDCSHP	−0.23	−0.01	−0.08	−0.62	−0.34	−0.54	0.45	−0.75	1.00					
BASHP	0.09	0.04	0.06	0.21	0.19	0.06	−0.30	0.19	−0.26	1.00				
BDCS	0.44	−0.38	0.04	0.50	0.56	0.37	−0.65	0.66	−0.30	−0.08	1.00			
MPNC	0.26	0.09	0.28	0.68	0.52	0.54	−0.43	0.80	−0.52	0.17	0.48	1.00		
RPMCP	0.15	0.38	0.23	−0.58	0.01	−0.27	0.54	−0.27	0.13	−0.07	−0.45	−0.41	1.00	
MLBPANT	0.61	−0.25	−0.22	0.01	0.37	0.04	−0.25	0.20	−0.07	0.21	0.34	−0.04	0.08	1.00

Source: Computed by authors from NFHS 4.

Table 8.12 Correlation matrix (2019–2020)

Variables	CUFPM	NUFP	CSECM	ACUFT	MAFACV	MCIFAP	PWAA	IB	HDCSHP	BASHP	BDCS	MPNC	RPMCP	MLBPANT
CUFPM	1.00													
NUFP	−0.3	1.00												
CSECM	0.53	−0.01	1.00											
ACUFT	0.72	−0.39	0.19	1.00										
MAFACV	0.6	−0.01	0.34	0.61	1.00									
MCIFAP	0.36	0.06	0.5	0.17	0.6	1.00								
PWAA	−0.38	0.07	−0.23	−0.44	−0.21	−0.4	1.00							
IB	0.03	0.24	0.25	0.15	0.36	0.42	−0.61	1.00						
HDCSHP	−0.14	−0.3	−0.08	−0.17	−0.49	−0.31	0.48	−0.79	1.00					
BASHP	0.07	0.24	0.44	0.03	0.22	0.46	−0.67	0.91	−0.6	1.00				
BDCS	0.1	0.12	0.42	0.07	0.17	0.31	−0.51	0.63	−0.49	0.66	1.00			
MPNC	0.15	0.37	0.46	−0.11	0.49	0.59	−0.12	0.43	−0.4	0.5	0.36	1.00		
RPMCP	−0.21	0.18	0.13	−0.16	0.23	0.12	0.56	−0.06	0.05	−0.17	−0.28	0.1	1.00	
MLBPANT	0.59	0.21	0.28	0.23	0.47	0.36	−0.35	0.11	−0.33	0.2	0.17	0.63	−0.4	1.00

Source: Computed by authors from NFHS 5

significant intra-zonal and inter-zonal differences among the sub-indicators. The analyses was performed at 5% significance level and the result has shown that for both the time frames the P value is <0.05 for most of the categories which indicates the presence of significant difference in terms of their availability and usage (Table 8.13).

8.7.3 Location of Health Facilities

Most health facilities (Table 8.14) are concentrated in the southern and eastern zone. Whereas the presence of the least number of health facilities can be observed in the western zone, and it is well proven that the presence of medical facilities also has a strong correlation to MHI. The western zone has the presence of least number of medical facilities as compared to the three other zones as a result it had ranked lowest in MHI.

8.8 Conclusion

Although significant progress has been made to improve the MH condition in West Bengal, the demand for such amenities is far greater than its supply. Although the zones have fared better over the years, it has been observed that inter-zonal disparities continue to prevail. Among the four zones, western zone has recorded least net increase, whereas northern zone has recorded the highest net increase in MHI. High rate of intra-zonal disparity can also be noticed, as the northern zone recorded the highest net intra-zonal change, and the southern zone recorded the least net intra-zonal change. While analysing MHI, only Bankura has recorded a net decrease in MHI (0.39%), whereas Uttar Dinajpur has recorded the highest net increase in MHI (20.15%). This differential is due to variations in the level of literacy, presence of medical facilities and performance of each districts in AI, MCI, DCI and PNCI. The western region lags behind in most of the indexes; this region has recorded the presence of least number of medical facilities. Imbalance in the infrastructural facilities,

Table 8.14 Zone-wise distribution of various categories of health facilities in West Bengal, India

Zones	Medical college and other general hospitals	Rural hospital	Block primary health centre	Primary health centre	Hospitals
North	52	59	46	187	378
East	82	57	17	89	694
West	50	63	18	224	271
South	93	66	30	197	996

Source: Computed by authors, data from Government of West Bengal, Health and Family Department, 2018.

as well as the inequality in progress of each one of the districts under the four domains, creates an imbalance in their growth and development of MHI.

After analysing the statistical records of the sub-indicators, it can be observed that comprehensive information about the adverse effects of contraceptive measures is missing, especially among the districts which are a part of the western and eastern zones, which has created a paucity in the improvement of MHI. It is noteworthy that most of the family planning initiatives are being undertaken by women, whereas male sterilization continues to remain low. Regular health check-up throughout the pregnancy is also missing among most women living in Haora, Puruliya, Nadia and Kolkata. Despite increase in the consumption of iron and folic acid, a significant section of mothers suffers from complications due to anaemia. Although increase in the number of institutional deliveries and gradual reduction in home births can be observed among certain districts, a slack in the growth of post-partum services can also be observed in the western and southern zone.

To bring about an equitable development, there is an urgent need to increase hospitals especially in rural areas and reduction in expenditure incurred during childbirth; a constant effort to increase awareness about various modern FPM should be encouraged among both genders. These initiatives would also help to reduce the pressure on medical facilities which are available in urban areas. There is also a need for equitable distribution of highly trained medical professionals to reduce intra-zonal disparities. Various measures like Sastha Swati, MatriMa, Ayushmati and Conditional Maternity Benefit Programme, which aim at improving MH by monitoring the health and nutrition of women during the critical months of pregnancy, ensuring the retail of medicines at a subsidized rate and providing cash incentives to pregnant women are much needed.

References

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, 1-13.

Ali N et al. 2020. Antenatal Care Initiation Among Pregnant Women In The United Arab Emirates: The Mutaba'ah Study. Frontiers In Public Health, 1-17.

Aliyu BM. 2018. Spatial Location And Utilization Of Maternal Healthcare Services By Women In Niger East Senatorial Zone. African Research Review, 12(4), 50-64.

Bandyopadhyay S et al. 2020. Status of Maternal Health Care Services: An Assessment Study In Slums Of Kolkata. Journal of Family Medicines and Primary Care, 4861-8.

Barman B, et al. 2020. Determining Factors of Institutional Delivery In India: A Study From National Family Health Survey-4(2015–16). Clinical Epidemiology And Global Health, 1335-40.

Baru R, et al. 2010. Inequities In Access To Health Services In India: Caste, Class And Region. Economic And Political Weekly, 49–58.

Bharati, S, et al. 2007. Obstetric Care Practice In Birbhum District, West Bengal, India. International Journal For Quality In Health Care, 244-9.

Bhan N, et al. 2020. Access To Women Physicians And Uptake Of Reproductive, Maternal And Child Health Services In India. Clinical Medicine, 1-7.

Bishanga D et al. 2018. Factors Associated With Institutional Delivery: Findings From A Cross-Sectional Study In Mara And Kagera Regions In Tanzania. Plos One, 13(12): 1-3.
Bose, M. 2019. Determinants Of Choice Of Care Providers During Childbirth In Rural West Bengal, India. Indian Journal Of Human Development, 47-70.
Chaudhuri S, Mandal B. 2020. Predictive Behaviour Of Maternal Health Inputs And Child Mortality In West Bengal–An Analysis Based On NFHS-3. Heliyon, 1-11.
Dharmalingam A, et al. 2010. Nutritional Status Of Mothers And Low Birth Weight In India. Maternal And Child Health Journal 14(2): 290.
Dussault G, Franceschini MC. 2006. Not Enough There, Too Many Here: Understanding Geographical Imbalances In The Distribution Of The Health Workforce. Human Resources For Health, 1-16.
Dutta B, Barman MP. 2017. A Study On Awareness Of Maternal And Child Health Care Schemes Under National Health Mission In Majuli, Assam. IJCRR, 9(16): 1-5.
Gwatkin DR, et al. 2004. Making Health Systems More Equitable. Lancet, 1273-80.
Houweling TA et al. 2007. Huge Poor-Rich Inequalities In Maternity Care: An International Comparative Study Of Maternity And Child Care In Developing Countries. Bulletin Of The World Health Organization, 745–54.
Jain A, et al. 2013. A Study Of Maternal Mortality In A Tertiary Health Care Centre In West Bengal. Journal Of Evolution Of Medical And Dental Sciences, 3822-8.
Jarris P, Savage-Narva Y, Lupi MV. 2016. Promoting Health Equity And Optimal Health For All. Journal Of Public Health Management And Practice, 5-7.
Jat TR et al. 2011. Factors Affecting The Use Of Maternal Health Services In Madhya Pradesh State Of India: A Multilevel Analysis. International Journal On Equity Health 10(1), 59.
Jeffery P, Jeffery R. 2010. Only When The Boat Has Started Sinking: A Maternal Death In Rural North India. Social Science & Medicine, 1711–8.
Kanchanachitra C, et al. 2011. Human Resources For Health In Southeast Asia: Shortages, Distributional Challenges And International Trade In Health Services. Lancet, 769–81.
Kesterton AJ et al. 2010. Institutional Delivery In Rural India: The Relative Importance Of Accessibility And Economic Status. BMC Pregnancy Childbirth, 30.
Konje ET et al. 2018. Missed Opportunities In Antenatal Care For Improving The Health Of Pregnant Women And Newborns In Geita District, Northwest Tanzania. BMC Pregnancy And Childbirth, 394.
Kowsalya R, Shanmugam M. 2017. Health Status Of The Indian Women- A Brief Report. Moj Proteomics & Bioinformatics 5(3): 109–11.
Kumar P et al. 2020. Do Family Planning Advice And Maternal Health Care Utilization Changes Course In Contraception Usage? A Study Based On Bihar, India. Clinical Epidemiology And Global Health, 693-7.
Lehmann U et al. 2008. Staffing Remote Rural Areas In Middle- And Low-Income Countries: A Literature Review Of Attraction And Retention. BMC Health Services Research, 1-10.
Mandal B. 2015. Demand For Maternal Health Inputs In West Bengal-Inference From NFHS 3 In India. Economics Bulletin, 1-17.
Manna PK, et al. 2011. Knowledge Attitude And Practices For Antenatal Care And Delivery Of The Mothers Of Tea Garden In Jalpaiguri And Darjiling Districts, West Bengal. National Journal Of Community Medicine, 4-8.
Marmot M, Allen JJ. 2014. Social Determinants Of Health Equity. International Journal For Equity In Health, S517–9.
Mavalankar D, et al. 2008. Achieving Millennium Development Goal 5: Is India Serious? Bull World Health Organ, 86(4): 243–4.
Mishra PS, Syamala T. 2020. Vulnerabilities In Utilising Maternal And Child Health Services In Uttar Pradesh, India. Economic And Political Weekly, 45–52.
Mishra PS et al. 2021. Impact Of Socio-Economic Inequity In Access To Maternal Health Benefits In India: Evidence From Janani Suraksha Yojana Using NFHS Data. Plos One, 1-17.

Mishra S, Mohanty SK. 2019. Out-Of-Pocket Expenditure And Distress Financing On Institutional Delivery In India. International Journal For Equity In Health, 99.
Mohanty SK, Kastor A. 2017. Out-Of-Pocket Expenditure And Catastrophic Health Spending On Maternal Care In Public And Private Health Centres In India: A Comparative Study Of Pre And Post National Health Mission Period. Health Economics Review, 7(1), 31.
Mohanty SK, Srivastava A. 2013. Out-Of-Pocket Expenditure On Institutional Delivery In India. Health Policy And Planning, 247–62.
Mukherjee N et al. 2014. Maternal Health Status In Tribal Areas Of Bankura District Of West Bengal, India. International Journal Of Development Research, 1578-83.
Mustafa G et al. 2015. Family Planning Knowledge, Attitudes, And Practices Among Married Men And Women In Rural Areas Of Pakistan: Findings From A Qualitative Need Assessment Study. International Journal Of Reproductive Medicine, 1-9.
Nair H, Panda R. 2011. Quality Of Maternal Healthcare In India: Has The National Rural Health Mission Made A Difference? Journal Of Global Health, 1(1): 79-85.
Navaneetham K, Dharmalingam A. 2002. Utilization Of Maternal Health Care Services In Southern India. Social Science & Medicine, 55: 1849–69.
NITI Aayog. 2021. SDG India Index & Dashboard 2020-21. Summary, New Delhi: Niti Aayog, 1-34.
Pallikadavath S, et al. 2004. Antenatal Care: Provision And Inequality In Rural North India. Social Sciences and Medicine 59(6), 1147–58.
Pathak PK, et al. 2010. Economic Inequalities In Maternal Health Care: Prenatal Care And Skilled Birth Attendance In India, 1992–2006. Plos One 5(10), 13593-5.
Paudel YR, et al. 2017. Timing Of First Antenatal Care(ANC) And Inequalities In Early Initiation Of ANC In Nepal. Frontier, Public Health, 1-6.
Paul S, et al. 2019. Universalisation Versus Targeting In Maternal And Child Health Care Provisioning: Evidence From India. Population Health, 1-2.
Prinja, S, et al. 2015. Coverage And Financial Risk Protection Or Institutional Delivery: How Universal Is Provision Of Maternal Health Care In India? Plos One, 1373-85.
Rani M, et al. 2008. Differentials In The Quality Of Antenatal Care In India. International Journal of Quality Health Care. 20(1): 62–71.
Rao M, et al. 2011. Human Resources For Health In India. Lancet, 587–98.
Salsberg E, Grover A. 2006. Physician Workforce Shortages: Implications And Issues For Academic Health Centres And Policymakers. Academic Medicine, 81(9): 782-7.
Sanneving L, et al. 2013. Inequity In India: The Case Of Maternal And Reproductive Health. Global Health Beyond, 1-32.
Saxena D, et al. 2013. Inequity In Maternal Health Care Service Utilization In Gujarat: Analyses Service Utilization In Gujarat: Analyses. Global Health Action, 1-10.
Paswan SIK, et al. 2020. Deaths During Pregnancy, Childbirth And Puerperium: Exploring Causes, Context And Evidence From Eastern India. The Journal Of Obstetrics And Gynaecology Research, (46): 2366-74.
Singh PK, et al. 2012. Determinants Of Maternity Care Services Utilization Among Married Adolescents In Rural India. Plos One 7(2): E31666.
Singh R, et al. 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, 1-12.
Suryanarayana R et al. 2017. Prospective Study On Prevalence Of Anaemia Of Pregnant Women And Its Outcome: A Community Based Study. Journal Of Family Medicine And Primary Care: 739-43.
Tadevosyan M et al. 2019. Factors Contributing To Rapidly Increasing Rates Of Caesarean Section In Armenia: A Partially Mixed Concurrent Quantitative qualitative Equal Status Study. BMC Pregnancy And Childbirth: 1-10.
The George Institute For Global Health, India. 2016. Framing Women's Health Issues In 21st Century India -A Policy Report. Summary, New Delhi: The George Institute For Global Health, India.

UNDP. 2017.Sustainable Development Goals. Summary, New York: UNDP.
UNICEF. 2008. The State Of The World's Children Report-Maternal And New born Health. Summary, New York, USA: United Nations Children's Fund.
UN. 2015.The Millennium Development Goals Report 2015. Summary, New York: UN.
Vellakkal S et al. 2017. A Qualitative Study Of Factors Impacting Accessing Of Institutional Delivery Care In The Context Of India's Cash Incentive Program. Social Science & Medicine, 55-85.
Vora, KS., Et Al. 2009. Maternal Health Situation In India: A Case Study. Journal Of Health Population And Nutrition, 27(2):184–201.
Wagner, A. et al. 2018. Using Community Health Workers To Refer Pregnant Women And Young Children To Health Care Facilities In Rural West Bengal, India: A Prospective Cohort Study, 1-10.
Warri D, George A. 2020. Perceptions Of Pregnant Women Of Reasons For Late Initiation Of Antenatal Care: A Qualitative Interview Study. BMC Pregnancy And Childbirth, 1-12.
WHO. 2017.Maternal Health. Fact Sheets, Europe: WHO.
WHO. 2015.Trends In Maternal Mortality: 1990 To 2015 Estimates By WHO, UNICEF, UNFPA, World Bank Group And The United Nations Population Division. Statistics, New York: WHO.
WHO. 2009.Women And Health- Today's Evidence Tomorrow's Agenda. Summary, New York: WHO.
Yadav D, Dhillon P. 2015. Assessing The Impact Of Family Planning Advice On Unmet Need And Contraceptive Use Among Currently Married Women In Uttar Pradesh, India. Plos One, 1-16.