

Title: Evaluation of socio-economic inequalities in the use of maternal health services in rural and peri-urban areas of Birbhum district, West Bengal, India

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Abstract

Background

Inequalities in maternal health care services prevent women of reproductive ages from accessing required care. The existence of equitable distribution channels can substantially diminish these discrepancies. Since the implementation of National Rural Health Mission (NRHM) in 2005, Maternal Mortality Ratio has significantly declined in India through a noticeable improvement in maternal health care services. However, India lags behind to achieve the target of millennium development goal (MDG5) to reduced maternal mortality ratio and improve universal reproductive health by 2015. The objective of this study was to evaluate the socio-economic inequalities, and factors associated to the use of maternal health services in rural and peri-urban areas of Birbhum district, West Bengal.

Methods

A cross sectional study was carried out among 2120 mothers in 3 blocks of Birbhum district, West Bengal. Data was collected by a structured questionnaire method. Women who, within the last 3 years, were aged 13–44 years at their last live birth that had delivered a singleton child were included. This study examined the degree of inequality exist in maternal health care namely full antenatal care (full ANC), skilled

attendants at birth (SBA), caesarian delivery type and institutional delivery in study area of Birbhum district, West Bengal.

Results

The effective coverage levels for rich and richest wealth level women were in better position compared to poor and middle women in antenatal care, institutional delivery and SBA in study area. The adjusted coverage for ANC service was substantially higher for better wealth level women (p value highly significant). Caesarian delivery was mostly conducted by skilled professionals at urban areas. Household wealth status and women's education were the most significant contributors to inequality in antenatal visits and facility-based deliveries.

Conclusion

There is a positive association between socioeconomic status of women and the use of maternal health care services. Those women who were better educated, economically well off and resided in urban areas availed the delivery care services to the maximum. Poor women cannot afford the cost of health care services.

Key Words: Full antenatal care (ANC), skilled attendants at birth (SBA), caesarian delivery type, institutional delivery, maternal mortality

Introduction

Maternal mortality ratio in India was 97 deaths per 100,000 live births in 2018–2020, which is progressively approaching what the Sustainable Development Goals envision to achieve by 2030 (i.e., less than 70 deaths per 100,000 live birth [DHF, 2022, UNDP, 2022]).

There have been several efforts in recent times to improve maternal health through the removal of barriers that limit access and utilization of health services. Prominent among these is the call for universal health coverage (UHC) which is defined by the World Health Organization (WHO) as a state where people and communities can use health care services they need without any financial hardship [WHO, 2019].

In 2019–2021, less than 60% of Indian mothers who gave birth in the last five years made a minimum four ANC visits and 20% of newborns failed to receive PNC from health professionals within two days of birth[**WHO, 2016, NFHS-5, 2019-22**]. India accounted for about one-fifth of the global maternal deaths in 2015 [**WHO, 2015**] and there are large inter-state and intra-state disparities. Northern states like Assam, Uttar Pradesh (including Uttarakhand) and Rajasthan have a relatively high maternal mortality ratio (MMR) (328, 292, and 255 maternal deaths per 100,000 live births, respectively) compared to southern states like Kerala (66) and Tamil Nadu (90)[**Registrar General of India, 2013**].

In 2016, the World Health Organization (WHO) introduced a new recommendation that pregnant women with uncomplicated pregnancies should attain at least eight ANC contacts [**WHO, 2016**]. Although the WHO recommends a new minimum, many official statistics and international documents still provide ANC indicators using ANC4+ [**Ataguba , 2018**].

The risk of maternal mortality is higher among adolescent women than other age groups of women due to their inadequate knowledge about pregnancy care, breastfeeding, and immunization leads them to complications of pregnancy and ill health of infants. The gaps in the utilization of maternal health care services between developed and developing countries are large and continue rising, and there is substantiation of the inequity within and between countries (**Claeson et al., 2000; Yaya & Ghose, 2019**)

Recent studies in India found that maternal health care service utilization is strongly correlated with factors like education, household wealth status, media exposure, religious affiliation, and women's education [**Murray & Lopez, 1997; Paul & Chouhan, 2020**]. Existing studies indicate the persistence of socioeconomic inequalities as the major contributor to difficulties in access to maternal health care services [**Victora et al, 2012**].

Materials and Methods

Sample Size

The total sample size is 2120 women aged 13- 44 years. To carry out this study, women in rural and peri-urban areas of 3 blocks (Suri-1, Md Bazar and Sainthia) were taken, Out of this rural sampled women, only women with last birth have been taken for analysis purpose.

Methods of Data Collection

Each participant was clearly informed about the purpose of the study and written consent was obtained. Using structured interview schedule, questions pertaining to socioeconomic characteristics and care received during pregnancy periods. Age of the participants was confirmed on the basis of birth certificate. For those who did not have a birth certificate, the school certificate, Voter ID card or Aadhaar card was carefully considered as a secondary source.

Outcome variables

Full Antenatal Care (ANC)

In the survey, women were asked whether they “had at least four visits for ANC check-up((including the first visit for registration), administer two doses of TT injection and provide at least 100 tablets of IFA for the last birth during the three years preceding the survey from January 1, 2021. This information was used to define full ANC in this study.

Skilled Birth Attendant (SBA)

A skilled birth attendant is an accredited health professional - such as doctor or nurse - who has been educated and trained to proficiency in the skills needed to manage normal (i.e. uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of women and neonates for complications. Traditional birth attendants, whether trained or not, are excluded from the category of "skilled attendant at delivery" (**WHO, 2018**).

Institutional Delivery

- It means giving birth to a child in a medical institution under the overall supervision of trained and competent health personnel.
- It also signifies an availability of amenities to handle the situation and save the life of the mother and child.

Cesarean Delivery

A cesarean delivery, also known as a C-section, is a surgical procedure to deliver a baby through an incision in the abdomen and uterus. In 2018, the WHO developed guidance on non-clinical interventions to reduce unnecessary caesarean sections [WHO, 2018].

Independent variables

The primary independent variables were wealth index, education level of the mother, religion and Caste. In the formation of wealth index, five groups have been created such as poorest, poor, middle, rich and richest. Wealth index was calculated on the basis of type of house, type of fuel materials used for cooking and type of sanitation facility used through principal components analysis (PCA) guidelines. Based on the wealth asset score, a household in the sample was ranked from the poorest to the richest.

The education level was categorized as “none” for women who had not received any kind of formal education, “able to read and write” for women for non formal education, “primary” for women who completed primary education level (1 to 4), “middle school” for women who completed 6 to 8 years education level and “secondary and higher secondary” for women who completed 9 to 12 years school education level and “graduation and above” for women who have completed more than 12 years college and all university level education and the respondents who have denied to give any answer denoted as “don’t know”.

Religion was coded as Hindu, Muslim, and Christian and other. Caste was recorded as Scheduled Tribes, Scheduled Castes, Other Backward Classes and others. The Scheduled Castes include a group of the population that is socially segregated and financially/economically by their low status as per Hindu caste hierarchy. The Other Backward Classes are considered low in the traditional caste hierarchy, but include the intermediate socioeconomic groups. The “others” caste category is identified as those having higher social status.

The following were adjusting factors used in this study; women’s age was grouped into “13–19,” “20–24,” “25–29,” “30–34,” “35–39,” and “40–44”.

Statistical Analysis

Bivariate analyses were performed to examine the nature of association between utilization of maternal health care services by selected socio-economic and demographic characteristics. The analysis has been performed using STATA version 12.

Full antenatal care (complete ANC) was regrouped in binary (0 and 1) as it was treated as dependent variable to find out logistic regression. Similarly skilled birth attendant (doctor and nurse) was regrouped in binary (0 and 1) and institutional delivery was regrouped in binary (0 and 1). These values were entered into the logistic regression model as response variables instead of the actual numeric values. Similarly, the predictor variables were coded separately and entered into the regression model as a set of dummy variables.

Results

Table-1: Descriptive statistics of women included in the analysis by maternal healthcare utilization indicators

Indicators	At least four ANC visits	Receiving adequate ANC	Institutional delivery	Skilled birth attendant	Cesarean section delivery
Women age					
13-19	47.40	39.71	93.75	95.05	24.09
20-24	52.07	41.03	94.60	95.63	33.56
25-29	51.12	43.02	93.85	93.85	40.50
30-34	50.55	41.76	91.21	91.21	41.76
35-39	65.38	46.15	88.46	92.31	53.85
40-44	14.29	14.29	85.71	85.71	28.57
Women education					
Illiterate	54.72	23.58	90.57	91.51	16.04
Read & write	100.00	100.00	100.00	100.00	0.00
1 -4 Standard	50.74	34.56	94.12	94.12	14.71
5-8 Standard	46.73	34.76	90.74	92.78	21.22
9 th - 12 th Standard	50.14	44.18	94.41	95.06	35.97
College and above	48.78	51.22	98.78	98.78	60.37
Denied to reply	63.64	45.45	100.00	100.00	18.18
Caste					
ST	42.64	34.01	92.39	93.40	14.21
SC	47.52	38.52	93.56	94.23	21.74
OBC	48.63	43.34	93.45	94.50	40.80

Other	56.17	43.69	95.04	96.17	41.56
Wealth Status					
Poorest	47.66	32.01	92.52	92.76	18.46
Poor	47.70	35.34	91.38	93.39	18.68
Middle	48.28	40.23	92.64	93.79	22.30
Rich	52.75	45.42	95.32	96.33	39.71
Richest	53.83	50.00	97.13	97.61	57.42

Table-1 shows the distribution of women by maternal healthcare utilization indicators. It demonstrates that the percentage of utilization of these five maternal healthcare (at least 4 ANC visits, adequate ANC [2 immunization, at least 4 ANCs and 100 iron and folic tablets taken], facility based delivery, skilled birth attendant and cesarean delivery) were higher among women with 9-12th standard and college & above education compared to those were comparatively less among study population.

Table-2 : Binary logistic regression showing unadjusted effects of selected characteristics on utilization of maternal healthcare services in rural and peri-urban study area

Characteristics	Full ANC			Institutional Delivery			SBA		
	Odd Ratio	95% CI	p-value	Odd Ratio	95% CI	p-value	Odd Ratio	95% CI	p-value
Women age									
13-19 (Reference)									
20-24	1.06	0.86 1.28	0.587	1.17	.77 1.77	0.464	1.14	0.72 1.81	0.578
25-29	1.15	0.88 1.47	0.294	1.02	.60 1.71	0.946	0.80	0.46 1.36	0.406
30-34	1.09	0.70 1.69	0.707	0.69	0.32 1.51	0.356	0.54	0.24 1.19	0.129
35-39	1.30	0.59 2.85	0.511	0.51	.15 1.76	0.288	0.62	0.14 2.74	0.533
40-44	0.25	0.30 2.11	0.204	0.40	.047 3.39	0.401	0.31	.036 2.66	0.287
Caste									
Scheduled Tribe(Reference)									
Scheduled Caste	1.22	0.87 1.69	0.245	1.20	0.65 2.18	0.559	1.15	0.61 2.19	0.663
OBC	1.48	1.05 2.09	0.025	1.18	0.62 2.23	0.621	1.21	0.61 2.41	0.579
General	1.51	1.08 2.09	0.015	1.58	0.84 2.95	0.154	1.77	0.89 3.51	0.099
Religion									
Hindu (Reference)									
Muslim	1.03	0.86 1.23	0.757	0.84	0.59 1.21	0.360	0.93	0.62 1.37	0.701
Christian	0.97	0.34 2.75	0.96	0.84	.109 6.51	0.872	0.73	.094 5.66	0.767

Wealth Index												
Poorest(Reference)												
Poor	1.16	0.86	1.57	0.328	0.86	0.51	1.44	0.559	1.10	0.63	1.93	0.730
Middle	1.43	1.08	1.89	0.012	1.02	0.61	1.69	0.946	1.18	0.69	2.01	0.544
Rich	1.77	1.35	2.31	0.000	1.64	0.95	2.86	0.078	2.05	1.13	3.72	0.018
Richest	2.12	1.61	2.81	0.000	2.73	1.39	5.38	0.004	3.19	1.54	6.58	0.002

Table-2 presents the bivariate logistic regression results for association between full ANC and institutional delivery, SBA and sociodemographic factors. Wealth quintile showed a significantly positive association with full ANC and institutional delivery and SBA. The odds of using full ANC services were 1.77 times [95% CI = 1.35 2.31] for rich and 2.12 times [95% CI= 1.61 2.81] more for women in the richest wealth quintile than for women in the lowest quintile. The odds of institutional delivery and SBA also increased with each increase in the wealth level.

Table-3: Binary logistic regression showing adjusted effects of selected characteristics on utilization of maternal healthcare services in rural and peri-urban study area

Characteristic s	Full ANC			Institutional Delivery			SBA		
	Odd Ratio	95% CI	p-value	Odd Ratio	95% CI	p-value	Odd Ratio	95% CI	p-value
Women age									
13-19 (Reference)									
20-24	1.06	.87 1.30	0.557	1.19	.77 1.84	0.423	1.16	.72 1.88	0.542
25-29	1.17	.90 1.51	0.242	0.97	.56 1.66	0.899	0.75	.42 1.31	0.309
30-34	1.19	.76 1.88	0.444	0.67	.30 1.50	0.334	0.55	.24 1.25	0.153
35-39	1.54	.67 3.53	0.303	0.48	.132 1.73	0.262	0.62	.13 2.94	0.548
40-44	0.32	.036 2.76	0.299	0.40	.046 3.43	0.403	0.36	.04 3.14	0.353
Caste									
Scheduled Tribe(Reference)									
Scheduled Caste	1.28	.91 1.79	0.15	1.20	.63 2.26	0.575	1.17	.59 2.30	0.656
OBC	1.77	1.24 2.53	0.002	1.19	.61 2.34	0.612	1.32	.64 2.74	0.451
General	1.46	1.04 2.03	0.028	1.46	.76 2.83	0.257	1.59	.77 3.26	0.210
Religion									
Hindu (									

Reference)									
Muslim	1.04	.87 1.25	0.66	0.82	.56 1.19	0.302	0.91	.60 1.36	0.640
Christian	0.89	.31 2.53	0.827	0.71	.092 5.49	0.743	0.59	.076 4.62	0.619
Wealth Index									
Poorest(Reference)									
Poor	1.17	.86 1.58	0.318	0.74	.43 1.23	0.281	0.98	.54 1.76	0.949
Middle	1.44	1.08 1.91	0.012	0.90	.53 1.55	0.715	1.06	.60 1.88	0.828
Rich	1.82	1.38 2.39	0.000	1.39	.77 2.48	0.268	1.78	.95 3.31	0.071
Richest	2.11	1.58 2.80	0.000	2.25	1.11 4.53	0.024	2.60	1.23 5.49	0.012

Adjusted variables include: blood pressure, weight, hemoglobin level urine for sugar and urine protein measurement.

Table-3 presents the adjusted logistic regression results for association between full ANC and institutional delivery, SBA and sociodemographic factors. Full ANC was significantly associated for OBC women [adjusted odds ratio =1.77, 95% CI= 1.24 2.53] and general [adjusted odds ratio= 1.46, 95% CI= 1.04 2.03]. Increase in odd ratio for utilization of full ANC was observed for women with OBC category in study population. Again, the odds of using full ANC services were 1.82 times [95% CI=1.38 2.39] for rich and 2.11 times [95% CI= 1.58 2.80] for richest wealth quintile for women compared to poor and middle quintile. Institutional delivery, SBA and full ANC did not show a significant association with women age and religion.

Discussion

This study deepens our awareness about the wide-ranging and persistent factors of inequality in the utilization of maternal healthcare services. We attempted to measure the inequalities in the utilization of maternal health care services among rural and peri-urban women of Birbhum district, West Bengal by capturing the dimension of full antenatal care, skill attendants at birth, and institutional delivery and caesarian outcome of delivery by skilled professionals at institution (private and government hospital & nursing home). The utilization of full antenatal care increases with the increase in the levels of mother's education. Higher educated women are more likely to use full ANC than uneducated or less educated women. Another study in the Indian context also found that women in the richest wealth quintile were more likely to use full antenatal care than the poorest women (Singh et al, 2012).

This study shows that a substantial poor–rich gap exists in the utilization of maternity healthcare services, which is in concordance with the findings from earlier studies in India (**Viegas Andrade et al. 2012**) and other developing countries (**Ahmed et al. 2010**).

Lower economic status of mothers is highly associated with lower financial and social access to maternal health services. Poor mothers often receive maternal health services from public health facilities which many times do not provide full, reliable and high-quality care. Again, alternative private health facility with high quality care can be relatively high priced, so for, this poor prior experience with the health system and financial barrier leads to underutilisation of maternal care in rural and peri- urban areas.

The analysis reveals that scheduled caste and wealth level positively contributed to the inequality and observed huge poor and non-poor disparities. It is suggested that maternal health programme especially Janani Suraksha Yojana should be continued and effectively implement to increase the uptake of full ANC component and reduce maternal mortality ratio in India.

Conclusion and Policy Implications

The findings of this study have important policy implications. First, the results recommend the significant efforts should be made to improve household wealth and female and male education. It should be noted, however, that despite an overall health advantage, huge differences exist between urban poor women and better-off women in access to maternal health care services. Unless the rural-urban gap is bridged, it is impossible to achieve SDG-3. Therefore, there is a need to pay more attention to rural areas, particularly those lagging behind in terms of socio-economic development indicators.

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We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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