Investigating Various Correlates Associated with Maternity Care Expenditure in India: Evidence from National Sample Survey Data

Monirujjaman Biswas[1]* and Anuradha Banerjee[2]

Abstract

The cost of maternity care [Antenatal Care (ANC), Delivery and Postnatal Care (PNC)] is gaining new records every day in public and private health sectors of India, which is often cited as the strongest barrier in utilizing quality health care during pregnancy and childbirth. Given this context, the present study aimed to, first, examine the socio-economic and demographic differentials in mean maternity care expenditure in public and private health facilities in India; second, investigate the effects of various correlates on the public and private maternity care expenditure using the unit-level data from the 75th round (2017-18) of the National Sample Survey Organization. The Heckman selection model was used to examine the factors explaining component-wise public and private maternity spending in India. The results reveal that the mean spending on ANC, delivery and PNC in public health facility were INR 1505, INR 3683 and INR 988, while that from private health facility were INR 6963, INR 22,492 and INR 2966, respectively. Overall, the mean spending on delivery, ANC and PNC in private health facility had increased by 6, 4 and 3 times compared to that from public health facility in India. Furthermore, multivariate analyses confirmed that respondent's age group, level of education, social and wealth status, religion, health insurance and place and region of residence emerged as significant factors explaining component-wise public and private maternity spending. Findings from this paper suggested the importance of government spending on the public health sector to magnify the accessibility and affordability of quality maternity care that may curtail household's economic distress to obtain utmost care from private health facilities in India, irrespective of their socio-economic status.

Key words: Maternity care, Healthcare expenditure, Public health facilities, Private health facilities, Heckman selection model, India.

Introduction

Globally, over a quarter of a million women die each year due to pregnancy and childbirth complications (WHO, 2023). The low and lower-middle-income countries suffer from undesirably higher maternal deaths (95 percent), of which the Sub-Saharan African (70 percent) and South Asian (16 percent) countries accounted for about 86 percent (249 000) of all maternal deaths in 2020 (WHO, 2023). India is home to 17.5 percent of the world's population and the poorest health performer in multiple indicators among the BRICS countries (Brazil, Russia, India, China, and South Africa) (Marten *et al*., 2014). In 2020, Nigeria (29 percent) and India (8 percent) conjointly accounted for one-third (106,000) of the world's maternal deaths (WHO, 2023). Although tremendous efforts have been made towards reducing Maternal Mortality Ratio (MMR), safe motherhood remains an utmost dream for many developing

* *Corresponding Author*

[1] *PhD Scholar, Centre for the Study of Regional Development, Jawaharlal Nehru University, New Delhi, India. Email Id: monwasman@gmail.com*

[2] *Professor, Centre for the Study of Regional Development, Jawaharlal Nehru University, New Delhi, India. Email Id: banerjee.anb@gmail.com*

countries, including India (Starrs, 2001). The Millennium Development Goals (MDGs) 5 highlighted that improving maternity care critically depends upon the availability and affordability of quality healthcare services in institutional settings (Mavalankar *et al.*, 2008).

Over the last few decades, India has made enormous progress in reducing MMR from 556 to 130 per 100,000 live births (77 percent declined) between 1990 and 2014-16, respectively (MoHFW, 2020), but failed to meet the MDG-5 target of MMR 109 by the end of 2015 (United Nations, 2014). Later, a newly proposed Sustainable Development Goals (SDGs) 3 aims to reduce MMR below 70 and financial protection to India's households from exorbitantly high out-of-pocket expenditure (OOPE) on maternity care [Antenatal Care (ANC), Childbirth and Postnatal Care (PNC)] by 2030 (United Nations, 2015). However, maternal and infant mortality can be prevented if women receive adequate maternity care, especially during childbirth (WHO, 2006). Previous research has indicated that the decrease in MMR is closely linked to an uptick in institutional deliveries. Recently, the National Family Health Survey (NFHS) report has highlighted that the delivery care at the public health facility had increased from 52 percent in 2015–16 to 62 percent in 2019–21, while the private health facility had almost constant from 26 percent in 2015–16 to 26 percent in 2019–21, respectively (IIPS & ICF, 2017; IIPS & ICF, 2021).

In India, the private health sector is distinguished by a predominant source of substantial expenditure on health care, while the public health sector continues to experience comparatively lower levels of expenditure (NHSRC, 2018). Currently, the government expenditure on health care contributes 2.1 percent of the Gross Domestic Product (GDP), which is considerably low compared with countries having similar per capita income, poverty and inequality (Drèze & Sen, 2013; Economic Survey, 2023). Furthermore, the household's financial distress is a critical factor contributing to the poor performance of maternity services (IIPS & ICF, 2021). Acknowledging the importance of OOPE, India contributes to nearly 59 percent of the total health expenditure (MoHFW, 2009), with a significant proportion of households incurring OOPE for maternity care (Lim *et al.*, 2010; Skordis-Worrall *et al.*, 2011; Pradhan *et al.*, 2014). It may be catastrophic for poor, rural, less educated and female-headed households, mostly during childbirth (Garg & Karan, 2009; Mohanty *et al.*, 2014; Kumar *et al.*, 2015). However, maternity care expenditure is gaining faster than the household's consumption expenditure (Mohanty *et al.*, 2016). As a consequence, such additional expenses not only hold women back from obtaining health facilities but also drives them further into extremes of poverty (Bonu *et al.*, 2009); and that thwarts household's capacity to meet essential needs (*e.g.*, food, cloth and education of their children) (Van Minh *et al.*, 2013).

An extensive body of health literature has documented that expenditure related to maternity care is often cited as a risk factor for the household's financial burden (OOPE). It may be catastrophic for poor households and considered to be fragile public health performance in low and middle-income countries (Bonu *et al.*, 2009; Skordis-Worrall *et al.*, 2011; Leone *et al.*, 2013; Mukherjee *et al.*, 2013; Issac *et al.*, 2016; Goli *et al.*, 2016; Singh *et al.*, 2016; Mohanty & Kastor, 2017; Goli & Rammohan, 2018). In

India, maternity services are offered free or at nominal charges in public health centres but not at the point of childbirth. Many families still pay a decent amount, such as user fees, diagnostics tests, medicines and bed charges to utilize public health facilities (Sengupta & Nundy, 2005; Chattopadhyay, 2013; Leone *et al*., 2013). Several factors may explain the poor performance of maternity services in the public health sector in India, such as unavailability, absenteeism and callous behaviour of doctors or health professionals, physical inaccessibility, poor health infrastructure, shortage of medicines and tools and lack of diagnostic test (Hussain, 2011; Skordis-Worrall *et al*., 2011; Garg *et al*., 2012; Mukherjee *et al*., 2013; Goli *et al*., 2016). These factors have strongly influenced a substantial proportion of women to prefer private health facilities, marked by the quality of care and the household's ability to pay (Griffiths & Stephenson, 2001; Garg *et al*., 2012; Mohanty & Srivastava, 2013). Given this context, previous studies have highlighted that households incur high expenditure for seeking quality delivery care in private health facilities (Borghi *et al*., 2006; Bonu *et al*., 2009; Modugu *et al*., 2012; Mohanty & Srivastava, 2013; Kowalewski *et al*., 2017). Besides, there are widespread informal health payments made by households in public health facilities attributed to service bias, social exclusion and impoverishment (Sharma *et al*., 2005; Pathak *et al*., 2010; Skordis-Worrall *et al*., 2011). As a consequence, a quarter of Indian households sink into extreme poverty and indebtedness (Navaneetham & Dharmalingam, 2002; Peters *et al*., 2002; Bonu *et al*., 2009; Garg & Karan, 2009; Balarajan *et al*., 2011; Mohanty & Srivastava, 2013).

Since independence, maternity care has been at the core of public health planning. Recognizing its importance, both the state and national governments introduced various cash incentive schemes and policy directives (*Janani Suraksha Yojana (JSY), Janani Shishu Suraksha Karyakram (JSSK), Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA), Janani Suvidha Yojana, Sambhav Vouchers, Agra Voucher, MAMATA scheme, etc.*) to reduce financial barriers, strengthen safe motherhood and child survival by availing quality maternal services in public health centres. Moreover, the Ministry of Health and Family Welfare (MoHFW), Government of India (GoI), launched a series of flagship programs under the umbrella of the National Rural Health Mission (NRHM) in 2005, now renamed as National Health Mission (NHM). For instance, the JSY, a Conditional Cash Transfer (CCT), is being implemented aiming to recommend and motivate women for opting institutional delivery and improving maternal and neonates survival in public or accredited private health facilities by offering a monetary incentive of Indian Rupees (INR) 1400 supported by the Accredited Social Health Activist (ASHA) (MoHFW, 2005; MoHFW, 2006). Later, it was modified by JSSK in 2011, which covers cashless institutional deliveries and gives medical treatment to sick neonates in public health facilities for up to one year (Randive *et al*., 2013; MoHFW, 2014). Recently, the PMSMA launched in 2016, aiming to provide free and quality ANC to all pregnant women (during the 2nd/3rd trimester) in public health facilities (MoHFW, 2019).

Although previous studies have documented maternal healthcare expenditure or any specific component/s and its correlates in low and middle-income

countries (Bonu *et al.*, 2009; Lim *et al.*, 2010; Skordis-Worrall *et al.*, 2011; Sambo *et al.*, 2011; Mukherjee *et al.*, 2013; Mohanty & Srivastava, 2013; Leone *et al.*, 2013; Goli *et al.*, 2016, Singh *et al.*, 2016; Issac *et al.*, 2016; Mohanty & Kastor, 2017; Goli & Rammohan, 2018), none of the studies have examined the factors explaining component-wise public and private maternity care expenditure among married women in the Indian context using the latest 75th round of the National Sample Survey Organization (NSSO). Moreover, a group of researchers have explored the OOPE and Catastrophic Health Spending (CHS) on maternity care in India using National Sample Survey (NSS) data (Goli *et al.*, 2016; Singh *et al.*, 2016 and Mohanty & Kastor, 2017). For instance, a recent study by Mohanty & Kastor estimated the OOPE and CHS on institutional delivery and Total Maternity Care (TMC) during pre and post NHM periods using the 60th and 71st rounds of the NSS. Considering this backdrop, this study attempted to fill two research gaps. First, to estimate the extent of maternity spending by source of provider and socio-economic and demographic characteristics. Second, to investigate the factors associated with public and private maternity care expenditure in India.

Methods

Data

The study primarily used unit-level records drawn from the 25th schedule of the NSS 75th round titled 'Key Indicators of Social Consumption in India: Health' conducted between July 2017-June 2018 (NSSO, 2019). A multi-stage stratified sampling design was adopted to conduct this survey by the Ministry of Statistics and Programme Implementation (MoSPI), GoI. Census villages in the rural areas and urban blocks in the urban areas were considered in the first-stage units (FSUs), followed by households in the second-stage units. Detailed information and interview schedule can be availed in the survey report (NSSO, 2019). The nationally representative NSS 75th round covered 5,55,115 individuals from 1,13,823 households. Among them, 32,152 women aged 15-49 years were reported being pregnant (comprising pre and postnatal care and childbirth) at any time during the 365 days preceding the survey across the States and Union Territories (UTs) in India.

To examine all three components of maternity care expenditure in public and private health facilities, this nationwide study restricted only currently married women aged 15–49 years who were pregnant or delivered a baby at any time in the last 365 days preceding the survey. The data on ANC and PNC costs were collected at an aggregate level. Unlike them, the delivery cost was collected at a disaggregated level as inpatient medical care expenditure, including eight sub-components: package components, doctor's or surgeon's fee, medicines, diagnostic tests, bed charges, other medical expenses (attendant charges, charges related to physiotherapy, personal medical appliances, blood, oxygen, etc.), transportation charges for the patient, other non-medical expenses incurred by the households (food, transport cost for others, expenditure on escort and lodging charges if any, etc.) in the last 365 days (NSSO, 2019). Therefore, the analyses of this study were confined to 31,184 women who had sought any ANCs, about 26,443 women who had delivered birth in a hospital setting, and 26,005 women who had availed PNCs during the reference period to capture all three components of public and private maternity spending. Like previous NSS

rounds, the latest 75th round also includes information on household consumption expenditure which was collected through a set of five questions on (i) purchases, (ii) home-produced stock, (iii) receipts through an exchange of goods and services, (iv) gifts and loans and (v) free collection to estimate household consumption expenditure, rather than a detailed listing of consumption items in the last 30 days preceding the survey. In India, it is difficult to obtain reliable data on household income. Thus, the NSSO reported monthly per-capita household consumption expenditure (MPCE) used as a proxy measure to depict the relative wealth status of households.

Dependent variables

This study measured six outcome variables, namely public ANC expenditure, private ANC expenditure, public delivery expenditure, private delivery expenditure, public PNC expenditure and private PNC expenditure, which were considered for the multivariate analyses. This study included only those women who had sought maternity care in both public and private facilities using the latest 75th round of the NSS. Data on various aspects of maternity cost were in continuous format and characterized by a cluster of data at zero and a right-skewed of the remaining sample distribution. However, the dependent variables were defined as any expenditure (above zero) incurred by households for currently married women who had availed ANC, childbirth and PNC in public and private health facilities. Those who had not obtained the services by source of care at any time in the last 365 days preceding the survey, were coded as zero.

Correlates

With regard to correlates, a set of socio-economic and demographic variables has been identified in previous studies and availability of those variables in the NSSO 75th round dataset as being critical factors for public and private maternity spending in Indian context (Navaneetham & Dharamalingam, 2002; Bonu et al., 2009; Kesterton et al., 2010; Mohanty, 2011; Leone et al., 2013; Mohanty & Srivastava, 2013; Mukherjee et al., 2013; Kumar et al., 2015; Goli et al., 2016; Singh et al., 2016; Mohanty & Kastor, 2017, Goli & Rammohan, 2018; NSSO, 2019). The key explanatory variables included in the analyses were women's age group (15–24, 25–34 and 35–49 years), place of residence (rural/urban), educational attainment (illiterate, primary, secondary, higher & above), religion (Hindu, Muslim and others (Christians, Sikhs, Jains, Buddhist, others), social group (Scheduled Castes (SCs), Scheduled Tribes (STs), Other Backward Castes (OBCs) and Other or General castes), MPCE quintile (poorest, poorer, middle, richer and richest), insurance coverage (no/any) and region of residence (north, central, east, north-east, west, south and UTs). The details of the study variables and their analytical sample were listed in Table 1).

Statistical analysis

Descriptive statistics were used to summarize the sample characteristics. Bivariate analyses were carried out to examine the association between component-wise mean maternity cost and socio-economic and demographic characteristics. It is worth mentioning that all correlates, which had been identified as statistically significant in the bivariate analyses using Pearson's chi-square test, were included in the multivariate analyses. To take advantage of the merits of two-stage procedure and address the zero-sample issue simultaneously, this paper adopted the

Heckman sample selection model. This model allowed one to compute the estimation while taking into explicit consideration self-selection into the sample, i.e. expenditure could only be observed for those women who had visited health centres for utilizing maternity services. Therefore, the multivariate analyses ran six Heckman selection (*two-step*) models to identify the factors explaining component-wise public and private maternity spending after the sample selection bias had been corrected. Most impressive of all, the two-step Heckman selection model is the most straightforward approach in the health economics literature and is used in such context where the outcome variables (as defined earlier) take on a value of zero for a substantial number of cases (Heckman, 1979; Janssens *et al*., 2011, Xu *et al*., 2017). After controlling the potential sample selection bias, the application of Heckman processed the estimation while taking into explicit consideration of self-selection of the sample, *i.e.* health expenditure (zero or non-zero) incurred on various aspects of maternity care decisions could only be based on a sample of those women who had visited any health providers for availing maternity care (Heckman, 1979). Therefore, the model proceeded one step further to include all women who had sought maternity care and thus "participates" in the equation (2) that determined public and private spending on maternity care. Furthermore, Heckman's Full Information Maximum Likelihood (FIML) technique was used to control the potential sample that may otherwise bias the selection when the independent does not support it. The mathematical equations of this model can be written using the following equations:

First, the main regression model (1) estimated how expenditure ranged by a set of correlates. This information was based on only those women who had truly incurred expenditure for seeking all three maternity care.

$$y_i = X_i\beta + \mu_i \qquad (1)$$

Where y_i is the dependent variables, X_i represents a vector of the observable features of a set of correlates, β indicates the vector of the parameters, and μ_i is the distributed error term with a mean of zero and standard deviation (SD) or σ to be estimated.

Second, below, the outcome variables were observed in the selection model (2):

$$Z_i y + \mu_{ii} > 0 \qquad (2)$$

where Z_1 represents the observable features of the outcome of interests, including the overlapping variables with X_i, y symbolizes the vectors of the parameters, and μ_{ii} is the distributed error term with a mean of zero and SD equal to one.

The random error terms of both main (1) and selection (2) models were expressed by the joint normal distribution (3):

$$\begin{aligned} &\mu_i \sim N\,(0, \sigma) \\ &\mu_{ii} \sim N\,(0,1) \\ &corr\,(\mu_i,\ \mu_{ii}) = \rho \end{aligned} \qquad (3)$$

where μ_i and μ_{ii} are the distributed error terms, ρ denotes the correlation between the error terms to be estimated. The joint normal distribution (3) allowed a non-zero correlation ρ of their respective error terms, which provides consistent and asymptotically efficient estimates for all parameters. Further, the coefficients were estimated simultaneously using the FIML techniques that gave more efficient results

than the traditional error terms by Heckman's '*two-step*' (Puhani, 2000). Finally, models were finalized. The results of all six models were presented using the estimated odds ratio with 95 percent confidence intervals (CIs). Both bivariate and multivariate analyses were calculated using a respective sampling weight given by NSSO. Statistical analyses were performed using STATA 14.0 (StataCorp LP, College Station, TX, USA).

Results

Descriptive statistics of the study variables

Table 1 summarizes the distribution of the study variables used in the statistical analyses. The mean expenditure incurred by a household on delivery care in a public health facility was INR 2304, and a private health facility was INR 5152, accounting for the highest maternity spending by a household per pregnancy, followed by ANC cost (INR 7333 in public and INR 1672 in private), and PNC cost (INR 3104 in public and INR 1093 in private), respectively. Besides, the distribution of socio-economic and demographic characteristics of the respondents showed that the majority of the sample (59 percent) were in rural areas, more than half of the respondents were in the age group of 25-34 years and two-thirds of women affiliated with the Hindu community. The social group (caste) demonstrated that 40 percent, 28 percent, 18 percent and 14 percent were OBCs, Other castes, STs and SCs, respectively. Concerning women's educational status, it was observed that nearly 12 percent of the sample were illiterate, while 18 percent, 36 percent and 34 percent had completed primary, secondary and graduation and above education. The distribution of sample in terms of the MPCE quintile revealed that nearly 38 percent of the sample was in the lowest two wealth quintiles, while nearly 24 percent, 17 percent and 21 percent were in the middle, richer and richest quintiles, respectively. Less than one-third of the sample was covered by any health insurance schemes.

Socio-economic and demographic differentials in maternity spending by source of care

Table 2 presents the socio-economic and demographic differentials in mean spending on maternity care by type of health facility in 2017-18, expressed in INR at 2017 price. Overall, the component-wise mean maternity cost was much more expensive in a private health facility than the public ones. As results were shown in Table 2, India's average expenditure incurred in a private health facility for ANC (INR 6963), delivery (INR 22,492) and PNC (INR 2966) were manifold higher than that in a public health facility for ANC (INR 1505), delivery (INR 3683), and PNC (INR 988), respectively. It indicates that women prefer to utilize less health care services from the public facility over private due to poor quality of care, fewer health professionals and doctors, inadequate infrastructure and unavailability of health facilities in the public sector. Furthermore, the extent of average expenditure incurred on childbirth, ANC, and PNC in a private health facility was six, four and three times higher than that from a public health facility, respectively.

However, mean spending on maternity care by source of health facility varied significantly across socio-economic, demographic and regional factors. With respect to the place of residence, women in urban areas incurred much higher expenditure on maternity care in a private

facility (ANC = INR 7763, delivery care = INR 26,233, PNC = INR 1245), followed by a public facility (ANC = INR 1921, delivery care = INR 6720, PNC = INR 1245) compared with those who were living in rural counterparts, respectively.

The mean maternity cost by type of health provider was much higher among women in the age group of 35-49 years, while it was considerably lower among women in the age group of 15-24 years. With respect to educational attainment, the mean spending on ANC, childbirth and PNC increased with an increase in the level of education up to higher education in public and private health facilities, while the lowest spending was observed among women who had illiterate. Likewise, the mean ANC and delivery costs by source of care substantially increased with an increase in social order up to general or other castes.

Table 1 Descriptive statistics of the study variables on maternal healthcare expenditure, India, 2017-18

Variable	*n*/Categories	Mean (INR)/%	SD/SE	±95% CI	Min	Max
Outcome variables						
Public ANC expenditure	9,928	7333	7451.13	±293.17	0	150000
Private ANC expenditure	21,349	1672	2837.60	±76.13	0	133920
Public delivery expenditure	9,073	23049	23267.94	±957.67	0	626500
Private delivery expenditure	18,085	5152	10558.36	±307.78	0	419580
Public PNC expenditure	8,936	3104	5392.44	±223.64	0	100000
Private PNC expenditure	17,364	1093	2184.23	±64.98	0	85000
Correlates (n= 29,769)						
Age Group	15-24	36.24	0.0028	±0.0109		
	25-34	56.32	0.0029	±0.0113		
	35-49	07.44	0.0015	±0.0060		
Place of residence	Rural	58.66	0.0029	±0.0112		
	Urban	41.34	0.0029	±0.0112		
Women education	Illiterate	11.79	0.0019	±0.0073		
	Primary	17.81	0.0022	±0.0087		
	Secondary	36.29	0.0028	±0.0109		
	Higher & above	34.11	0.0027	±0.0108		
Religion	Hindu	75.43	0.0025	±0.0098		
	Muslim	14.94	0.0021	±0.0081		
	Others	09.63	0.0017	±0.0067		
Social group	SCs	13.61	0.0020	±0.0078		
	STs	18.01	0.0022	±0.0087		
	OBCs	40.41	0.0028	±0.0111		
	Others	27.97	0.0026	±0.0102		
MPCE quintile	Poorest	18.20	0.0023	±0.0089		
	Poorer	19.94	0.0023	±0.0089		
	Middle	24.16	0.0025	±0.0097		
	Richer	16.54	0.0022	±0.0084		
	Richest	21.16	0.0024	±0.0093		
Insurance	No	82.23	0.0022	±0.0087		
	Any	17.77	0.0022	±0.0087		
Region of residence	North	31.14	0.0027	±0.0105		
	Central	11.97	0.0019	±0.0074		
	East	12.88	0.0019	±0.0076		
	North-east	20.29	0.0023	±0.0091		
	West	0.32	0.0003	±0.0013		
	South	20.33	0.0023	±0.0091		
	Union Territories	3.08	0.0010	±0.0039		

Source: Estimated by authors based on the 75th round of the NSSO, 2019

Note: [a]All '*n*' are unweighted; SD= Standard Deviation; SE= Standard Error; ±CI: difference of upper and lower limit at the 95% Confidence Interval.

Table 2 Socio-economic and demographic differentials in mean maternity spending (in INR at 2017 prices) in source of health provider, India, 2017-18

Correlates	ANC (INR 4234)				Delivery Care (INR 13,088)				PNC (INR 1977)			
	Public	±95% CI	Private	±95% CI	Public	±95% CI	Private	±95% CI	Public	±95% CI	Private	±95% CI
Age group												
15-24	1357	3	6209	15	3353	11	19671	48	940	3	2776	14
25-34	1451	4	6965	16	3021	17	23891	57	993	3	3078	11
35-49	1359	14	7899	80	4036	27	26737	185	1153	20	3640	59
Place of residence												
Rural	1278	3	6023	14	2995	8	19856	40	917	2	2881	11
Urban	1921	7	7763	20	6720	39	26233	74	1245	6	3180	14
Women education												
Illiterate	1033	6	5848	49	2646	16	16163	84	829	4	2188	14
Primary	1191	4	6080	26	2694	10	17540	88	934	4	2297	15
Secondary	1489	4	6102	17	3716	16	20139	57	983	5	2770	15
Higher & above	1907	7	7633	18	6189	39	27002	67	1215	6	3596	16
Religion												
Hindu	1451	3	6767	13	3671	12	22892	46	931	2	2849	10
Muslim	1351	8	6091	28	3566	18	19555	71	1184	9	3039	20
Others	1609	12	7783	50	4439	47	26407	186	1132	14	2980	35
Social group												
SCs	948	4	5226	40	2816	21	17039	165	685	4	2718	45
STs	1255	4	6349	33	3102	18	19633	103	922	4	3088	23
OBCs	1428	4	6451	15	3725	15	21490	47	1071	4	3013	13
Others	1758	6	7421	22	4884	28	25713	80	1025	5	2977	15
MPCE quintile												
Poorest	1049	3	5215	26	2690	12	17703	83	825	3	2610	17
Poorer	1372	5	5920	29	3148	16	18437	68	888	3	2747	25
Middle	1532	6	6300	19	3668	18	19462	69	999	4	2855	16
Richer	1656	8	7511	32	4720	29	22075	73	1262	12	2859	19
Richest	1900	10	8138	25	6902	68	29469	94	1277	9	3583	20
Insurance												
No	1347	3	6233	12	3626	11	21274	42	969	2	2907	9
Any	1708	8	7986	30	3852	24	27742	108	1006	11	3281	27
Region of residence												
North	1339	4	6004	25	3086	11	18150	50	1092	3	2868	13
Central	1622	11	6475	28	4839	61	20756	90	841	5	2392	16
East	1028	5	6215	45	2694	22	19580	141	747	6	3032	31
North-east	1580	7	5383	24	3777	20	21131	124	827	5	2319	27
West	3632	137	6559	332	5020	320	29921	1395	3209	108	3568	261
South	2455	11	8832	21	5659	32	26936	68	1182	11	3408	20
Union territories	1898	25	12147	144	6580	159	64240	574	1005	13	7524	150
India	1505	3	6963	13	3683	10	22492	39	988	2	2966	9

Source: Estimated by authors based on the 75th round of the NSSO, 2019

Notes: INR: Indian National Rupees; Public: Public Facility; Private: Private Facility; CI: difference of upper and lower limit at the 95% Confidence Interval.

The mean spending on ANC and delivery care were much higher among Hindus, followed by Muslims, while it was vice-versa for PNC expenditure. In terms of the MPCE quintile, the mean spending on maternity care increased with an increase in wealth status up to the richest quintile in public and private health facilities. Comparing women who belonged to the poorest household, the average expenditure incurred by a richer household was at least 1.5 and 1.4 times higher in both public and private health facilities to avail maternity services. It is worth mentioning that there were handsome differences in mean institutional delivery costs between richest and poorest households, those who gave birth in a private setting spent 6.6 and 4.3 times more money than that in a public setting for seeking better-quality care during childbirth. In addition, the mean expenditure on maternity care was higher for women covered by any health insurance schemes in public or private health facilities. Regarding the region of residence, Table 2 further reveals that the regional variations in mean spending on various maternity components by type of health facility were non-linear patterns.

Multivariate analysis

Table 3 represents the results of the Heckman selection model showing the effects of correlates on ANC expenditure in public and private health facilities. The dependent variables were ANC expenditure in public facilities in the first model (Table 3, columns 1 and 2) and ANC expenditure in private health facilities in the second model (Table 3, columns 3 and 4). In both selection models (Table 3, columns 2 and 4), the coefficients of ANC expenditure in public facilities depended significantly and more likely among urban women, age group of 25-34 years, those who had completed secondary and higher education, social groups up to others, top three wealth quintiles, coverage of any health insurance and women who had lived in the Central, North-east and Southern regions, while it was vice-versa for spending on ANC in private health facilities. Further, Table 3 shows strong significant evidence of the selection effects in both models explaining ANC expenditure in public and private health facilities displayed by the correlation between the error terms, where ρ coefficients were 0.07 and 0.74, those were positively significant. However, in both main models (Table 3, columns 1 and 3), the coefficients such as respondent's age group of 25-34 and 35-49 years, richest wealth quintile, coverage of any health insurance, and those had belonged to the UTs and Southern regions were making significant positive contribution to spending on ANC in public health facilities, while age group of 35-49 years, those had completed up to secondary education, households had middle and richer quintiles and women who had lived in the East, North-east and Western regions were also making significant positive contribution to drive ANC cost in private facilities. Thus, the results indicate that women significantly incurred higher ANC expenditure in public and private health facilities after correcting the selections (Table 3, columns 2 and 4), as they had higher financial ability to pay for ANC in either public or private health facilities.

Table 4 shows the results of the Heckman selection to estimate the factors of delivery expenditure in public and private health facilities. In selection models, the coefficients of delivery expenditure in public facilities (Table 4, column 2) depended significantly and positively among urban women, age

Table 3 Estimated coefficients of Heckman selection model for antenatal care expenditure, India, 2017-19

Correlates	Public expenditure		Private expenditure	
	Main model	Selection equation	Main model	Selection equation
Place of residence *(Rural)*				
Urban	332.438	0.335***	–209.429**	–0.330***
Age group *(15-24)*				
25-34	331.702**	0.044**	8.023	–0.051***
35-49	2183.920***	–0.021	172.317**	0.005
Women education *(Illiterate)*				
Primary	–80.865	–0.024	288.041***	0.080**
Secondary	542.591	0.125***	352.246***	–0.054***
Higher & above	1358.255	0.495***	155.409	–0.402***
Religion *(Hindu)*				
Muslim	–421.061**	–0.036	87.397	0.029
Others	–82.235	–0.045	–84.107**	–0.016*
Social group *(SCs)*				
STs	1364.459	0.429***	33.999	–0.334***
OBCs	912.916	0.579***	–86.757	–0.483***
Others	1812.973	0.713***	–6.042	–0.597***
MPCE quintile *(Poorest)*				
Poorer	114.076	0.024	81.365	–0.015
Middle	386.013	0.066***	138.734**	–0.037***
Richer	783.635	0.210***	297.023***	–0.175***
Richest	1662.274**	0.412***	136.856	–0.360***
Insurance *(No)*				
Any	732.587***	0.119***	–42.461	–0.116***
Region of residence *(North)*				
Central	705.017	0.415***	–276.720**	–0.364***
East	681.150	–0.249***	174.999**	0.267***
North-east	124.531	0.103***	370.836***	–0.045**
West	816.378	–0.059	2050.331***	0.125
South	3227.475***	0.568***	248.069	–0.509***
Union Territories	4031.377***	–0.421***	293.804*	0.402***
Constant	–1946.696	–1.732***	159.177*	1.455***
N	30,293		30,293	
Uncensored observation	9,612		20,132	
Wald chi2(20)	343.65		170.78	
Prob>chi2	0.000		0.000	
ρ	0.077		0.739	

Source: Estimated by authors based on the 75tht round of the NSSO, 2019

Notes: ®: Reference Category: *p*-value: *p<0.10; **p<0.05; ***p<0.01. ρ is the correlation of the error terms of degrees of freedom.

group of 25-34 years, those who had completed graduation and above education, social group up to others, wealth status up to richest quintile, while it was vice-versa for spending on delivery care in private facilities (Table 4, columns 4). Besides, the differences in delivery cost were more significant by the respondent's social and wealth status, an increase in social and wealth status increases the probability of spending on delivery care in public facilities, while vice-versa for spending on delivery care in private facilities. Moreover, Table 4 demonstrates strong significant evidence of the selection effects in both models explaining spending on delivery care in public and private health facilities shown by the correlation between the error terms, where ρ coefficients were 0.77 and 1.00, and both were high and positive. However, in both main models (Table 4, columns 1 and 3), the positive coefficients such as urban women, age group

of 25-34 and 35-49 years, those who had completed graduation and above education, social group up to others, top three MPCE quintiles, coverage of any health insurance and those had lived in the UTs, Central and Southern regions were more likely significant associated with delivery expenditure in public facilities, while urban women and those had belonged in the UTs, East and North-eastern regions were making a significantly positive contribution to delivery expenditure in private facilities. Furthermore, the coefficients such as urban women, social group up to others and coverage of health insurance were less likely to be significantly associated with delivery expenditure in private facilities (Table 4, column 3). It clearly states that higher delivery costs might put all women who sought delivery care at private health facilities as they had a lesser ability to pay for it.

Table 4 Estimated coefficients of Heckman selection model for delivery care expenditure, India, 2017-18

Correlates	Public expenditure		Private expenditure	
	Main model	Selection equation	Main model	Selection equation
Place of residence *(Rural)*				
Urban	4980.332***	0.313***	802.064**	–0.317***
Age group *(15-24)*				
25-34	4082.055***	0.094***	–176.785	–0.132***
35-49	7959.704***	0.050	573.570	–0.024
Women education *(Illiterate)*				
Primary	–2336.992*	–0.132***	–86.011	0.054
Secondary	1464.183	–0.037	–235.143	–0.108***
Higher & above	12062.190***	0.365***	–1288.683**	–0.529***
Religion *(Hindu)*				
Muslim	–3522.215***	–0.077***	372.673	0.123***
Others	1364.573	0.017	211.233	0.017
Social group *(SCs)*				
STs	8818.958***	0.128***	–696.544*	–0.205***
OBCs	13322.880***	0.422***	–2032.903***	–0.512***
Others	18448.710***	0.546***	–2688.499***	–0.640***
MPCE quintile *(Poorest)*				
Poorer	1250.968	0.064**	–146.884	–0.051**
Middle	2646.653*	0.197***	–615.417*	–0.220***
Richer	5692.507***	0.281***	330.093	–0.312***
Richest	13277.070***	0.528***	–1280.181*	–0.550***
Insurance *(No)*				
Any	4190.546***	0.004	–782.299***	–0.033
Region of residence *(North)*				
Central	9535.445***	0.359***	–1594.940***	–0.424***
East	–3321.655*	–0.269***	1166.867***	0.262***
North-east	1644.773	–0.121***	2335.186***	0.144***
West	3460.424	–0.212	1271.115	0.282**
South	14103.340***	–0.346***	–750.329	–0.422***
Union Territories	10968.410***	–0.438	3809.693***	0.429***
Constant	–35080.410***	–1.327***	663.516*	1.678***
N	26,351		26,351	
Uncensored observation	9,007		18,003	
Wald chi2(20)	473.64		211.26	
Prob>chi2	0.000		0.000	
ρ	0.766		1.000	

Source: Estimated by authors based on the 75th round of the NSSO, 2019

Notes: ®: Reference Category: *p*-value: *p<0.10; **p<0.05; ***p<0.01. ρ is the correlation of the error terms of degrees of freedom.

Table 5 demonstrates the results of the Heckman model to estimate the factors of PNC expenditure in public and private health facilities. In both selection models (Table 5, columns 2 and 4), the coefficients of PNC expenditure in public facilities were more likely significant among women in urban areas, age groups of 25-34 and 35-49 years, and those who had completed secondary and higher education, social group up to others, households had poorest to richest quintile, coverage of any health insurance and those had lived in the Central and Southern regions, while women in urban, those had completed graduation and above education, social group up to others, richest quintile, coverage of any health insurances and those had belonged in the Central and Southern regions were less likely significant associated with PNC expenditure in private facilities (Table 5, column 4). However, Table 5 reveals strongly considerable evidence of the selection effects in both models explaining PNC expenditure in public and private health facilities, shown by the correlation between the error terms, where ρ coefficients were 0.64 and 1.00, which were high and positive. In both main models (Table 5, columns 1 and 3), the positive coefficients such as women age group of 25-34 and 35-49 years, those who had completed secondary and graduation and above education, top two MPCE quintiles, coverage of any health insurance and those had resided in the UTs and Southern regions were more likely significant contributed with PNC expenditure in public and private health facilities. After correcting the selection effects, the results further express that women considerably incurred higher expenditure on PNC in public and private health facilities, as they had higher financial means to pay for seeking quality PNC service. Thus, the above results highlighted the significance of considering the selection models while estimating correlates of spending on maternity care in public and private health facilities in India.

Discussion

Financing on maternity care remains the core for a preference of accessing care by type of health facility. Over the last few decades, India has progressed significantly towards utilizing maternity care in the public health sector but not even faster than the private sector (MoHFW, 2019). This nationwide study contributed to a better understanding of the component-wise mean maternity expenditure in public and private health facilities and identified the responsible factors associated with it. With regard to this paper, none of the previous studies has explored all three aspects of maternity care expenditure exhaustively using the latest 75th round of the NSS data. Below, the critical findings of the paper were discussed. The findings suggest that mean delivery cost between public and private health facilities by socio-economic and demographic characteristics varied considerably, while it did not hold true in other aspects of maternity care (ANC and PNC). This finding is consistent with the results of previous studies (Bonu *et al*., 2009; Leone *et al*., 2013; Kumar & Mishra, 2015; Mohanty & Kastor, 2017). The extent of average expenditure of delivery, ANC and PNC in a private health facility were six, four and three times higher than that from a public health facility. The recently published NFHS-5 reported that although many women had visited public health facilities, a good proportion of women had availed of private health facilities with the prospect of getting quality care during childbirth (IIPS & ICF, 2021).

Table 5 Estimated coefficients of Heckman selection model for postnatal care expenditure, India, 2017-18

Correlates	Public expenditure		Private expenditure	
	Main model	Selection equation	Main model	Selection equation
Place of residence *(Rural)*				
Urban	681.882	0.289***	–330.655**	–0.217***
Age group *(15-24)*				
25-34	595.557***	0.123***	95.400*	–0.011
35-49	1577.496***	0.086**	391.699***	0.035
Women education *(Illiterate)*				
Primary	126.934	–0.015	181.817**	0.066**
Secondary	1049.827***	0.116***	171.242**	0.000
Higher & above	2543.065***	0.474***	–223.700	–0.265***
Religion *(Hindu)*				
Muslim	154.436	–0.075***	573.364***	0.115***
Others	–479.694**	–0.021	126.321	–0.021
Social group *(SCs)*				
STs	137.746	0.275***	–179.252*	–0.064**
OBCs	805.055	0.499***	–407.486**	–0.237***
Others	1223.747	0.602***	–657.612***	–0.324***
MPCE quintile *(Poorest)*				
Poorer	46.836	0.034***	–60.692	–0.015***
Middle	466.030	0.157***	–16.301	–0.089***
Richer	958.234**	0.245***	–79.667	–0.190***
Richest	1894.704***	0.465***	–394.411	–0.336***
Insurance *(No)*				
Any	291.073**	0.044**	–187.157**	–0.068***
Region of residence *(North)*				
Central	817.374	0.360***	–892.593***	–0.281***
East	–815.558	–0.262***	327.356**	0.203***
North-east	–877.243***	–0.098***	88.261	0.023
West	–40.975	–0.174	2733.373***	0.362***
South	2082.791***	0.454***	–104.457	–0.192***
Union Territories	733.373**	–0.284***	700.688**	0.453***
Constant	–5973.870*	–1.714***	–1047.194**	0.644***
N	30,293		30,293	
Uncensored observation	8,717		16,593	
Wald chi2(20)	136.37		148.63	
Prob>chi2	0.000		0.000	
ρ	0.639		1.000	

Source: Estimated by authors based on the 75^{tht} round of the NSSO, 2019
Notes: ®: Reference Category: *p*-value: *p<0.10; **p<0.05; ***p<0.01. ρ is the correlation of the error terms of degrees of freedom.

Further, the findings highlighted that the gap in mean maternity cost between public and private health facilities has widened in the last couple of years (NSSO, 2006; Mohanty & Srivastava, 2013; NSSO, 2015; NSSO, 2019). It can be attributed to the absolute gap in average maternity cost as an increase in the number of women opting for quality care in private health facilities and maybe the underestimation of the absolute level of maternity cost in the latest NSS 75th round than the previous estimates (NSSO, 2006; NSSO, 2015). Moreover, the results showed that institutional delivery cost by source of care was much more expensive than the components of other maternity costs. It may be happened due to an increase in the number of caesarean births and associated expenses. Besides, women in well-off households prefer obtaining delivery care from private health facilities due to unsatisfactory and inadequate care

from public health facilities (Skordis-Worrall *et al.,* 2011). Reasons for the shortage of health professionals, poor infrastructure, deficient medicines and diagnostic tests at public hospitals (Leone et al., 2013; Kumar & Mishra, 2015), are the critical factors that may discourage many women from opting for private facilities for the sake of better-quality care that in turn could have pushed them down with exorbitantly higher OOPE.

Place of residence plays crucial and differential roles in deciding maternity cost by type of health facility in India. Urban women were spending higher mean maternity costs in public and private health facilities than their rural counterparts, which suggests that the household's wealth status is significantly higher in urban areas associated with better maternal facilities. Studies have suggested that rural households are paying or borrowing considerable expenses to cover transport, food and accommodation costs to access quality health facilities located in the nearest towns or cities during pregnancy and childbirth, are at the risk of losing their job or monthly wealth capacity and unwillingly falling into extreme poverty, especially poor and marginalized (Bonu *et al*., 2009; Skordis-Worrall *et al.*, 2011; Garg *et al.*, 2012; Mohanty & Srivastava, 2013; Kumar & Mishra, 2015). An interesting finding was that the average ANC and PNC costs by type of health facility were higher among women affiliated with Hindu and Muslim religions. Perhaps women in other religions were of wealthier status and preferred better care in a private facility than public ones. Furthermore, the results show that the component-wise mean maternity cost increases with an increase in women's education level, social order and MPCE quintile in both public and private health facilities, respectively. It may be because women in higher socio-economic status are seeking to improve maternal facilities, take additional care of their health and have the ability to pay for it. It is worth mentioning that the female-headed households (mostly widows) who are poorer than male-headed, are likely to spend much more on maternity care due to having higher decision-making autonomy who had experienced complications during and following pregnancy and childbirth (Meenakshi *et al*., 2000). However, spending on maternity care seems to be very progressive in India. Women who are well educated, general castes and high-income households have higher ability to pay substantial expenses for seeking quality maternal care in private facilities than those less educated/illiterate, SCs and low-income households. For instance, the results show that there was a substantial gap in maternity cost between the richest and the poorest households, e.g. women in wealthier status significantly incurred higher expenditures for seeking quality care. Despite high maternity costs in private facilities, poor women still prefer private facilities more effectively than public ones (Griffiths & Stephenson, 2001). Besides, women who had any insurance spent more on any source of care than those with no insurance. This paper also highlighted that regional variation in maternity cost might be due to variations in the level of education, wealth status, availability and accessibility of maternal health facilities. The regional differentials are widened in remote areas where women still receive inadequate care due to inaccessibility and lack of communication with small towns or cities to get better maternal facilities.

Furthermore, maternity care expenditure in India is directly or indirectly associated with

women's socio-economic and demographic and household's wealth status. The findings of the multivariate analyses confirmed that age group, education, social and wealth status, religion, health insurance and place and region of residence emerged as highly significant correlates contributing to component-wise maternity expenditure in public and private health facilities. The results suggest that women with low/high educated, SCs/other social groups and poorer/richer status were more likely to incur higher expenditure on various aspects of maternity care in public and private health facilities. Interestingly, the findings from this study found that the public and private maternity costs were significantly influenced by social and wealth status in the selection models, indicating that an increase in social and wealth status increases the probability of spending on all three aspects of maternity care in a public health facility, while it was vice-versa for the private health facility across India.

Limitations

This paper used the 75th round of NSS data and was thus subject to study limitations. The present study was limited to currently married women who had used any maternity services at a health care facility (whether public or private) but excluded households in which women used maternity care at a home setting. Neither the previous nor the NSS 75th round collected detailed information on the component-wise maternity care expenditure at a disaggregate level. Unlike the cost of delivery care incurred by households in institutional settings at a disaggregate level, the current NSS 75th round provided information on home delivery care expenditure at an aggregate level. The NSS rounds did not provide any information on supply-side factors that may influence maternity expenditure (NSSO, 2006; NSSO, 2015; NSSO, 2019). Furthermore, the availability of information on various aspects of maternity expenditure has suffered from some of the serious limitations that were reported in earlier NSS rounds and previous studies conducted in India. For instance, studies based on the old datasets (Bonu et al., 2009; Mohanty & Srivastava, 2013; Leone et al., 2013; Mukherjee et al., 2013; Singh et al., 2016; Goli et al., 2016; Mohanty & Kastor, 2017); had methodological constraints, geographical settings and limited or fewer samples (Skordi-Worral et al., 2011; Sambo et al., 2013; Govil et al. 2016; Issac et al., 2016; Goli & Rammohan, 2018) and under-reporting of true maternity cost (NSSO, 2006; NSSO, 2015; NSSO, 2019); and this information is the subjects to potential recall bias. In addition, the concept of accessibility and affordability was not measured directly. Since the data on maternity expenditure were self-reported, there could have been issues of over- or under-estimation. Future NSS surveys on maternity care and related expenditures need to consider the aforementioned limitations to adopt some suitable steps to overcome them.

Conclusion

The findings of this study suggested that the household's wealth status would be a serious curtailment of accessing better-quality maternal services in India. Despite many un/conditional cash transfer schemes implemented by national and state governments toward reducing exorbitantly high OOPE and enhancing the quality of maternity care, these efforts have yet to yield significant improvements. For instance, the JSY and JSSK emerged as a milestone to promote cashless maternal and infant health care facilities and reduce the financial

distress of households, but it was not sufficient to minimize all, and poor and less educated women were not always likely to receive the Voucher to meet additional maternity costs. Here, the estimated average delivery cost is multiple times higher than the *Voucher* received under the JSY. A newly proposed PMSMA has contributed to making safe pregnancies covered over cashless 9.18 lakh high-risk pregnancy cases and 1.89 crores ANC check-ups in approximately 13,672 public health facilities (MoHFW, 2019). The findings suggest that despite having such cashless schemes, the health insurance schemes are not enough to face high spending on maternity care in either public or private health facilities in India. Given the extent of considerable public and private maternity expenditure gaps, the government needs to: improve better-quality maternal facilities, mindful of pregnancy complications, strengthen health infrastructure, priorities state-specific scheme/s, strengthen and extend the *Voucher* amount and increase the awareness of the continuum of maternity care, which can help to reduce the household's financial distress (OOPE/CHS) and sky-high cost in private health centres, especially during childbirth. From a policy perspective, health planners and policymakers should be concerned about adequate health scheme/s to cope with exorbitantly high expenditures on maternity entitlements. Thus, this study has suggested few effective policy implications. For instance, the government need to: improve the accessibility and availability of adequate maternity care in the public health sector, avoid childbirth complications to restrict huge expenses, develop the public-private partnership, implement maternity-specific policy, provide adequate voucher or direct cash transfers to all women are needed to be adopted to reduce the financial distress of households as well as minimize the expenditure gap between public and private health facilities in India. Considering the findings of this paper, the central, along with the state government, should adopt some of the above dominant principles cautiously for policy implication to extend better maternal health outcomes in public settings by ensuring "financial safety" in terms of receiving quality care to all pregnant women, irrespective of their class-caste-religion-region.

Ethical Clearance

The unit-level data from the NSS 75th round dataset used in this study is also available in the public domain. The NSSO took ethical approval before the survey, and thus this study did not require any ethical clearances. The name and place of the respondents were concealed (NSSO, 2019).

Conflicts of interest

The authors have declared no conflicts of interest.

Funding

This research received no specific grant from any funding agency, commercial entity or not-for-profit organization.

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