Research Article

Socioeconomic and regional disparities in safe delivery in India (1990-2006)

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ABSTRACT

Background: Giving birth to a child is not only a strain for the body, but it also puts the woman's health at risk. Globally, nearly 300,000 thousand women die each year as a result of pregnancy related complications. India, with a population of more than 1.21 billion, has the highest maternal mortality in the world (estimated to be 56000 in 2010). Addressing the maternity care needs of women may have considerable ramifications for achieving the Millennium Development Goal (MDG)-5. The proportion of births attended by skilled health personnel (safe delivery) is one of the main indicators used to monitor progress in reaching MDG 5. The main objective of this study was to trace the changes in utilization patterns and determinants of safe delivery care services by women in India, during last one and half decade, 1990-2006.

Methods: Data from three rounds of the Demographic and Health Survey (DHS), known as the National Family Health Survey (NFHS) in India were analyzed. Bivariate and multivariate-pooled logistic regression model were applied to assessing the trends and determinants of safe delivery care services utilization, over one and half decade, 1990-2006 and also fit models stratified by survey periods and with interactions among key socioeconomic predictors to show the extent of disparity in the utilization of safe delivery care services among women belonging to different socioeconomic strata.

Results: The results from analysis indicate that the coverage of safe delivery has increased from 34 percent to 50 percent during the last one and half decade. Overall, it can be said that, there was an improvement in the level of safe deliveries over the period of time. This improvement was somewhere very marginal, but somewhere very pronounced too. The results shows those women's education, husband's education, religion, caste, mass media exposure, birth order and interval, wealth quintile and region of residence were found to be statistically significant determinants in the utilization of safe delivery care services. Women from the Southern region utilizing the highest safe delivery care services compared to other regions.

Conclusions: The region specific inequalities, which were greater than the socioeconomic inequalities, may be reduced by expanding outreach health programs to bring services closer to the disadvantaged. Promoting the use of family planning, female education, targeting vulnerable groups such as poor, illiterate, high parity women, involving media and grass root level workers and collaboration between community leaders and health care system could be some important policy level interventions to address the unmet need of safe delivery care services among women. Maternity programmes should be designed keeping in mind the socioeconomic and geographically context, especially women who belongs to EAG states, India.

Keywords: NFHS, Safe delivery, Antenatal care, Pooled data, MDG, Maternal care

INTRODUCTION

Equal opportunities for health are desirable goal in all societies. It is expected that everyone should have a fair chance to attain their full health potential and that none should be excluded from achieving this. Although the health status in most countries of the world has significantly improved over the past few decades, substantial inequalities in health outcomes among nations, socioeconomic groups and individuals have remained.¹

Improving the health of the poor and reducing health inequalities have become the central goals of many development programs.² Four dimensions in health such as equal access to available care for equal need, equal utilization for equal need, equal quality of care for equal need, and equity in outcome are emphasized to promote health equity.³ Previous studies revealed that poverty and ill-health are linked each other's and that poverty and marginalization are the major causes of inequities in health.^{2,4}

The health status of the poor requires to be understood by their social conditions including access to the basic needs and amenities like food, drinking water, housing, education, employment, transport and communication.⁵ The socioeconomic well-being of the poorer section of the community has deteriorated in many developing countries in relative terms because the rural poor were generally denied access to resources needed to them by which they could improve their own incomes and living conditions.⁶

The poor and women are expected to suffer a greater burden of ill health than do the rest of the population particularly during pregnancy and childbirth. The need of the expansion of reproductive health services in developing countries has now been recognized than ever and more than 500,000 maternal deaths that occur every year of which a quarter to a third of all deaths is the result of complications of pregnancy.⁷

The regional variation in reproductive health outcome is also very wide and more than 99% of maternal deaths occur in developing countries. Studies show that a woman living in Africa has 200 times greater risk of dying from complications related to pregnancy than a woman living in an industrialized country.⁷ Acknowledging the importance of the issue, the United Nations focused on improving maternal health in the Millennium Development Goals to reduce Maternal Mortality Ratio (MMR) by 75% percent during 1990-2015.⁸

Several studies has documented the fact that poor availability of services is a one of the factor in non-use of skilled attendants during childbirth, but even in areas where these services are available certain groups of women, belonging poorest economic strata, illiterate, and

rural backgrounds, non-using properly these services.⁹⁻¹¹ Several studies have been indicated that countries which have improved their maternal health care services are successful in reducing the maternal morbidity or mortality.¹²⁻¹⁴

However every women need access to all maternal care during the pregnancy and child birth. Therefore it is very imperative that all the births delivery at home should be attended by skilled health professionals, as timely delivery care, proper management and careful treatment can make the difference between life and death. Several post research on demographic behaviour has indicated that much disparities in the northern and southern states of India.¹⁵⁻¹⁸

A few attempts have been made to understand the trends in safe delivery care services utilization by women in India, over time period. To feel the gap, present study going to investigate the differentials in the use of safe delivery care services by women in India (1990-2006) and further, this study also traces the changes in utilization patterns and determinants of safe delivery care services by socioeconomic and regional background of women during last one and half decade, 1990-2006.

METHODS

This study is based on three rounds of the Demographic and Health Survey (DHS) data, known as the National Family Health Survey (NFHS) in India, which were canvassed during 1992-93 (NFHS-1), 1998-99 (NFHS-2), and 2005-06 (NFHS-3).¹⁹⁻²¹ These surveys used a multistage stratified sampling design. The NFHS is a standard large-scale survey in India, which provides nationally representative estimates on issues related to family welfare, maternal and child health care, and nutrition.

Different rounds of NFHS collected information related to place of delivery and assistance during delivery (childbirth) for different reference periods. In NFHS-1 (1992-93), information was collected for the last three births to women in the four years preceding the date of survey. Similarly, in NFHS-2 (1998-99), information was collected for the last two births in the three years preceding the date of survey. However, in NFHS-3 (2005-06), information was collected for the last three births in the five years preceding the date of survey.

Considering these inconsistencies across the three surveys, the sample for this study was limited to the information for the last birth in the three years preceding the date of survey. Required information/data in states of Sikkim was missing in NFHS-1.

Therefore, in order to retain consistency, samples for Sikkim were excluded from the final analytic samples. Appropriate sample weights were used taking into account the survey design. The details of the sampling

weights as well as extensive information on survey design, data collection, and management procedures are described in the NFHS reports of the respective rounds.¹⁹⁻²¹

Outcome variables

The dependent variable, safe delivery was assessed with delivery conducted either in a medical institution or home deliveries assisted by doctor/nurse/Lady Health Visitor (LHV)/Auxiliary Nurse Midwife (ANM)/other health professionals.²² Yes: coded as 1 and No: coded as 0.

Predictor variables

All models control for a wide range of socioeconomic and demographic predictors such as age of the woman, women's education, husband's education, women's occupation, husband's occupation religion, social group, mass media exposure, birth order and interval, status of child, wealth quintile, place of residence, city wise residence and region of residence were included as predictor variables in the study. Mother's age at birth was categorized into, five age group as 15-19, 20-24, 25-29, 30-34 and 35-49 years of age.

The educational level of the women and their husbands was defined using years of schooling and they were grouped into illiterate, literate but below primary, primary but below middle school, middle but below high school, and high school and above. The religion of the mother was categorized as Hindu, Muslim, and others (Sikh, Christians, Buddhist and others). Identification of the social group was based on the women's self-reporting, Scheduled Castes (SCs), Scheduled Tribes (STs) and Other than SC/ST.

Mass media exposure has been assessed by considering how often the respondents read the newspaper, listen to the radio and watch television or cinema. The birth order of children of women and the interval between the child births were grouped as first birth order, birth order 2/3 and interval ≤ 24 , birth order 2/3 and interval >24 , birth order-4+ and interval ≤ 24 and birth order-4+ and interval >24 .

Similarly, household wealth was also calculated from the standard set of assets owned by the household, which included ownership of consumer items and dwelling characteristics. Individuals were ranked on the basis of their household scores and divided into different quintiles, each representing 20 percent of the score, between 1 (poorest) and 5 (wealthiest).²³

Previous studies indicated that the regional variation in the utilization of maternal health care services, this study also try to adjust the estimates for region of residence.²³ For this purpose, India was divided into six regions based on geographical location and cultural settings. The six regions consist of North (Jammu and Kashmir, Himachal

Pradesh, Punjab, Haryana, Rajasthan, Delhi and Uttaranchal), Central (Uttar Pradesh, Madhya Pradesh and Chhattisgarh), East (Bihar, Jharkhand, West Bengal and Orissa), North-East (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura), West (Gujarat, Maharashtra and Goa), and South (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu).

Analytical approach

To identify the factors associated with safe delivery care services among women, bi-variate and multivariate-pooled logistic regression analyses were performed. As the sampling design of the NFHS offers an opportunity to make all the three rounds of data comparable, several earlier studies have pooled the different rounds of DHS/NFHS datasets to observe changes over time.²⁴⁻²⁷

Bi-variate analyses were performed to examine the nature of association between safe delivery care services and selected socioeconomic and regional background characteristics. However, binary logistic regression was applied to investigate which factors best explain and predict the utilization of safe delivery care. In the bi-variate analysis, using the Chi-square test, significant variables were identified and those were included in the binary logistic regression model. Cochran-Armitage tests were used to test linear time trend estimates, while χ^2 (Chi squared) tests were used for nonlinear trends with tests adjusted for complex survey design.^{28,29}

The whole analysis was performed using SPSS version 20.0 and STATA version 13.0. To take into account the survey design (i.e. sampling weights with clustering and strata) while estimating bivariate and multivariate statistics, the SVY command in STATA was used.^{30,31} The present study used pooled multivariate logistic regression models to assess the influence or the strength of selected key socioeconomic predictors.

The models were adjusted for a set of socioeconomic and regional factors. In addition the present study also fit models stratified by survey periods and with interactions among key socioeconomic predictors to show the extent of disparity in the utilization of safe delivery care services among women belonging to different socioeconomic and regional strata. The interactions between the predictor of interest and the survey periods in the pooled dataset were analyzed using Wald tests. For unambiguous presentation of the logit models with number of interaction terms, we report the model-based predicted probabilities (PP), and also proportion of women according to different socioeconomic strata, along with their 95% CI.

Ethical consideration

Present study is based on data available in public domain, therefore no ethical issue is involved. I wish to thank the

DHS (NFHS) for making this data available for this study.

RESULTS

Profile of respondents

Table 1 represents the weighted percentage distribution of the women age group 15–49 years, who had delivered the last child during the three years preceding the survey by select socioeconomic characteristics. Majority of the women almost two third had given birth between ages 20–29 years irrespective of time period. About two third 64 percent women were illiterate during 1990–93 while more than half 52% and more than two fifth 47% women were illiterate during 1996–99 and 2003–2006 respectively, and majority of them belonged to the Hindu

religion irrespective of time period. The social group wise distribution shows that most of the mothers were from other than SC/ST group.

More than two third 69% during 2003–06 whereas more than two fifth 47% during 1990–93 and 44% during 1996–99 women had mass media exposure. Among the respondents, almost three-fourth of the respondents belonged to the rural area and about 25% of the respondents belonged to the poorest wealth quintile irrespective of survey time period. Women who had experience of childbirth in their maternal age, almost one third were belonged to the central regions and more than one fifth from Eastern regions of India.

Table 1: Percentage distribution of women who had at least one live birth in their maternal age (aged 15–49) during the last three years preceding the survey by selected background characteristics, in India, 1992–2006.

Background characteristics	NFHS-1 (1990–93)		NFHS-2 (1996–99)		NFHS-3 (2003–06)	
	%	n	%	n	%	n
Maternal age						
15–19	12.2	3205	13.0	3482	09.9	1930
20–24	37.1	10923	38.9	12123	38.9	9053
25–29	28.7	9128	29.3	10078	30.8	8248
30–34	14.3	4531	12.6	4522	13.6	3965
35–49	07.8	2469	06.3	2328	06.8	1950
Women's education						
Illiterate	63.72	17617	52.05	12387	47.47	9654
Literate but below primary	06.51	2062	09.15	2313	06.83	1801
Primary but below middle	11.79	3850	06.85	1803	6.95	1680
Middle but below high school	07.05	2525	16.66	4484	28.85	8387
High school and above	10.92	4131	15.29	4314	9.9	3624
Husband's education						
Illiterate	35.71	9784	28.87	6764	28.14	5769
Literate but below primary	08.81	2619	09.33	2288	07.33	1800
Primary but below middle	15.93	4756	16.44	4153	15.57	3787
Middle but below high school	12.85	4232	14.38	3932	17.41	4574
High school and above	26.7	8724	30.98	8164	31.55	8998
Women's occupation						
Not working	73.23	21807	68.27	17492	65.73	16933
Agricultural work	17.62	5484	25.54	6055	23.87	5084
Skilled/Unskilled work	06.41	1901	03.71	877	06.56	1612
Professional work	02.73	1088	02.49	877	03.84	1498
Husband's occupation						
Not working	02.92	825	02.66	688	01.1	307
Agricultural work	40.7	11317	38.84	9154	30.17	6416
Skilled/Unskilled work	31.19	9482	35.33	8940	42.01	10216
Professional work	25.19	8644	23.18	6519	26.72	8109
Religion						
Hindu	79.61	23006	79.72	18858	78.31	17406
Muslim	15.11	4016	14.97	3579	16.96	4203
Others	05.28	3258	05.31	2835	04.72	3537
Social group						
Scheduled caste (SCs)	12.98	3835	20.07	4653	20.88	4,405
Scheduled tribe (STs)	09.29	3858	09.97	3730	09.76	3,963

Others than SCs/STs	77.74	22587	69.96	16918	69.36	15,874
Mass media exposure						
No exposure	52.08	14523	55.84	10377	30.7	5830
Any exposure	47.92	15757	44.16	14924	69.3	19316
Birth order and interval						
Birth order 1	25.85	8040	27.94	7070	29.25	7770
Birth order-2/3 and interval≤24	11.69	3710	12.17	3079	13.5	3482
Birth order-2/3 and interval>24	30.79	9325	32.76	8174	31.59	8059
Birth order-4+ and interval≤24	07.21	2117	06.25	1647	06.52	1523
Birth order-4+ and interval>24	24.47	7088	20.88	5331	19.14	4312
Status of the child						
Wanted	76.68	23155	79.19	20021	78.41	19755
Unwanted	23.32	7119	20.81	5280	21.59	5390
Wealth quintile						
Poorest	25.29	6281	24.97	5484	24.86	4375
Poorer	25.27	6527	24.76	5680	22.1	4556
Middle	20.56	6420	20.39	5456	19.38	5062
Richer	16.49	5877	17.76	4961	18.29	5554
Richest	12.38	4617	12.13	3720	15.37	5599
Type of residence						
Urban	23.03	8251	22.85	6733	25.85	9683
Rural	76.97	22029	77.15	18568	74.15	15463
City-wise residence						
Capital, large city	06.99	2327	05.59	2355	08.41	4332
Small city	07.55	2486	06.73	1359	07.12	1582
Town	08.49	3438	10.53	3019	10.32	3769
Countryside	76.97	22029	77.15	18568	74.15	15463
Region						
North	11.87	6841	13.09	6061	12.85	4533
Central	29.49	7134	24.07	4626	28.82	5542
East	22.2	4983	24.02	4686	25.5	4026
Northeast	04.19	3330	03.56	3504	03.87	4519
West	13.22	3257	14.37	2732	12.89	2886
South	19.02	4735	20.89	3692	16.06	3640
Total	100.0	30280	100.0	25301	100.0	25146

Differentials in Safe delivery

Table 2 shows the weighted percentage of women who have utilized safe delivery care during last birth by selected background characteristics. The proportion of women availing themselves safe delivery care services in India increased by nearly ten percentage points from a level of 34.3% during 1990–93 to 44.7% during 1996-99 while nearly five percentage points from a level of 44.7% during 1996-99 to 49.9% during 2003-06.

However, there was an increase of nearly 16 percentage points from a level of 34.3% during 1990–93 to 49.9% during 2003-06. A considerable growth in the level of safe delivery utilization was observed in the women belonging to the Scheduled caste (SC) and Scheduled Tribes (ST). The prevalence (%) of safe delivery among Scheduled Tribes (ST) women grew by 78%, Scheduled Caste women grew by 77%, compared to an increase of about 44% among others then Scheduled Caste/ Scheduled Tribes women. A considerable increase was

observed in the proportion of safe delivery availed by uneducated women and also women whose husbands were uneducated. The prevalence (%) of safe delivery among uneducated women grew by 53%, compared to an increase of about 9% among women who had been completed their high school and above education.

Women whose husbands were uneducated grew 62%, compared to an increase of about 28% among women whose husbands had been completed their high school and above education. The proportion of women availing themselves safe delivery care in India increased by 16 percentage points from a level of 34.3% during 1990–93 to 49.9% during 2003-06. A considerable growth in the level of use of safe delivery care services was observed in the poorest, poorer, middle and the richest wealth quintiles. The prevalence (%) of safe delivery among poorest quintile women grew by (46%), poorer wealth quintile women grew by (73%), middle wealth quintile women grew by (58%), compared to an increase of about 11% among women who were belongs to richest wealth

quintile. The prevalence (%) of safe delivery among rural women grew by 63%, compared to an increase of about 13% among urban women. A considerable growth is

higher in the level of use of safe delivery care services was observed in the North, Central, East and Northeast regions as compared to West and South regions.

Table 2: Percentage of women who experiencing safe delivery by selected background characteristics, in India, 1990-2006.

Background characteristics	NFHS-1 (1990-93)		NFHS-2 (1996-99)		NFHS-3 (2003-06)		Relative change (%)			P-trend
	%	95% CI	%	95% CI	%	95% CI	a	b	c	d
Maternal age	$\chi^2=268.657^{***}$		$\chi^2=217.175^{***}$		$\chi^2=278.124^{***}$					
15-19	33.1	[31.0-35.2]	42.4	[39.8-45.1]	47.0	[44.0-50.1]	28.1	10.8	42.0	0.001
20-24	37.3	[35.7-38.8]	48.4	[46.6-50.2]	53.2	[51.4-55.1]	29.8	09.9	42.6	0.030
25-29	36.5	[34.9-38.1]	45.7	[43.7-47.9]	52.2	[50.2-54.3]	25.2	14.2	43.0	0.080
30-34	30.6	[28.8-32.4]	39.6	[37.2-42.1]	44.8	[42.2-47.5]	29.4	13.1	46.4	0.062
35-49	21.2	[19.3-23.3]	31.7	[28.9-34.5]	34.0	[30.8-37.3]	49.5	07.3	60.4	0.033
Women's education	$\chi^2=7206.356^{***}$		$\chi^2=5341.654^{***}$		$\chi^2=5318.845^{***}$					
Illiterate	18.4	[17.5-19.4]	25.1	[23.7-26.5]	28.2	[26.6-29.8]	36.4	12.4	53.3	0.002
Literate but below primary	42.8	[39.4-46.3]	45.3	[42.4-48.2]	49.7	[46.4-53.1]	05.8	09.7	16.1	0.187
Primary but below middle	51.7	[49.3-54.2]	52.0	[49.1-54.8]	50.8	[47.5-54.0]	00.6	-02.3	-01.7	0.000
Middle but below high school	64.3	[61.4-67.1]	66.5	[64.5-68.6]	70.9	[69.0-72.6]	03.4	06.6	10.3	0.000
High school and above	84.4	[82.7-86.0]	84.8	[83.1-86.5]	92.3	[90.7-93.6]	00.5	08.8	09.4	0.188
Husband's education	$\chi^2=3117.027^{***}$		$\chi^2=2488.377^{***}$		$\chi^2=2897.297^{***}$					
Illiterate	17.0	[15.9-18.1]	24.9	[23.2-26.6]	27.5	[25.7-29.5]	46.5	10.4	61.8	0.004
Literate but below primary	30.8	[28.4-33.3]	36.5	[33.9-39.2]	39.8	[36.6-43.1]	18.5	09.0	29.2	0.029
Primary but below middle	35.0	[32.9-37.1]	42.7	[40.6-44.9]	49.4	[46.9-51.9]	22.0	15.7	41.1	0.037
Middle but below high school	40.4	[38.3-42.5]	49.7	[47.4-51.9]	53.4	[50.9-55.8]	23.0	07.4	32.2	0.369
High school and above	55.5	[53.6-57.5]	64.5	[62.6-66.4]	71.0	[69.1-72.8]	16.2	10.1	27.9	0.385
Women's occupation	$\chi^2=860.524^{***}$		$\chi^2=1001.012^{***}$		$\chi^2=1316.229^{***}$					
Not working	37.3	[36.0-38.8]	49.5	[47.9-51.2]	56.2	[54.4-58.1]	32.7	13.5	50.7	0.005
Agricultural work	19.8	[18.2-21.5]	28.6	[26.7-30.5]	31.5	[29.4-33.7]	44.4	10.1	59.1	0.194
Skilled/Unskilled work	28.6	[25.7-31.8]	49.9	[44.1-55.7]	40.3	[36.5-44.2]	74.5	-19.2	40.9	0.000
Professional work	60.2	[55.6-64.5]	69.7	[64.3-74.6]	71.2	[67.2-74.9]	15.8	02.2	18.3	0.008
Husband's occupation	$\chi^2=2340.853^{***}$		$\chi^2=1681.538^{***}$		$\chi^2=1313.071^{***}$					
Not working	39.2	[35.0-43.5]	50.6	[45.4-55.7]	51.9	[44.5-59.2]	29.1	02.6	32.4	0.000
Agricultural work	21.0	[19.9-22.2]	31.4	[29.7-33.1]	37.5	[35.4-39.7]	49.5	19.4	78.6	0.000
Skilled/Unskilled work	35.0	[33.2-36.8]	45.6	[43.6-47.6]	47.5	[45.4-49.5]	30.3	04.2	35.7	0.928
Professional work	54.4	[52.1-56.7]	65.1	[62.7-67.4]	67.5	[65.3-69.5]	19.7	03.7	24.1	1.488
Religion	$\chi^2=369.338^{***}$		$\chi^2=222.529^{***}$		$\chi^2=187.749^{***}$					
Hindu	33.7	[32.5-35.0]	43.9	[42.3-45.5]	50.9	[49.1-52.6]	30.3	15.9	51.0	0.007
Muslim	29.9	[26.7-33.3]	41.9	[38.8-45.1]	41.9	[38.1-45.8]	40.1	00.0	40.1	0.165
Others	55.7	[51.5-59.9]	64.4	[60.3-68.2]	62.1	[57.3-66.7]	15.6	-03.6	11.5	0.244
Social group	$\chi^2=749.463^{***}$		$\chi^2=722.060^{***}$		$\chi^2=716.292^{***}$					
Scheduled caste (SCs)	24.2	[22.2-26.3]	38.6	[36.4-40.9]	43.1	[40.5-45.8]	59.5	11.7	78.1	0.217
Scheduled tribe	16.1	[14.0-18.4]	22.8	[19.9-26.0]	28.5	[25.6-31.5]	41.6	25.0	77.0	0.225

(STs)										
Other than SCs/STs	38.2	[36.8-39.7]	49.5	[47.8-51.2]	55.2	[53.3-57.1]	29.6	11.5	44.5	0.002
Mass media exposure	$\chi^2=4225.614^{***}$		$\chi^2=3551.049^{***}$		$\chi^2=2490.374^{***}$					
No exposure	17.3	[16.4-18.3]	23.7	[59.6-63.2]	26.2	[24.6-28.0]	54.9	-57.3	51.4	0.000
Any exposure	52.8	[51.0-54.6]	61.4	[22.5-24.9]	60.3	[58.6-62.0]	-55.1	54.4	14.2	0.006
Birth order and interval	$\chi^2=1791.430^{***}$		$\chi^2=2111.222^{***}$		$\chi^2=2612.384^{***}$					
Birth order 1	49.0	[47.2-50.8]	63.2	[61.2-65.3]	68.8	[67.0-70.6]	29.0	08.9	40.4	0.077
Birth order-2/3 and interval $\leq$ 24	38.8	[36.6-41.0]	46.7	[44.1-49.4]	50.9	[48.4-53.4]	20.4	09.0	31.2	0.175
Birth order-2/3 and interval $>$ 24	36.0	[34.4-37.7]	45.0	[43.0-47.0]	51.7	[49.7-53.8]	25.0	14.9	43.6	0.056
Birth order-4+ and interval $\leq$ 24	21.1	[18.9-23.6]	25.4	[22.8-28.3]	25.0	[22.3-28.1]	20.4	-01.6	18.5	0.193
Birth order-4+ and interval $>$ 24	18.4	[17.3-19.6]	24.1	[22.5-25.7]	25.5	[23.6-27.6]	31.0	05.8	38.6	0.023
Status of the child	$\chi^2=0.261$		$\chi^2=9.951^{***}$		$\chi^2=162.941^{***}$					
Wanted	34.4	[33.1-35.7]	45.2	[43.5-46.8]	52.0	[50.3-53.7]	31.4	15.0	51.2	0.026
Unwanted	34.1	[32.4-35.8]	42.7	[40.6-44.9]	42.2	[39.9-44.5]	25.2	-01.2	23.8	0.039
Wealth quintile	$\chi^2=6657.683^{***}$		$\chi^2=5639.613^{***}$		$\chi^2=6029.901^{***}$					
Poorest	14.6	[13.5-15.8]	18.5	[17.0-20.1]	21.3	[19.6-23.1]	26.7	15.1	45.9	0.107
Poorer	19.6	[18.3-21.0]	30.2	[28.5-31.9]	34.0	[31.9-36.1]	54.1	12.6	73.5	0.005
Middle	33.1	[31.3-35.1]	48.3	[46.3-50.4]	52.4	[50.0-54.8]	45.9	08.5	58.3	0.006
Richer	55.2	[52.8-57.6]	68.4	[66.1-70.5]	70.6	[68.5-72.7]	23.9	03.2	27.9	0.087
Richest	82.1	[80.1-84.0]	88.5	[86.7-90.1]	91.0	[89.7-92.2]	07.8	02.8	10.8	0.034
Type of residence	$\chi^2=4197.659^{***}$		$\chi^2=2831.315^{***}$		$\chi^2=2625.344^{***}$					
Urban	66.7	[64.0-69.2]	75.6	[72.8-78.2]	77.2	[74.7-79.6]	13.3	02.1	15.7	0.043
Rural	24.7	[23.3-26.1]	35.6	[34.0-37.2]	40.3	[38.6-42.0]	44.1	13.2	63.2	0.004
City-wise residence	$\chi^2=4441.944^{***}$		$\chi^2=2926.714^{***}$		$\chi^2=2675.573^{***}$					
Capital, large city	75.6	[70.3-80.2]	83.6	[80.0-86.7]	81.9	[78.5-84.9]	10.6	-02.0	08.3	0.000
Small city	71.2	[67.3-74.9]	79.6	[75.4-83.2]	79.3	[74.3-83.5]	11.8	-00.4	11.4	0.000
Town	55.3	[51.7-58.7]	68.8	[64.5-72.8]	72.0	[67.4-76.1]	24.4	04.7	30.2	0.145
Countryside	24.7	[23.3-26.1]	35.6	[34.0-37.2]	40.3	[38.6-42.0]	44.1	13.2	63.2	0.004
Region	$\chi^2=3479.432^{***}$		$\chi^2=3201.435^{***}$		$\chi^2=3544.256^{***}$					
North	31.8	[29.8-33.9]	44.9	[42.-,47.1]	52.0	[48.4-55.6]	41.2	15.8	63.5	0.000
Central	20.0	[18.0-22.1]	26.8	[24.-29.1]	32.4	[29.9-34.9]	34.0	20.9	62.0	0.016
East	24.2	[21.8-26.7]	32.4	[30.0-34.9]	39.4	[36.2-42.6]	33.9	21.6	62.8	0.023
Northeast	22.9	[19.6-26.5]	28.9	[25.0-33.1]	36.8	[32.1-41.7]	26.2	27.3	60.7	0.771
West	51.5	[47.1-55.9]	58.3	[53.8-62.7]	70.3	[66.5-73.9]	13.2	20.6	36.5	0.057
South	60.5	[57.5-63.5]	73.1	[70.3-75.9]	82.9	[80.4-85.1]	20.8	13.4	37.0	0.002
Total	34.3	[33.1-35.6]	44.7	[43.1-46.3]	49.9	[48.2-51.5]	30.3	11.6	45.5	0.028

aCalculated as relative change = [(period 2 %-period 1%)/period 1%*100]; bCalculated as relative change = [(period 3 %-period 2%)/period 2%*100]; cCalculated as relative change = [(period 3 %-period 1%)/period 1%*100]; dBased on Cochran-Armitage time trend analyses (for linear trend) and χ^2 analyses (for nonlinear trend) with Rao-Scott adjustments to assess significant trends over time.

Determinants of safe delivery

Table 3 demonstrates the results of the multivariate analysis of the utilization of safe delivery care services by women in India during 1990-2006. The results shows those women's education, husband's education, religion, caste, mass media exposure, birth order and interval, wealth quintile and region of residence were found to be statistically significant determinants in the utilization of safe delivery care services. As expected, utilization of safe delivery care services increases with the increase of women's educational level. Compared with uneducated

women, those with high school and above education were more likely to use safe delivery care services (OR=4.454, 95% CI=1.191-1.565) during 1990-93, (OR=2.909, 95% CI=2.477-3.416) during 1996-99 and (OR=3.936, 95% CI=3.093-5.009) during 2003-06.

Although husband's education appeared to be a significant factor for the utilization of safe delivery care services, but it was not as strong a factor as women's education. The likelihood of using safe delivery care services was low among women belonging to Muslim (OR=0.700, 95% CI=0.603-0.814) during 1990-93,

(OR=0.793, 95% CI=0.702-0.896) during 1996-99 and (OR=0.677, 95% CI=0.579-0.791) during 2003-06, compared with women belonging to the Hindu religion.

The probability of utilizing safe delivery care services was found to be less among Scheduled Tribe (OR=0.781, 95% CI=0.616-0.990) during 1990-93, (OR=0.679, 95% CI=0.564-0.818) during 1996-99 and (OR=0.693, 95% CI=0.569-0.845) during 2003-06, compared with women belonging to the Scheduled caste while the probability of utilizing safe delivery care services was found to be more likely among women who belongs other than SC/ST caste as compared to Scheduled caste women. Women who had any exposure of mass media were more likely to use safe delivery care services (OR=1.231, 95% CI=1.122-1.350), during 1990-93, (OR=1.150, 95% CI=1.048-1.263) during 1996-99 and (OR=1.203, 95% CI=1.076-1.345) during 2003-06, compared than women who did not have any mass media exposure.

Birth order was also found to be a significant determinant in the utilization of safe delivery care services. Women who had previous experience of childbirth were less

likely to utilize safe delivery care services compared with those women who experienced childbirth for the first time. Rural women, compared with their urban counterparts, were less likely to undergo safe delivery (OR=0.477, 95% CI=0.388-0.515), (OR=0.506, 95% CI=0.439-0.583) and (OR=0.561, 95% CI=0.483-0.651) over the period 1990-93, 1993-96 and 2003-06 respectively. After women's education, the economic status of women was one of the most significant determinants in the utilization of safe delivery care services.

As compared with women who were poorest wealth quintile, the women from the richest wealth quintile, were 3.7 times (95% CI=2.953-4.554) during 1990-93, 5.4 times (95% CI=2.953-4.554) during 1996-99 and 5.9 times (95% CI=4.703-7.492) during 2003-06, more likely to use safe delivery care services. The odds of utilization of safe delivery care services were higher in the South region (OR=5.879, 95% CI=5.029-6.871), during 1990-93, (OR=3.141, 95% CI=1.716-3.126), during 1996-99 and (OR=5.259, 95% CI=4.255-6.501) during 2003-06 compared with the North region.

Table 3: Socioeconomic and demographic predictors for women who accessing safe delivery care services, in India, 1990–2006.

Background characteristics	NFHS-1 (1990–93)		NFHS-2 (1996–99)		NFHS-3 (2003–06)	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Maternal age						
15-19 (ref)	1.000		1.000		1.000	
20-24	1.226***	[1.084-1.385]	1.317***	[1.159-1.495]	1.376***	[1.189-1.592]
25-29	1.551***	[1.342-1.792]	1.668***	[1.443-1.927]	1.862***	[1.562-2.219]
30-34	1.915***	[1.606-2.284]	2.068***	[1.724-2.480]	1.951***	[1.590-2.394]
35-49	1.804***	[1.456-2.234]	2.197***	[1.736-2.781]	2.368***	[1.823-3.075]
Women's education						
Illiterate (ref)	1.000		1.000		1.000	
Literate but below primary	1.720***	[1.471-2.011]	1.616***	[1.408-1.855]	1.736***	[1.479-2.038]
Primary but below middle	1.958***	[1.733-2.212]	1.651***	[1.417-1.924]	1.457***	[1.241-1.709]
Middle but below high school	2.491***	[2.119-2.927]	2.168***	[1.909-2.461]	1.942***	[1.716-2.198]
High school and above	4.454***	[3.759-5.277]	2.909***	[2.477-3.416]	3.936***	[3.093-5.009]
Husband's education						
Illiterate (ref)	1.000		1.000		1.000	
Literate but below primary	1.309***	[1.118-1.532]	1.123	[0.970-1.301]	1.130	[0.953-1.339]
Primary but below middle	1.294***	[1.135-1.476]	1.092	[0.976-1.222]	1.334***	[1.177-1.513]
Middle but below high school	1.431***	[1.243-1.648]	1.308***	[1.153-1.485]	1.265***	[1.109-1.444]
High school and above	1.365***	[1.191-1.565]	1.179***	[1.045-1.330]	1.221***	[1.058-1.409]
Women's occupation						
Not working (ref)	1.000		1.000		1.000	
Agricultural work	0.715***	[0.630-0.813]	0.793***	[0.713-0.883]	0.892**	[0.791-1.006]
Skilled/Unskilled work	0.895	[0.753-1.065]	1.078	[0.843-1.378]	0.832**	[0.689-1.006]
Professional work	1.160	[0.929-1.450]	1.112	[0.864-1.433]	1.075	[0.855-1.352]
Husband's occupation						
Not working (ref)	1.000		1.000		1.000	

Agricultural work	0.923	[0.733-1.163]	0.861	[0.678-1.092]	0.943	[0.646-1.376]
Skilled/Unskilled work	1.093	[0.857-1.394]	0.955	[0.751-1.213]	1.122	[0.763-1.651]
Professional work	1.128	[0.891-1.429]	1.090	[0.853-1.394]	1.084	[0.740-1.587]
Religion						
Hindu (ref)	1.000		1.000		1.000	
Muslim	0.700***	[0.603-0.814]	0.793***	[0.702-0.896]	0.677***	[0.579-0.791]
Others	1.623***	[1.354-1.945]	1.445***	[1.197-1.743]	1.113	[0.908-1.365]
Social group						
Scheduled caste (SCs) (ref)	1.000		1.000		1.000	
Scheduled tribe (STs)	0.781**	[0.616-0.990]	0.679***	[0.564-0.818]	0.693***	[0.569-0.845]
Other than SC/ST	1.157***	[1.027-1.303]	1.017	[0.901-1.147]	1.170***	[1.044-1.312]
Mass media exposure						
No exposure (ref)	1.000		1.000		1.000	
Any exposure	1.231***	[1.122-1.350]	1.150***	[1.048-1.263]	1.203***	[1.076-1.345]
Birth order and interval						
Birth order 1 (ref)	1.000		1.000		1.000	
Birth order-2/3 and interval≤24	0.533***	[0.470-0.604]	0.380***	[0.332-0.435]	0.409***	[0.354-0.474]
Birth order-2/3 and interval>24	0.534***	[0.481-0.593]	0.392***	[0.351-0.437]	0.402***	[0.357-0.453]
Birth order-4+ and interval≤24	0.325***	[0.272-0.390]	0.250***	[0.206-0.303]	0.245***	[0.196-0.305]
Birth order-4+ and interval>24	0.321***	[0.276-0.373]	0.256***	[0.219-0.300]	0.268***	[0.226-0.318]
Status of the child						
Wanted (ref)	1.000		1.000		1.000	
Unwanted	1.025	[0.934-1.126]	1.076	[0.965-1.199]	0.935	[0.840-1.041]
Wealth quintile						
Poorest (ref)	1.000		1.000		1.000	
Poorer	1.069	[0.943-1.213]	1.313***	[1.164-1.482]	1.230***	[1.076-1.406]
Middle	1.424***	[1.242-1.632]	1.888***	[1.654-2.155]	1.730***	[1.493-2.004]
Richer	2.207***	[1.874-2.600]	2.716***	[2.306-3.199]	2.548***	[2.143-3.031]
Richest	3.667***	[2.953-4.554]	5.443***	[4.327-6.848]	5.936***	[4.703-7.492]
Type of residence						
Urban (ref)	1.000		1.000		1.000	
Rural	0.447***	[0.388-0.515]	0.506***	[0.439-0.583]	0.561***	[0.483-0.651]
Region						
North (ref)	1.000		1.000		1.000	
Central	0.954	[0.804-1.132]	0.683***	[0.580-0.804]	0.742***	[0.616-0.894]
East	1.332***	[1.119-1.585]	1.100***	[0.945-1.280]	1.218**	[1.001-1.481]
Northeast	1.140	[0.923-1.409]	0.697***	[0.565-0.859]	0.735***	[0.581-0.929]
West	3.141***	[2.632-3.749]	1.825***	[1.549-2.151]	2.080***	[1.685-2.568]
South	5.879***	[5.029-6.871]	4.273***	[3.654-4.997]	5.259***	[4.255-6.501]

Levels of significance: *p<0.10; **p<0.05; ***p<0.01; City wise residence was excluded from the multivariate analysis after examining high collinearity between type of residence and city wise residence.

Multivariate-pooled logistic regression results for receiving safe delivery care services

Table 4 presents the results of the pooled logistic regression models to examine the effect of individuals, household and community characteristics on utilization of safe delivery care services by women in India, during last one and half decade, 1990-2006. Along with the adjusted odds ratios, the table provides observed (or unadjusted)

odds ratios for each correlate, which permit direct comparison of observed and adjusted effects.

The study estimated the baseline effect of each variable on utilization of safe delivery care services in the unadjusted model, and then controlled for other variables in the adjusted one. The result from the both model unadjusted and adjusted shows that the time period, maternal age, mother's education, father's education, birth order and birth interval of child, mass media exposure, religion, social group, economic status and

region of residence emerged as significant factors affecting the utilization of safe delivery care services.

The overall probability of women availing themselves of safe delivery care services appeared to increase by only 48% (95% CI=1.379-1.594) between 1990–93 and 1996–99 whereas the probability of women availing themselves of safe delivery care grew by 2 times (95% CI=1.857-2.176) between 1990–93 and 2003–06. The probability of safe delivery increased significantly with the increasing age of women. Women's education transpired as the most influential socio-demographic predictor leading to higher probability of women's availing themselves of safe delivery care services during 1990–2006.

Women with high school and above education were found more than 3 times (95% CI=3.095-3.803), more likely to availing themselves of safe delivery care services as compared to uneducated women. The economic status of women was one of the most significant determinants in the utilization of safe delivery care services after women's education.

The probability increased significantly with the increasing economic level (that is, wealth quintile) of the safe delivery care. As compared with women who were poor, the women from the richest wealth quintile, were 5 times (95% CI=4.448- 5.720) more likely to use safe delivery care services.

Table 4: Socio-economic and demographic determinants of utilization of safe delivery care services in India (1990-2006).

Background characteristics	Bivariate		Multivariate	
	Odds ratio	95% CI	Odds ratio	95% CI
Period				
1990–93 (ref)	1.000		1.000	
1996–99	1.417***	[1.300-1.545]	1.483***	[1.379-1.594]
2003–06	1.903***	[1.738-2.084]	2.010***	[1.857-2.176]
Maternal age				
15-19 (ref)	1.000		1.000	
20-24	1.280***	[1.206-1.358]	1.289***	[1.199-1.387]
25-29	1.217***	[1.142-1.296]	1.690***	[1.550-1.842]
30-34	0.898***	[0.833-0.968]	1.936***	[1.743-2.151]
35-49	0.588***	[0.535-0.646]	2.057***	[1.801-2.349]
Women's education				
Illiterate (ref)	1.000		1.000	
Literate but below primary	2.779***	[2.576-2.998]	1.655***	[1.523-1.797]
Primary but below middle	3.567***	[3.328-3.823]	1.724***	[1.595-1.864]
Middle but below high school	7.262***	[6.813-7.740]	2.102***	[1.953-2.263]
High school and above	20.828***	[19.069-22.750]	3.431***	[3.095-3.803]
Husband's education				
Illiterate (ref)	1.000		1.000	
Literate but below primary	1.949***	[1.842-2.062]	1.209***	[1.109-1.317]
Primary but below middle	2.553***	[2.440-2.671]	1.254***	[1.172-1.343]
Middle but below high school	3.476***	[3.323-3.636]	1.359***	[1.262-1.463]
High school and above	7.006***	[6.737-7.285]	1.286***	[1.194-1.384]
Women's occupation				
Not working (ref)	1.000		1.000	
Agricultural work	0.006***	[0.331-0.356]	0.813***	[0.761-0.868]
Skilled/Unskilled work	0.021***	[0.649-0.733]	0.917	[0.820-1.026]
Professional work	0.097***	[2.382-2.762]	1.10	[0.967-1.258]
Husband's occupation				
Not working (ref)	1.000		1.000	
Agricultural work	0.031***	[0.424-0.546]	0.882*	[0.763-1.020]
Skilled/Unskilled work	0.056*	[0.792-1.012]	1.035	[0.894-1.198]
Professional work	0.124***	[1.712-2.197]	1.094	[0.944-1.268]
Religion				
Hindu (ref)	1.000		1.000	
Muslim	0.820***	[0.753-0.893]	0.721***	[0.667-0.779]
Others	2.121***	[1.922-2.340]	1.402***	[1.257-1.563]
Social group				

Scheduled caste (SCs) (ref)	1.000		1.000	
Scheduled tribe (STs)	0.512***	[0.462-0.568]	0.726***	[0.647-0.814]
Other than SCs/STs	1.533***	[1.440-1.632]	1.116***	[1.042-1.195]
Mass media exposure				
No exposure (ref)	1.000		1.000	
Any exposure	5.149***	[4.893-5.418]	1.190***	[1.126-1.259]
Birth order and interval				
Birth order 1 (ref)	1.000		1.000	
Birth order-2/3 and interval≤24	0.016***	[0.517-0.579]	0.448***	[0.415-0.482]
Birth order-2/3 and interval>24	0.011***	[0.493-0.538]	0.446***	[0.419-0.474]
Birth order-4+ and interval≤24	0.009***	[0.186-0.220]	0.280***	[0.251-0.313]
Birth order-4+ and interval>24	0.006***	[0.178-0.200]	0.289***	[0.265-0.316]
Status of the child				
Wanted (ref)	1.000		1.000	
Unwanted	0.021***	[0.825-0.906]	1.016	[0.959-1.078]
Wealth quintile				
Poorest (ref)	1.000		1.000	
Poorer	1.743***	[1.634-1.860]	1.223***	[1.141-1.312]
Middle	3.667***	[3.423-3.928]	1.699***	[1.572-1.836]
Richer	8.462***	[7.831-9.143]	2.484***	[2.264-2.725]
Richest	32.026***	[28.958-35.418]	5.044***	[4.448-5.720]
Type of residence				
Urban (ref)	1.000		1.000	
Rural	0.184***	[0.169-0.200]	0.509***	[0.470-0.552]
Region				
North (ref)	1.000		1.000	
Central	0.470***	[0.451-0.491]	0.727***	[0.661-0.800]
East	0.625***	[0.598-0.653]	1.177***	[1.068-1.297]
Northeast	0.824***	[0.787-0.863]	0.816***	[0.720-0.924]
West	2.465***	[2.341-2.595]	2.100***	[1.892-2.331]
South	3.416***	[3.253-3.586]	4.679***	[4.246-5.156]

Levels of significance: *p<0.10; **p<0.05; ***p<0.01; OR= Odds ratio; City wise residence was excluded from the multivariate analysis after examining high collinearity between type of residence and city wise residence.

Women belonging to the ST social group appeared to be disadvantaged with 28% less probability to avail themselves of safe delivery compared to SC social group women, whereas women belonging with other than SC/ST social group were found more (OR=1.119 95%CI=1.045-1.198) as compared to SC women. However Muslim women were also almost equally disadvantaged (with 28% less probability) than Hindu women. Similarly, women with birth order-2/3 and interval≤24 had 55% and women with birth order-4+ and interval>24 had 71% less probability to avail themselves of safe delivery care services compared to women with first birth order. Women who had exposure to mass media were more likely to utilize safe delivery care than women who did not have any mass media exposure (OR=1.187 95%CI=1.122-1.255).

Rural women, compared with their urban counterparts, were less likely to undergo safe delivery (OR=1.190, 95% CI=1.126-1.259). The odds of utilization of safe delivery care services were higher in the South region (OR=4.679, 95%CI=4.246- 5.156), followed by the West region (OR=2.100, 95%CI=1.892- 2.331) and East region

(OR=1.177, 95% CI=1.068- 1.297) compared with the North region.

Interaction effect of socioeconomic characteristics in safe delivery

Table 5 presents the adjusted predicted probability (PP) for paired interactions of socioeconomic characteristics of women who accessing safe delivery care services, in India, during last one and half decade, 1990-2006.

Rural women with no education in the poorest wealth quintile were almost 62–65 percentage points less likely to avail safe delivery care services, compared to urban women with high school education and more in the richest wealth quintile during 1990–2006.

Interacting with the social group of women, the probability of availing safe delivery by rural SC/ST women belonging to the poorest wealth quintile was 53-55 percentage points lower compared to urban non-SC/ST women in the richest wealth quintile during last one and half decade, 1990-2006. Similarly, the rural

SC/ST women with no education in the poorest wealth quintile had 63-71 percentage points less probability to avail themselves of safe delivery, compared to urban non

SC/ST women with high school education and more in the richest wealth quintile during last one and half decade, 1990-2006.

Table 5: Adjusted predicted probability (PP) for paired interactions of socioeconomic characteristics of women who accessing safe delivery care services in India, 1990–2006.

Paired interaction of covariates	NFHS-1 (1990–93)		NFHS-2 (1996–99)		NFHS-3 (2003–06)	
	PP	95% CI	PP	95% CI	PP	95% CI
Safe Delivery						
Rural*No education*Q1 ^a	0.273	[0.185-0.361]	0.267	[0.174-0.360]	0.352	[0.214-0.490]
Rural*HS & above*Q5 ^b	0.846	[0.799-0.991]	0.829	[0.654-0.911]	0.906	[0.048-0.960]
Urban*No education*Q1 ^c	0.445	[0.156-0.734]	0.434	[0.119-0.750]	0.317	[0.125-0.509]
Urban*HS & above*Q5 ^d	0.938	[0.260-0.975]	0.945	[0.609-0.998]	0.972	[0.102-0.986]
Rural*SC/ST*Q1 ^e	0.224	[0.101-0.348]	0.259	[0.145-0.373]	0.316	[0.175-0.457]
Rural*Non SC/ST*Q5 ^f	0.644	[0.157-0.845]	0.698	[0.146-0.743]	0.782	[0.475-0.838]
Urban*SC/ST*Q1 ^g	0.393	[0.034-0.820]	0.444	[0.026-0.862]	0.422	[0.059-0.785]
Urban*Non SC/ST*Q5 ^h	0.773	[0.658-0.804]	0.840	[0.949-0.928]	0.854	[0.018-0.925]
Rural*SC/ST*No education*Q1 ⁱ	0.233	[0.075-0.379]	0.272	[0.120-0.425]	0.344	[0.130-0.558]
Rural*Non SC/ST*HS & above*Q5 ^j	0.870	[0.690-0.930]	0.848	[0.780-0.876]	0.921	[0.240-0.982]
Urban*SC/ST*No education*Q1 ^k	0.383	[0.070-0.836]	0.389	[0.016-0.795]	0.387	[0.015-0.789]
Urban*Non SC/ST*HS & above*Q5 ^l	0.946	[0.662-0.954]	0.955	[0.750-0.961]	0.980	[0.794-0.994]
Proportion of women	%	95% CI	%	95% CI	%	95% CI
Rural*No education*Q1 ^a	94.8	[94.2-95.4]	96.8	[96.4-97.3]	93.2	[92.3-94.0]
Rural*HS & above*Q5 ^b	80.0	[78.5-81.5]	21.1	[19.6-22.7]	20.7	[19.2-22.3]
Urban*No education*Q1 ^c	05.2	[04.6-05.8]	03.2	[02.7-03.6]	06.8	[06.0-07.7]
Urban*HS & above*Q5 ^d	20.0	[18.5-21.5]	78.9	[77.3-80.4]	79.3	[77.7-80.8]
Rural*SC/ST*Q1 ^e	96.0	[95.2-96.7]	96.9	[96.3-97.4]	94.5	[93.5-95.4]
Rural*Non SC/ST*Q5 ^f	21.3	[20.1-22.6]	22.1	[20.9-23.5]	23.7	[22.5-25.0]
Urban*SC/ST*Q1 ^g	04.0	[03.3-04.8]	03.1	[02.6-03.7]	05.5	[04.6-06.5]
Urban*Non SC/ST*Q5 ^h	78.7	[77.4-79.9]	77.9	[76.5-79.1]	76.3	[75.0-77.5]
Rural*SC/ST*No education*Q1 ⁱ	96.0	[95.1-96.8]	96.9	[96.3-97.5]	94.8	[93.7-95.7]
Rural*Non SC/ST*HS & above*Q5 ^j	19.6	[18.1-21.2]	21.0	[19.5- 22.7]	20.0	[18.4-21.7]
Urban*SC/ST*No education*Q1 ^k	04.0	[03.2-04.9]	03.1	[02.5-03.7]	05.2	[04.3-06.3]
Urban*Non SC/ST*HS & above*Q5 ^l	80.4	[78.8-81.9]	79.0	[77.3-80.5]	80.0	[78.3-81.6]

Multivariate model controls for mother's age, husband's education, mother's occupation, husband's occupation, religion, mass media exposure, birth order and interval, status of the child and region of residence besides all variables shown in the table. ^aRural women with no education in the poorest wealth quintile; ^bRural women with high school & above education in the richest wealth quintile; ^cUrban women with no education in the poorest wealth quintile; ^dUrban women with high school & above education in the richest wealth quintile; ^eRural SC/ST women in the poorest wealth quintile; ^fRural Non SC/ST women in the richest wealth quintile; ^gUrban SC/ST women in the poorest wealth quintile; ^hUrban Non SC/ST women in the richest wealth quintile; ⁱRural SC/ST women with no education in the poorest wealth quintile; ^jRural SC/ST women with high school & above education in the richest wealth quintile; ^kUrban SC/ST women with no education in the poorest wealth quintile; ^lUrban SC/ST women with high school & above education in the richest wealth quintile; Note: All the predicted probabilities were significantly different at p,0.001.

DISCUSSION

The present study has comprehensively demonstrated the trends in women's availing themselves of safe delivery with considerable disparities across key socio-demographic and economic, regional spectrum in India during 1990–2006. Over the last one and a half decades, a negligible and modest increase in safe delivery care, was evident among women in India.

Ever since the integration of the Safe Motherhood and Child Health Program into the Reproductive and Child

Health Program (RCH) in 1996, the Government of India has made several efforts to improve the maternal healthcare utilization.

Moreover, because of the less safe delivery among women has been always a central focus among policy makers. Thus, considering the distinct disadvantage over poor than the non-poor and among the rural and uneducated women, the present study assesses the safe delivery among women who had given birth in the three years preceding the survey.

The study has used data from the National Family Health Survey (NFHS) conducted during 1992–93, 1998–99, and 2005–06. The objective of the study is to examine the factors that significantly affect the safe delivery among women in India.

This study has investigated the factors affecting the safe delivery, with the aim of improving the information available to decision-makers who are responsible for planning and administering maternal health and maternal care programs. This study has also identified several other determinants that have a significant influence to the safe delivery such as women's education, social group, religion, economic status, birth order and interval, health provider's visit and region of residence.

The utilization of safe delivery care was found to be significantly lower among Muslim women than among women belonged to other religions. However, few studies observed mixed effects of religion on maternal care services utilization; Hindu and Muslim women residing in urban India do not avail delivery care services equally as documented earlier.^{31,33}

A recent study suggested a possibility that the 'purdah', a physical segregation of the sexes, and the requirement for women to cover their bodies and conceal their form, may be contributing to the low utilization of safe delivery care.^{34,35} There has been considerable discussion about the influence of religious and cultural practices on overall health behavior independent of socioeconomic processes.³⁶⁻³⁸ In India, the religious differentials in the socioeconomic and demographic profiles have been well documented due to cultural and regional diversity and, political interests.³⁹⁻⁴⁴

The most studied issue in public health literature in India has been on Hindu-Muslim differences in fertility and family planning.⁴⁵⁻⁴⁷

Few studies have also explored child survival prospects across different religious groups.⁴⁸ A study in India highlighted that Muslim women tend to put the baby to the breast sooner after birth and this may perhaps explain the Muslim child survival advantage.⁴⁹ This study also observed the same finding that Muslim women gave birth outside medical facilities more than then Hindu, Therefore supporting the problematical.

Offering economic support and incentives to girls and their families, especially to girls belonging to the least advantaged groups in socioeconomic spectrum in rural areas can also be one of the effective ways of preventing early childbearing. The rationale behind this approach is that immediate economic opportunities provide an acceptable alternative to marriage, and increase the value and contribution of a daughter to her parental family.⁵⁰

CONCLUSION

This study concludes that over the last one and a half decades, a negligible and modest increase in safe delivery care was evident among women in India. The marginalization of women in utilizing safe delivery care services in India over one and a half decades is clearly evident in this study. The finding of this study reveals less utilization of safe delivery care services for the second and higher order births compared with the first birth order.

Hence, there is need to look at the causes related to the utilization of safe delivery care services by higher birth order and special efforts must be made by government to reach higher birth order mothers for timely and appropriate counselling regarding the adverse effect of safe delivery care services.

In addition the present study suggests the focus should be motivating mothers with more than one child to access services from the health system will be ensure positive maternal health outcome of safe delivery care services decrease with increase in the parity of women.

This has immense implication in the regulation of maternal mortality in India. Girl's education is the most important weapon to deal with such concerns in any society. Since 2005, the government of India has launched several programs, including the National Rural Health Mission (NRHM).

Besides, the socioeconomic vulnerability regional disparities clearly evident from this study among considerable population who are disadvantaged in using safe delivery care services could foster adverse reproductive outcomes. Incentives and better facilities, like transportation vehicles, should be provided to health personnel working in adverse geographically area specially rural and tribal areas of the country.

Limitation of the study

While, this study explores several unfold dimensions of safe delivery care by women in India but still it suffers from some of the limitations too. The population belonging to the so-called "Other Backward Classes" (OBC) are identified as economically and socially deprived by the Mandal Commission that reported to the Indian government in 1980.⁵¹

Since the NFHS-1 (1992–93) data contained only three categories of the social/caste group—SC, ST and Other, to avoid the inconsistency in all three round of survey, to pool OBC and the Other social group in the successive two NFHS rounds (i.e., NFHS-2 (1998–99), and NFHS-3 (2005–06)), which provided separate information for OBC.

Some others predictors variables of utilization of maternal and child health care services such as type of family, presence of ASHA, visited health provider during pregnancy, women autonomy and anemia in women, which were not collected in NFHS-1 and NFHS-2, could not be used for this study to maintain consistency across the three round of survey.

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