



Accessing Maternal and Child Health Care Services Utilization: An Application of Andersen's Behaviour Model

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ABSTRACT

According to WHO maternal and child health services can be defined as promoting, preventing, therapeutic or rehabilitation facility or care for the mother and child. In India and developing world, many women suffer from complications during pregnancy and delivery care. Utilization of maternal and child care services during pregnancy and delivery care will help in reducing the mortality and morbidity of mother and her child.

An effort has been made in this study to assess the maternal and child health care services utilization among the women. Third round of National Family Health Survey (NFHS-III) has been used in this study. The study selected 32,222 women age 15-49 who had at least one birth in five year prior to the survey. Empowered Action Group states and Assam has been selected to carry-out this study. In this study we illustrate the Andersen's Behavioural Model of Health Care Utilization. The model describes factors that inhibit or facilitate access to health care, and how these factors are applied in the process of seeking and using health services. The result showed that only 19% of the women delivery takes place in health facilities while 31.7% received assistance during delivery from skilled provider in EAG states and Assam. Utilization of maternal health services was significantly low among rural women as compared to their urban counterparts. Result also showed that the educational status of the mother, household wealth quintile is found to be strong indicators of utilization of maternal health care services.

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Introduction

Every day in 2015, about 830 women and 16,000 children under-five died due to complications of pregnancy and child birth. Almost all of these deaths occurred in low-resource settings, and most could have been prevented [1]. Developing regions account for approximately 99% (302 000) of the global maternal deaths. At the country level, India is estimated to account for over one in six of all maternal deaths worldwide, with an approximate 45 000 maternal deaths (15%) [2].

The majority of maternal deaths occur during labor, delivery, and the immediate postpartum period [3]. Because most maternal deaths occur due to preventable obstetric complications, most could be prevented if women had access to high-quality maternal health care, including antenatal care, skilled assistance at delivery, and postnatal care [4, 5].

Maternal and child health services can be defined as promoting, preventing, therapeutic or rehabilitation facility or care for the mother and child [6]. High-quality antenatal care (ANC) has been shown to promote maternal and fetal wellbeing [7, 8].

Antenatal care

Antenatal care (ANC) refers to pregnancy-related health care, which is usually provided by a doctor, an ANM, or another health professional. Antenatal care (ANC) is a strategic platform for delivering critical tests, counseling, and treatment, and for establishing a relationship between mothers and the health system, a relationship that influences future care seeking [9, 10, 11].

Although utilization of antenatal care (proportion of pregnant women receiving one or more consultations with trained health workers) is regularly monitored in most settings, and has improved considerably in developing countries in 1990s, there is little evidence on the content and quality of antenatal care in these settings [12].

Previous studies have shown that socio-demographic factors affect utilization of maternal health care services [13, 14, 15]. Some studies showed women's education increases the use of maternal health services [13, 14]. Previous work on use of health services suggests that distance and transportation facility to the utilization of health care services are also likely to affect the type of care chosen [16, 17]. Studies in many developing countries show that, maternal mortality rates continue to be high, with many deaths the result of complications related to pregnancy and childbirth [37]. Maternal deaths could be prevented if women had access to high-quality maternal health care especially antenatal care [38, 39, 51, 52].

Place of delivery

The safe motherhood initiative strongly emphasizes ensuring the availability and accessibility of skilled care during pregnancy and childbirth, of which institutional delivery is one element. This would avoid most maternal deaths occurring from preventable obstetric complications. Previous studies have clearly demonstrated, the utilization of existing maternal health services is very low in Asian and African countries [18, 15]. An extensive body of literature exists on factors that influence facility delivery [19, 20, 21].

In spite of the importance of facility based delivery in preventing maternal death, a larger proportion of women give birth outside of health facilities without any skilled attendance [22, 23]. A few have looked at community-level factors such as community norms, media access, and the level of local development [24, 25]. Most of maternal and child deaths occur due to obstetric complications and it can be prevented by institutional delivery and skilled assistance [38, 39].

Assistance during Delivery

Obstetric care from a trained provider during delivery is recognized as critical for the reduction of maternal and neonatal mortality [26]. A number of studies have assessed the role of demographic, socioeconomic and other characteristics of mother and her family influencing demand for professional assistance at the time of delivery [27, 28]. The factors influencing use of skilled attendants at delivery include the service environment such as distance to the nearest health facility and quality of care [29, 30]. Studies show that the professional assistance during delivery can save most of the mother and her child deaths [38, 39].

Postnatal care

Postnatal care (PNC) refers to the care given to the mother and her newborn baby immediately after birth (within 24 hours) and for the first 6 weeks (42 days) of life, with the aim of ensuring optimum health for the newborn [31, 32]. The care received in PNC includes monitoring for danger signs in the newborn's breathing, temperature, breastfeeding, and movement as well as counselling the mother about health, nutrition, and healthy lifestyle practices [33, 34, 35]. Several factors contribute to low levels of PNC, including mother's age at birth, perceived size at birth, maternal education, household wealth, maternal employment status, geographic distance, such as household distance to a health facility [33, 35, 36]. Most of the maternal and child death can be prevented by giving proper obstetric care and postnatal care [38, 39].

Child immunization:

Universal immunization of children against the six vaccine-preventable diseases (namely, tuberculosis, diphtheria, whooping cough, tetanus, polio, and measles) is crucial to reducing infant and child mortality [26]. Factors that have been found to be significantly associated with childhood immunization include maternal education and age, socio-economic status, religion and place of residence [47, 48, 49, 50]. Children age, sex and birth order significantly affects the childhood immunization status. In developed countries, children from low income families [40, 41], whose parents are lacking health insurance [41, 42], whose mothers are less educated and have low status [41, 42, 43], and area of residence [44], are at greater risk of not being fully immunized.

The knowledge of health status is essential for adoption of healthy behaviours [45]. In this study we applied Andersen's behavioural model of health care utilization [46]. The purpose of this study is to analyze the association of utilization of maternal and child health care services with predisposing, enabling and need factors.

Data and Methods:

The study uses data from third round of National Family Health Survey –III [26] which include a national representative of women age 15-49. The analysis is specific to 32,222 women who have given birth in the last five year preceding the survey.

Dependent Variables

Five indicators are used to measure the maternal and child health services:

i. Use of antenatal care: A woman is considered to have completed ANC if she was checked by a health professional (doctor, nurse or midwife) at least 4 times during her pregnancy. The variable is coded as 1 if the women receive ANC and 0 otherwise.

ii. Place of delivery: At health facility, birth is considered a safe and healthy process. The variable place of delivery is coded as 1 if the birth takes place at facility (public hospital, private hospital and NGO/trust) and 0 if it is at home.

iii. Assistance during Delivery: Skilled assistance during child birth is central to reduce maternal and child mortality. The variable is coded as 1 if the professional assistance received during child birth and 0 otherwise.

iv. Postnatal care: Postnatal care encompasses the care for a mother and her newly born baby immediately after birth and for the following few (six) weeks. The first 48 hours after the birth, is very critical for both the mother and child. The variable is coded as 1 if the mother received PNC within 48 hours and 0 otherwise.

v. Full immunization: Childhood immunizations involve vaccines that protect children from six major preventable diseases. Fully immunized children are those who received a dose of BCG, three doses each of DPT, three doses polio and a dose of measles vaccines. The variable is coded as 1 if the children age 12-59 months are fully immunized and 0 otherwise.

Independent variable

i. Individual characteristics

a. Maternal age: The variable refers to the age of women at the time of survey and has three category 15-24, 35-34 and 35-49.

b. Maternal education: Educational level of women and it is categorized into three groups as no education, primary education and secondary and above education.

c. Employment and cash earning: The working status of mother is categorized as employed and not employed. Employed women are further divided into two groups i.e. employed for cash and employed for in-kind.

d. Sex of child: This is classified as male or female.

e. Age of child: The variable refers to the age of child is classified as three categories 0-11, 12-23 and 24-59 months.

f. Birth order: Birth order gives the order in which the children were born, it is categorized as first, second or third, fourth or fifth, sixth or seventh and eighth and above

g. Cast: The variable refers to social status of the household and classified as Scheduled caste, Scheduled tribe, other backward caste and other caste.

h. Religion: Religion is characterised by a diversity of religious beliefs and practices. It is classified in major categories as Hindu, Muslim and Others.

ii. Household characteristics

a. Wealth index: Measured by a composite score of several indicators of household possession. An index of the economic status of households called the wealth index. This is categorized as high (highest and fourth), middle and low (second and lowest).

b. Place of residence: This is a dichotomous variable (urban and rural) according to where the woman was living at the time of the survey. It was coded as 0 for urban and 1 for rural.

The Andersen conceptual framework on utilization of maternal and child health care services.

Predisposing factor	Enabling factor	perceived need	Utilization of health care services
<i>Individual Characteristic</i>	<i>Household characteristics</i>	<i>Need/illness level</i>	<i>Health care services</i>
Women age	Wealth Index	Pregnancy complications	Antenatal care
Women education	Place of residence	Ever had pregnancy termination	Place of delivery
Women employment	Covered by health insurance	Postpartum complications	Assistance during delivery
Child age	Distance from health facility		Postnatal care
Child sex	Transport facility		Child immunization
Caste			
Religion			

c. Covered by health scheme/insurance: Health insurance is a type of insurance coverage that pays for medical and surgical expenses incurred by the insured household. The variable is coded as 0 for the household with no health coverage and 1 if yes.

iii. Perceived community characteristics

a. Distance from health centre: Women were asked about their perception of distance between community and health facility. It has two possible outcomes i.e. no problem/not a big problem and big problem.

b. Transport facility: Women were asked about their perception of availability of transport facility between community and health facility. It has two possible outcomes i.e. no problem/not a big problem and big problem.

iv. Need/Illness level

a. Pregnancy complications: Women were asked that whether she experienced any problem during pregnancy such as difficulty with vision during daylight, night blindness, convulsions (not from fever), swelling of the legs, body or face, excessive fatigue, or vaginal bleeding. If yes coded as 1, no coded as 0.

b. Ever had pregnancy termination: Women were asked whether she experienced a miscarriage, an induced abortion or a stillbirth. If yes, coded as 1 and no coded as 0.

c. Postpartum complications: Women were asked whether she had symptoms of massive bleeding, high fever or both. If yes, coded as 1 and no coded as 0.

Statistical analysis

Data analysis was carried out using SPSS 20 and MS Excel. The data analysis included univariate, bivariate and multivariate analysis. In the univariate analysis descriptive statistics (frequency and percentages) used to explain the variables. The relationship between independent variable and dependent variable has been tested for the significant difference between by using chi-square test of association. Multivariate analysis was performed by using binary logistic regression analysis. Analysis used to estimate the effect of independent variable on dichotomous dependent variables. The logistic regression analyses were performed to estimate and identify the significant factors associated with the utilization of maternal and child health services. The logistic function is shown as below:

$$\text{Log} \left[\frac{p}{1-p} \right] = \beta_0 + \beta_1 x$$

Where p is the predicted probability of an event occurring, $1-p$ is the predicted probability of the other decision, x is our predictor variable, and β_0 estimates the log odds and β estimates the maximum likelihood, the differential log odds of Full ANC, institutional delivery, professional assistance during delivery, postnatal care received and full immunization associated with the predictor x .

Results**Background characteristics of the sample**

The sample used in this study includes 32,222 women in the age group 15-49 who had given birth in the last five years preceding the survey in Empowered Action Group states and Assam. Table 1 presents percentage distribution of women and child by predisposing, enabling factors, need/illness level and health seeking behaviour characteristics. From the table 1, most of the women are in the age group 25-34 years (49.6 percent). More than sixty percent of the women in this study are illiterate and not employed. The proportions of male and female children are almost equally distributed and the age groups of children are equally represented, with each twelve-month group representing more or less 20% of the sample. About two-fifth of the children are second and third order birth and only 14.1% of the children are sixth or higher order births. The sample is predominantly Hindu (81.4%) and most of the mothers are from other backward caste (47.6%).

Table 1 show that about 60% of the women in this study are from the poorer household and 17.9% of the women reside in the urban area. 39.0% of the women consider the distance of health centre is a big problem and 36.1% women perceived the transportation is a big problem to their community. About one-fifth women who were told by a health provider or worker about specific signs of pregnancy complications (19.5%) and 20.4% of the women report that they ever had pregnancy termination (a miscarriage, an induced abortion, or a stillbirth). Women also reported postpartum complications for 19.4% of births during the two months after delivery. Table 1 gives the percentage of children age 12-59 months who received all six basic vaccinations. Result shows that only 14.1% children received all basic vaccination. Seventeen percent of women had more than three antenatal care visits during the last pregnancy and less than twenty percent of deliveries take place in health institutions. About one-third of deliveries are assisted by professional health provider and a majority (84.3%) of women did not receive postnatal check-up after their most recent birth.

Cross tabulation

Table 2 presents the distribution of children six basic vaccination with need/illness level among mother. The percentage of children who received all the six basic vaccinations to the mother having pregnancy complications, ever had pregnancy complications and postpartum complications is found to be 27.5%, 12.3% and 11.3% respectively. Table also shows that the distribution of mother who had live birth during the last five years by the number of antenatal care visits to the need/illness level. Seventy-nine percent of mothers had 1-3 antenatal care visits and have no symptoms of pregnancy complication during her pregnancy. About 52% women had four or more antenatal care visits to the health facility if they have sign of pregnancy

Table 1. Background characteristics of sample in EAG states and Assam, 2005-06.

Factors	%	N		%	N
Predisposing factor			Perceived community characteristics		
Mother Age			Distance from health centre		
15-24	39.7	12797	No problem/not a big problem	61.0	19648
25-34	49.6	15993	Big Problem	39.0	12571
35-49	10.7	3432	Transport facility		
Education			No problem/not a big problem	63.9	20573
No education	63.1	20321	big problem	36.1	11647
Primary education	12.8	4133	Need/Illness Level		
Secondary+	24.1	7767	Pregnancy complications		
Employment and cash earning			No	80.5	11398
Employed for in-kind	20.0	6448	Yes	19.5	2760
Employed for cash	19.7	6349	Ever had a pregnancy termination		
Not employed	60.3	19425	No	79.6	25651
Sex of child			Yes	20.4	6570
Male	51.6	16613	Postpartum complications		
Female	48.4	15609	No	80.6	29585
Age of Child			Yes	19.4	7132
0-11	19.6	6312	Health care seeking behavior		
12-23	19.4	6263	Child fully immunized		
24-59	61.0	19647	No	85.9	20353
Birth order			Yes	14.1	3343
First Child	25.1	8092	Received Antenatal care visits		
Second or third child	39.3	12676	No visit	35.1	7616
Fourth or fifth child	21.5	6914	1-3 visits	47.3	10249
Sixth or seventh child	9.3	2996	More than 3visits	17.6	3820
Eight child and above	4.8	1542	Place of delivery		
caste			Home	81.1	26037
Scheduled caste	21.6	6853	Institutional	18.9	6049
Scheduled tribe	10.4	3300	Assistance during delivery		
Other backward class	47.6	15124	No	68.3	21978
None of above	20.4	6472	Yes	31.7	10206
Religion			Received Postnatal care		
Hindu	81.4	26225	No PNC	84.3	27162
Muslim	16.8	5401	With 2 days	13.3	4284
Others	1.8	586	3-42 days	2.4	651

Table 2. Utilization of maternal and child health service according to health need, 2005-06.

	Pregnancy complications		Ever had a pregnancy termination		Postpartum complications	
	No	Yes	No	Yes	No	Yes
Child have all vaccination						
No	86.6	72.5	88.3	87.7	87.9	88.7
Yes	13.4	27.5	11.7	12.3	12.1	11.3
N	10844	2657	23602	6067	15556	5073
p-value	0.000		0.100		0.081	
Received Antenatal care						
No visit			35.9	32.4		
1-3	78.8	48.1	47.3	47.0		
4+	21.2	51.9	16.8	20.6		
N	11323	2744	17087	4600		
p-value	0.000		0.100			
Place of delivery						
Home	77.3	53.0	82.0	77.9	79.4	80.2
Institutional	22.7	47.0	18.0	22.1	20.6	19.8
N	11351	2748	25553	6533	16337	5300
p-value	0.000		0.000		0.096	
Received Postnatal care						
No	60.8	36.2	69.5	63.5	65.7	49.0
Yes	39.2	63.8	30.5	36.5	34.3	45.7
N	11396	2760	25628	6556	16387	5326
p-value	0.000		0.000		0.053	

Table 3. Odds of four and above antenatal visits among women by selected factors in EAG states and Assam, 2005-06.

	Odds ratio	95% Class interval
Predisposing Characteristics		
Women Age		
15-24	1	
25-34	1.45***	[1.29, 1.63]
35-49	1.45***	[1.16, 1.818]
Education		
No education	1	
Primary education	1.48***	[1.29, 1.71]
Secondary+	2.14***	1.90, 2.42]
Employment		
Employed for in-kind	1	
Employed for cash	1.37***	[1.16, 1.61]
Non-working	1.19***	[1.03, 1.38]
caste		
Scheduled caste	1	
Scheduled tribe	1.05***	[1.44, 2.11]
Other backward class	1.33***	1.16, 1.52]
Other	1.58***	1.35, 1.84]
Religion		
Hindu	1	
Muslim	0.69***	[0.59, 0.80]
Others	1.20	[0.87, 1.65]
Enabling characteristics		
Household characteristics		
Wealth index		
Low	1	
Middle	1.24***	[1.09, 1.42]
High	2.06***	[1.80, 2.36]
Place of residence		
Urban	1	
Rural	0.52***	[0.46, 0.59]
Covered by health scheme/insurance		
No	1	
Yes	1.32***	[1.01, 1.71]
Perceived community characteristics		
Distance from health centre		
No problem/not a big problem	1	
Big Problem	0.99	[0.85, 1.15]
Transport facility		
No problem/not a big problem	1	
big problem	0.91	[0.78, 1.07]
Need/Illness factor		
Pregnancy complications		
No	1	
Yes	2.93***	[2.63, 3.26]
Ever had pregnancy termination		
No	1	
Yes	1.15**	[1.03, 1.28]

complications. Result also shows that 32.4% of women had no antenatal care visits if they ever had pregnancy termination. Percentage of women is higher for 1-3 antenatal care visits if they had all the three need/illness level.

A majority of women (63.8%) received postnatal check-up if they had complications during their pregnancy, conversely only 36.5% of women received postnatal check-up if they ever had pregnancy termination. Table also shows that every second women received postnatal check-up even they had postpartum complications after the recent birth.

Only 47.0% of mothers with pregnancy complication give births in EAG states and Assam in health institution.

About three-fourth of the deliveries take place at home to the mother whoever had pregnancy termination or postpartum complication.

Multivariate analysis

Use of antenatal care

Table 3 presents the multivariate logistic regression result. The analysis shows the effect of each factor (predisposing, enabling and need) on the status of antenatal care visits. Result shows that the older women more (1.45 times) likely to receive antenatal care visits as compared to their younger counterparts.

A significant difference is observed by maternal education variables. The odds of antenatal care visits is higher among the mother who have primary education as compared to illiterate mother (OR=1.48) and the mother with secondary education are almost two time more likely to have ANC visits as compared to the women with no education.

Mother who employed for cash is 1.37 more likely to use antenatal care services compared to the mother who employed not for cash.

The odds of scheduled tribe women is 1.05 times more than the scheduled caste women in the EAG states and Assam (OR=1.05). Result show that Muslim women are 31% less likely to receive antenatal care services as compared to their Hindu counterparts (OR=0.69).

The wealthiest women are significantly more likely than the low wealth to receive antenatal care services, being twice as likely as the poorest to obtain such care (OR=2.06). In EAG states and Assam, the rural women are 48% less likely to receive antenatal care as compared to their urban counterparts. The women covered with health schemes/insurance are 32% more likely to receive antenatal care services compared to their uncovered counterparts.

A statistical significant result is obtained in all the three maternal health need. Women who have pregnancy complication during the last pregnancy are three times more likely to receive antenatal care services as compared to those women who don't have any complication. Result shows that the women ever had pregnancy termination are 15% more likely to receive antenatal care as compared to those women who have never had pregnancy termination (OR=1.15).

Place of delivery

Table 4 presents the results of multivariate logistic regression analyses examining the effect of selected factors (predisposing, enabling and need) on the women's place of delivery.

Older mother are more likely to deliver at health institutions than younger mother (OR=1.58 and OR=2.14 for the women in the age group 25-34 and 35-49 respectively). Result shows that maternal education has important affect in delivery practices. Mother with secondary or higher education found to be 1.78 times more likely to deliver her last child in the health institutions as compared to the illiterate mothers. Non-working women are about 27% more likely to deliver their last child in health institutions as compared to women employed not for cash. Scheduled tribe women are 35% less likely to give birth in health institutions compared to scheduled caste women and women from other caste are 35% more likely to deliver in health institutions (OR=0.65 for scheduled caste and OR=1.35 for other caste). Muslim women are 0.85 times are less likely to use health facility for delivery as compared to their Hindu counterpart (OR=0.85).

Table 4. Odds of place of delivery among women by selected factors in EAG states and Assam, 2005-06.

	Odds ratio	95% Class interval
Predisposing Characteristics		
<i>Women Age</i>		
15-24	1	
25-34	1.58***	[1.40, 1.79]
35-49	2.140***	[1.70, 2.68]
<i>Education</i>		
No education	1	
Primary education	1.23***	1.06, 1.42]
Secondary+	1.78***	[1.57, 2.01]
<i>Employment</i>		
Employed for in-kind	1	
Employed for cash	1.16***	[0.97, 1.39]
Non-working	1.27***	[1.09, 1.48]
<i>caste</i>		
Scheduled caste	1	
Scheduled tribe	0.65***	[0.52, 0.82]
Other backward class	1.10	[0.96, 1.27]
Other	1.35***	[1.16, 1.58]
<i>Religion</i>		
Hindu	1	
Muslim	0.85**	[0.73, 0.98]
Others	1.070	[0.75, 1.53]
Enabling characteristics		
<i>Household characteristics</i>		
<i>Wealth index</i>		
Low	1	
Middle	1.66***	[1.44, 1.905]
High	3.38***	[2.95, 3.88]
<i>Place of residence</i>		
Urban	1	
Rural	0.39***	[0.35, 0.44]
<i>Covered by health scheme/insurance</i>		
No	1	
Yes	1.37**	[1.04, 1.80]
<i>Perceived Community Characteristics</i>		
<i>Distance from health centre</i>		
No problem/not a big problem	1	
Big Problem	0.85**	[0.73, 0.99]
<i>Transport facility</i>		
No problem/not a big problem	1	
big problem	1.010	[0.93, 1.29]
Need/illness factor		
<i>Pregnancy complications</i>		
No	1	
Yes	2.00***	[1.79, 2.24]
<i>Ever had a pregnancy termination</i>		
No	1	
Yes	1.17***	[1.04, 1.31]

Result show that household characteristics- wealth index, place of residence, coverage of health scheme/insurance, perceived community characteristics have significant effect on place of delivery. Household wealth has positive implication on maternal delivery. Women from high wealth quintile households are about three times more likely to deliver in health facility as compared to the women belong to low wealth quintile (OR=3.38). Rural women are disadvantaged to delivery in health facility compare to their

urban counterparts (OR=0.39). Women from household covered by health scheme/insurance are 1.37 times more likely to use health facility for delivery compared to those women who belongs to the household uncovered by health scheme/insurance (OR=1.37). Women who perceived big problem to the distance from health centre were 15% less likely to deliver in the health facility compared to the women who do not perceived it as big problem or problem. Women who had complications during the pregnancy are two times more likely to give birth in health institution compared to the women who have no complication during the pregnancy.

Delivery assistance

Table 5. Odds of assistance during delivery among women by selected factors in EAG states and Assam, 2005-06.

	Odds ratio	95% Class interval
Predisposing Characteristics		
<i>Women Age</i>		
15-24	1	
25-34	1.45***	[1.34, 1.66]
35-49	1.89***	[1.56, 2.29]
<i>Education</i>		
No education	1	
Primary education	1.35***	[1.20, 1.52]
Secondary+	2.03***	[1.82, 2.26]
<i>Employment</i>		
Employed for in-kind	1	
Employed for cash	1.03	[0.90, 1.18]
Non-working	.96	[0.85, 1.08]
<i>caste</i>		
Scheduled caste	1	
Scheduled tribe	0.84***	[0.70, 0.10]
Other backward class	1.30***	[1.16, 1.46]
Other	1.47***	[1.28, 1.69]
<i>Religion</i>		
Hindu	1	
Muslim	0.64***	[0.57, 0.74]
Others	.78	[0.57, 1.08]
Enabling characteristics		
<i>Household characteristics</i>		
<i>Wealth index</i>		
Low	1	
Middle	1.49***	[1.33, 1.66]
High	2.81***	[2.49, 3.17]
<i>Place of residence</i>		
Urban	1	
Rural	0.50***	[0.45, 0.56]
<i>Covered by health scheme/insurance</i>		
No	1	
Yes	1.33***	[0.99, 1.79]
<i>Perceived Community Characteristics</i>		
<i>Distance from health centre</i>		
No problem/not a big problem	1	
Big Problem	.890	[0.78, 1.01]
<i>Transport facility</i>		
No problem/not a big problem	1	
big problem	1.090	[0.95, 1.24]
Need/illness factor		
<i>Pregnancy complications</i>		
No	1	
Yes	1.92***	[1.73, 2.14]
<i>Ever had a pregnancy termination</i>		
No	1	
Yes	1.21***	[1.09, 1.33]

Delivery assistance by professional provider during delivery is recognized as critical for the reduction of maternal and child mortality. Table 5 shows the result for the multivariate regression model for predisposing, enabling and need/illness characteristic for the women who get professional assistance during delivery.

Compared with women age 25-34, younger women are significantly less likely to get professional assistance during delivery, while older women are significantly more likely to use them (OR=1.45 for 25-34 age and OR=1.89 for 35-49 age group women). Women who have higher and primary education are more likely to get delivery assistance compared to their illiterate counterparts (OR=1.35 for primary education and OR=2.03 for secondary and above education).

Scheduled tribe women are 16% less likely to get delivery assistance compared to their scheduled caste counterpart. Other backward caste and other caste women are more likely to get delivery assistance as compared to their scheduled caste women (OR=1.30 for OBC women and OR=1.47 for other caste women). Result also showed that the birth assisted by professional health worker among Muslim women is less likely compared to Hindu women (OR=0.64).

Wealth index has a strong statistically significant relationship to the professional delivery assistance for the last birth among women. Women in the high wealth quintile are about 3 times more likely to deliver by assistance from health professionals when compared to women belongs to low wealth quintile (OR=2.81). Women with health coverage are more likely to get delivery assistance by health professional (OR=1.33). Women who had complications during pregnancy are about two 92% more likely to give births by professional assistance. Pregnancy termination statistically significant to the delivery assistance (OR=1.21).

Postnatal Care

Health of mother and her newborn child depends not only on the health care she receives during her pregnancy and delivery, but also on the care she and the infant receive during the first few weeks after delivery. Table 6 shows the result for the multivariate regression model for the selected characteristics (predisposing, enabling and need/illness) influencing the postnatal care practice within two days of delivery among the women.

Result shows that women age and education are the factors that significantly influence the use of postnatal check-up in EAG states and Assam. Women in the age group 35-49 are two times more likely to use PNC services than women in the age group 15-24 (OR=2.19). Other class women are almost 1.5 times more likely to use PNC services compared to their scheduled caste counterparts.

Result also shows that enabling factors like wealth index, place of residence, coverage by health scheme/insurance have statistical significant effect on the utilization of PNC services among women. Women from high wealth quintile household are about two times more likely to use postnatal care within the 48 hours of delivery than women from low wealth quintile (OR=1.99), while women residing in rural area are about 0.44 times less likely to use PNC services (OR=0.44). Women who have health coverage/insurance are more likely to receive postnatal care than those women who are not covered by health scheme/insurance (OR=1.54).

Result shows that the health need/illness level among women is significant predictor of use of postnatal care among women in EAG states and Assam.

Table 6. Odds of postnatal care among women by selected factors in EAG states and Assam, 2005-06.

	Odds ratio	95% Class interval
Predisposing Characteristics		
<i>Age</i>		
15-24	1	
25-34	1.50***	[1.34, 1.69]
35-49	2.19***	[1.77, 2.70]
<i>Education</i>		
No education	1	
Primary education	1.40***	[1.22, 1.61]
Secondary+	1.76***	[1.56, 1.98]
<i>Employment</i>		
Employed for in-kind	1	
Employed for cash	1.11	[0.94, 1.30]
Not employed	.87	[0.76, 1.01]
<i>caste</i>		
Scheduled caste	1	
Scheduled tribe	1.210	[1.00, 1.47]
Other backward class	1.23***	[1.07, 1.40]
Other	1.55***	[1.33, 1.80]
<i>Religion</i>		
Hindu	1	
Muslim	0.85**	[0.74, 0.99]
Others	.79	[0.57, 1.10]
Enabling factor		
<i>Household characteristics</i>		
<i>Wealth index</i>		
Low	1	
Middle	1.28***	[1.12, 1.46]
High	1.99***	[1.74, 2.27]
<i>Place of residence</i>		
Urban	1	
Rural	0.44***	[0.39, 0.50]
<i>Covered by health scheme/insurance</i>		
No	1	
Yes	1.54***	[1.19, 2.00]
<i>Perceived Community Characteristics</i>		
<i>Distance from health centre</i>		
No problem/not a big problem	1	
Big problem	0.85**	[0.73, 0.99]
<i>Transport facility</i>		
No problem/not a big problem	1	
big problem	1.150	[0.98, 1.34]
Need/illness factor		
<i>Pregnancy complications</i>		
No	1	
Yes	2.19***	[1.97, 2.43]
<i>Ever had a pregnancy termination</i>		
No	1	
Yes	1.05	[0.95, 1.18]
<i>Postpartum complications</i>		
No	1	
Yes	1.11**	[0.99, 1.24]

Women who have some complications during their pregnancy have twice the odds of receiving postnatal care as compared to the women do not experience any pregnancy complication (OR=2.19).

The likelihood of having postnatal care increased by 11 percent for the women has postnatal complications.

Child immunization

Table 7. Odds of immunization among children (12-59 months) by selected factors in EAG states and Assam, 2005-06.

	Odds ratio	95% Class interval
Predisposing Characteristics		
<i>Age</i>		
15-24	1	
25-34	1.33***	[1.16, 1.53]
35-49	1.55***	[1.20, 2.00]
<i>Education</i>		
No education	1	
Primary education	1.44***	[1.20, 1.72]
Secondary+	2.45***	[2.11, 2.86]
<i>Employment</i>		
Employed for in-kind	1	
Employed for cash	1.15	[0.94, 1.40]
Not employed	1.04	[0.87, 1.23]
<i>Child sex</i>		
Male	1	
Female	0.89***	[0.79, 0.99]
<i>Child age</i>		
12-23 month	1	
24-59 months	0.93***	[0.82, 1.05]
<i>Birth order</i>		
First	1	
Second or third	0.82***	[0.71, 0.94]
Fourth or fifth	0.60***	[0.50, 0.73]
Sixth or seventh	0.38***	[0.27, 0.52]
Eight and above	0.18***	[0.09, 0.33]
<i>caste</i>		
Scheduled caste	1	
Scheduled tribe	.83	[0.65, 1.06]
Other backward class	1.02	[0.87, 1.20]
Other	1.20	[1.01, 1.44]
<i>Religion</i>		
Hindu	1	
Muslim	0.86**	[0.72, 1.02]
Others	1.43**	[1.01, 2.04]
Enabling factor		
Household characteristics		
<i>Wealth index</i>		
Low	1	
Middle	1.35***	[1.14, 1.59]
High	1.55***	[1.31, 1.83]
<i>Place of residence</i>		
Urban		
Table 7: Cont'd...		
Rural	0.56***	[0.49, 0.64]
<i>Covered by health scheme/insurance</i>		
No	1	
Yes	1.22*	[0.92, 1.60]
<i>Perceived Community Characteristics</i>		
<i>Distance from health centre</i>		
No problem/not a big problem	1	
Big Problem	0.79**	[0.66, 0.95]
<i>Transport facility</i>		
No problem/not a big problem	1	
big problem	1.21**	[1.00, 1.47]
Need/Illness Level		
<i>Pregnancy complications</i>		
No	1	
Yes	1.79***	[1.58, 2.03]
<i>Ever had a pregnancy termination</i>		
No	1	

Yes	0.86**	[0.76, 0.98]
Postpartum complications		
No	1	
Yes	1.18**	[1.04, 1.34]

Table 7 shows the result for the multivariate regression model for children vaccination in EAG states and Assam. In this table the selected characteristics (predisposing, enabling and need/illness) that influence key dependent variable child (more than 1 year) vaccination is included in the model. Result shows that the likelihood of being full vaccination is 1.33 and 1.55 times higher among the children of mother in the age group 25-34 and 35-49 respectively. Higher the maternal education, the child is more likely to be fully vaccinated (OR=1.44 for primary education and OR=2.45 for secondary and above education). Maternal employment, child age child sex and caste had no statistical significance on the childhood vaccination in EAG states and Assam. Muslim children are 14% less likely to be fully vaccinated and other religion children are 43% more likely to be fully vaccinated as compared to their Hindu children. Result also show that the female child is about 10% less likely to be fully immunized compared to their male counterparts. Children of higher birth order are less likely to receive full immunization (OR=0.82 for second or third, OR= 0.60 for fourth or fifth, OR=0.38 for sixth or seventh, OR=0.18 for eight and above birth orders).

All three household characteristics wealth index, place of residence and health coverage or insurance have significant relationship with child vaccination. Children from middle and high wealth quintile household are 1.55 and 1.35 times more likely to be fully vaccinated compared to the children from low quintile household. The likelihood of full vaccination among rural children is 0.56 times is less than their urban counterparts.

The odds of full vaccination are 22% higher for the children from the household covered by scheme/insurance. Likewise household characteristics, perceived community characteristics significantly affect the childhood immunization. Children are less likely to be fully immunized whose mother perceived distance of health facility as a big problem compared to those children whose mother do not perceived it as a big problem (OR=0.79).

All the three need/illness level characteristics significantly affect the childhood vaccination.

Children are more likely to be vaccinated whose mother have some pregnancy complications compared to their counterparts whose mother have no any pregnancy complication (OR=1.79). The odds of childhood vaccination are about 14% (OR=0.86) less for the children whose mother ever had pregnancy termination compared the children whose mother have no pregnancy termination.

Children whose mothers have postpartum complications has 18% more odds of full vaccination compared with the children whose mother do not have postpartum complication (OR=1.18).

Discussion and conclusion

In the selected Empowered Action Group (EAG) states and Assam, a total of 32,222 samples has been included in this study to examine the factors affect the utilization of maternal and child health services. The result in this study signifies that the women who have complications during maternity have some positive effect on utilization of maternal and child health care services.

It has has been well established that the predisposing factors (including women age, education, employment, child

age, sex, caste and religion) plays an important role in utilization of maternal and child health services. Study found that the older mother and well educated mother have relatively higher level of utilization of maternal and child health services [13, 14, 15, 33, 35, 36]. The reason may be that the older women are more independent to utilize their health care services. As we know that education enhances the awareness and knowledge regarding health practices in the individual. Study reveals that the women and children from socially deprived class have the less utilization of health care services. Study confirms the previous evidences that the social caste has major association with the maternal health care utilization [13, 14, 15].

It is found that children age, sex and birth orders are significantly linked with the immunization [47, 48, 49]. One of the main reasons for less proportion of female immunization is that they are deprived of health care. Children of older age and higher birth order get lesser attention regarding health care [48].

In conclusion, government should formulate policies expressly provides maternal and child health services accessible to all women. A free and compulsory education should be guaranteed to all women especially girls. In the agriculture sector wages in-kind still exist. Cash or cashless payment should be promoted to the unorganised and agriculture sector and the payment should go to the women hand or their account.

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