Factors Associated with Maternal and Child Healthcare Service Utilization: A Comparative Study of East and Western Uttar Pradesh

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ABSTRACT

Every year, thousands of women die around the world as a result of pregnancy and delivery-related complications, and thousands of children suffer from diseases that could be avoided with vaccination. The objective of this study is to explore the factors determining the utilization of maternal and child healthcare service utilization in the eastern and western Uttar Pradesh. For the study Researchers used National Family Health Survey round 4 (2015-2016) data which is a multi-round, large-scale survey conducted on a representative sample of households from across the country. Chi-square test was used to find the significance level during bivariate analysis. Additionally, binary logistic regression analysis was used to establish the association between outcome variables and other explanatory variables. The result suggests that the percentage use of full antenatal care services by mothers age, media exposure, caste, and birth order is almost similar in both the regions while for education it depicts a surprising result as women with higher education in WUP tend to have lesser utilization of full ANC as compared to the women of EUP of the same category. The mothers of eastern Uttar Pradesh lag behind in utilizing the PNC services as compared to the western Uttar Pradesh. The prevalence of full immunization, and PNC is tended to be higher among the children of western Uttar Pradesh. Women in the higher quantiles and with more education were more likely to get their child vaccinated and have a PNC visit.

Keywords: Ante-natal care, Immunization, Post-natal care, Skilled Birth Attendant.

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1. INTRODUCTION

Public healthcare delivery systems, particularly in middle- and low-income nations, must prioritise maternal and child health services. Every year, thousands of women die around the world as a result of pregnancy and delivery-related complications, and thousands of children suffer from diseases that could be avoided with vaccination. Governments all over the world have made maternal and child health a top priority. According to a special bulletin issued by the Registrar General of India, India's Maternal Mortality Ratio (MMR) has decreased by ten points. From 113 in 2016-18 to 103 in 2017-19, it has decreased (8.8 percent decline). The MMR had been steadily decreasing in the country, from 130 in 2014-2016 to 122 in 2015-17, 113 in 2016-18, and 103 in 2017-19. Many Indian states have met their SDG targets, but three states, Madhya Pradesh (163), Uttar Pradesh (167), and Assam (205), still have MMRs above 150 [7]. India's IMR is 32 per 1000 live births, with Uttar Pradesh having a higher IMR of 43 per 1000 live births [23]. It is critical to have an appropriate, well-designed, and timely availability of related healthcare services such as antenatal care, postnatal care, skilled birth attendants, and mandatory immunisation in order to improve maternal and child health and mitigate the threat of mortalities in a country.

Pregnant women should have at least four antenatal care visits, according to the WHO [12]. In developing countries, however, just 65% of moms sought prenatal care, compared to 97% of mothers in developed ones [15]. SBA is concerned with providing adequate medical and health worker services during childbirth, which are critical for a safe delivery. Both the mother and the child are affected by the type of support a woman receives during childbirth. The presence of a professional attendant at the time of delivery is linked to lower maternal death rates [11]. Despite the fact that the usage of trained birth attendants has expanded globally [18], many mothers in developing countries still do not deliver their babies with the help of skilled birth attendants [14]. Complications and infection risks persist after labour, necessitating postpartum care [12, 13]. Monitoring the mother's and new-born child's health is part of post-natal health care. It covers the mother's and child's routine health checks to ensure that they are free of communicable infections and illnesses. In many developing countries, postnatal care is still underutilised [16, 13].

Since the First and Second Five-Year Plans (1951-56 and 1956-61) when the Government of India started initiatives to promote maternity and child health services, maternal and child health has remained an integral aspect of the Family Welfare Programme of India [10]. Maternal, child, and nutrition services were integrated with family planning services as part of the Minimum Needs Programme, which was implemented during the Fifth Five-Year Plan (1974-79). In a country like India, where there is diversity, women are given high importance in various religions, yet despite this, their health is not up to par [10]. In developing countries like India, many of these services are insufficient. The use of maternal healthcare services at all stages of pregnancy and birth can reduce both morbidity and death among mothers [17].

Many studies done at individual country level opined that socio-cultural factor like caste, type of family, education level of mothers' socio-economic status of the family, child birth practices, prenatal care and the type of medical attention at the time of birth determine the maternal and child health service utilization in India [2].

The majority of the studies conducted in India has focused on the state level but very few has compared the eastern with the western part of Uttar Pradesh. There was a need to do a comparative study in order to get a clearer picture of where the eastern region of Uttar Pradesh lies, which factors plays dominant role in determining the maternal and child healthcare service utilization. Also, not much study has been done by combining all the three components (ANC, PNC, and SBA) of maternal healthcare utilization and two components (full immunization, and PNC) of child healthcare utilization as a part of comparative study.

The purpose of the study is to find out the factors which affects the utilization of maternal and child healthcare services in the two regions of Uttar Pradesh. This comparison has been done to know where the rural part i.e., Eastern Uttar Pradesh (EUP) lies as compared to its urban counterpart i.e., Western Uttar Pradesh (WUP).

2. MATERIALS AND METHODS

2.1 Data Source and Study Design

This study is based on the data from fourth rounds of the National Family Health Survey (NFHS-4) conducted in 2015-16 by International Institute for Population Sciences (IIPS). It provides information on maternal and child health care and nutrition for India and each state or union territory. NFHS-4, for the first time, collected information at the district level. NFHS-4 adopted a two-stage stratified sampling method. Primary sampling units i.e., the villages for rural areas and census enumeration blocks in urban areas were selected in the first stage of sampling and households were selected in the second stage of sampling. A total of 699,686 women aged 15-49 years were interviewed with a response rate of XXXX. See IIPS & ICF (2017) for detailed information on sampling. For this study we have considered districts of eastern and western region of Uttar Pradesh state.

2.2 Statistical analysis

Descriptive statistics along with bivariate analysis was presented in the present paper. Chi-square test [5] was used to find the significance level during bivariate analysis. Additionally, binary logistic regression [6] analysis was used to establish the association between outcome variables (ANC, delivery by SBA and PNC under maternal healthcare services, full vaccination and PNC under child healthcare services) and other explanatory variables. The binary logistic regression model is usually put into a more compact form as follows:

$$\text{Logit}\,[P(Y = 1)] = \beta_0 + \beta * X + \epsilon$$

The parameter β_0 estimates the log odds of the outcome variables (ANC, SBA, PNC, full immunization, and PNC among children) for the reference group, while β estimates the maximum likelihood, the differential log odds of the outcome variables associated with set of predictors X, as compared to the reference group and ϵ represents the residual in the model.

2.3 Description of the variables

Outcome variable:

There were three outcome variables to assess the maternal health care services namely ante-natal care, delivery by skilled birth attendant and post-natal care.

1. Full ante-natal care (ANC): defined as our or more antenatal visits, at least one tetanus toxoid (TT) injection and reported consumption of iron folic acid (IFA) tablets or syrup for a minimum of 100 days [1].
2. Delivery by skilled birth attendant (SBA): defined as women who gave birth in health centre and hospital by assistance of health professionals that have midwifery skills including Midwife nurse, Nurse, Health Officers and Doctors [8].

3. Post-natal care (PNC): defined as women who received a postnatal check during the first 2 days after giving birth [9].

   There were two outcome variables to assess the child health care services namely full immunization and post-natal care.

1. Full immunization: defined as if the children who received one dose of BCG, three doses of DPT, three doses of polio vaccine and one dose of measles [4].

Table-A1 Socio-economic profile of women (15-49 years) in east and west Uttar Pradesh, 2015-16

Background characteristics	West		East	
	Sample	Percentage	Sample	Percentage
Maternal age at childbirth (in years)				
<18	5,727	14.5	4,027	17.9
18-29	33,174	84.2	18,067	80.4
30+	510	1.3	368	1.6
Education				
Not educated	18,407	46.7	11,945	53.2
Primary	5,450	13.8	2,599	11.6
Secondary	11,583	29.4	5,887	26.2
Higher	3,971	10.1	2,030	9.0
Media Exposure				
No	13,721	34.8	9,488	42.2
Yes	25,690	65.2	12,973	57.8
Birth Order				
One	6,094	15.5	3,473	15.5
Two	9,288	23.6	4,774	21.3
Three	8,367	21.2	5,018	22.3
Four and more	15,661	39.7	9,196	40.9
Child's Birth interval (in months)				
>24 months	9,307	23.6	5,092	22.7
24-36 months	10,693	27.1	5,930	26.4
< 36 months	19,410	49.3	11,439	50.9
Religion				
Hindu	31,395	79.7	19,290	85.9
Non-Hindu	8,016	20.3	3,171	14.1
Caste				
SC/ST	8,907	22.6	5,227	23.3
Non-SC/ST	30,504	77.4	17,234	76.7
Wealth Index				
Poorest	9,341	23.7	7,729	34.4
Poorer	8,200	20.8	5,806	25.9
Middle	6,851	17.4	3,987	17.8
Richer	6,848	17.4	2,790	12.4
Richest	8,170	20.7	2,150	9.6
Type of Residence				
Urban	13,004	33.0	3,013	13.4
Rural	26,407	67.0	19,448	86.6
Total	39,411	100.0	22,461	100.0

The explanatory variable like Maternal age at childbirth (less than 18 years, 18-29 years and 30 or more years), Education (educated, primary, secondary and higher), Media exposure (no and yes), birth order (one, two, three and four and above), Child's birth interval (less than 24 months, 24-36 months and more than 36 months), Religion (Hindu and non-Hindu), Caste (Scheduled Caste/Scheduled Tribe (SC/ST) and non-SC/ST), wealth index (poorest, poorer, middle, richer and richest), type of residence (urban and rural), Uttar Pradesh was divided into two regions namely West and East.

2.4 Ethical considerations:

Ethical permission was not sought for the current study since NFHS datasets used are publicly available.

2. RESULTS:
A. Factors determining maternal healthcare service utilization

The socio-economic profile of women of both the regions of Uttar Pradesh for the present study is given in the Table A1.

SC/ST: Scheduled Caste/Scheduled Tribe

Table-A2 Percentage distribution of full ante-natal care (ANC) by background characteristics in east and west Uttar Pradesh, NFHS 2015-16

Background characteristics	West		East	
	%	**p<0.05**	**%**	**p<0.05**
Maternal age at childbirth (in years)		*		*
<18	2.2		2.1	
18-29	6.2		6.1	
30+	20.3		14.4	
Education		*		*
Not educated	1.7		1.5	
Primary	2.8		3.6	
Secondary	7.1		7.2	
Higher	24.7		19.8	
Media Exposure		*		*
No	1.6		1.6	
Yes	8.8		8.9	
Birth Order		*		*
One	11.4		9.5	
Two	7.7		8.1	
Three	3.5		3.7	
Four and more	2.1		1.8	
Child's Birth interval (in months)		*		*
>24 months	3.6		4.7	
24-36 months	3.9		3.6	
< 36 months	8.2		7.0	
Religion		*		
Hindu	6.6		5.8	
Non-Hindu	5.0		5.9	
Caste		*		*
SC/ST	3.4		2.3	
Non-SC/ST	7.1		6.9	
Wealth Index		*		*
Poorest	1.1		1.1	
Poorer	2.0		3.3	
Middle	3.4		7.2	
Richer	7.2		11.1	
Richest	20.4		26.0	
Type of Residence		*		*
Urban	12.3		17.2	
Rural	3.7		4.3	
Total	6.2		5.8	

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05 (chi-square test); %: Percentage*

Table A2 show the percent distribution of Full ANC visits by background characteristics of women in eastern and western Uttar Pradesh. The prevalence of Full ANC check-ups for mother age <18 years at child birth is 2.1 % while 6.1 % and 14.4 % for age 18-29 and age >30 respectively in eastern Uttar Pradesh. The corresponding prevalence are nearly similar in western Uttar Pradesh except for the age >30 (14.4%). The percentage of Full ANC visits for Mother who are not educated is 1.5% and for primary educated the prevalence is 3.6 % and the coverage rose to 19.8 % for mothers who are highly educated in EUP. The ANC utilization is higher in eastern Uttar Pradesh for women with primary and secondary education compared to the western Uttar

Pradesh. The prevalence for media exposure is nearly same in both the regions. The Prevalence is 9.5 % for birth order one in EUP while 11.4 % in WUP, while for second birth order EUP (8.1%) has more prevalence than the WUP (7.7%) and is slightly vary for third and fourth birth orders. The prevalence is 4.7 % for the child birth interval >24 months in EUP while 3.6 % in WUP and 7.0 % for <36 month in EUP and 8.2 % in WUP. The percentage is 5.8 % for mothers belongs to Hindu community and 5.9 % for non-Hindu in EUP. The corresponding percentage is 6.6 % and 5.0 % respectively in WUP. The Mothers belongs to SC/ST community are low in availing Full ANC services in compare to Non-SC/ST mothers in both the regions of Uttar Pradesh. Only 7.2 % mother belongs to Middle wealth quintile are availing Full ANC services while 11.1 % of Richer quintile and 26.0 % of Richest quintile in EUP. The corresponding percentage is 3.4 % for Middle quintile, 7.2 % for Richer and 20.4 % for richest quintile in WUP. The mother who lives in urban areas receives 17.2 % Full ANC while only 4.3 % in rural areas in EUP and the corresponding percentage are 12.3 % in Urban areas and 3.7 % in rural areas in WUP.

Table-A3 Percentage distribution of using skilled birth attendant (SBA) by background characteristics in east and west Uttar Pradesh, 2015-16

Background characteristics	West		East	
	%	**p<0.05**	**%**	**p<0.05**
Maternal age at childbirth (in years)		*		*
<18	62.0		62.6	
18-29	72.7		73.3	
30+	82.0		70.9	
Education		*		*
Not educated	61.0		59.4	
Primary	68.9		70.8	
Secondary	79.7		82.9	
Higher	92.7		91.3	
Media Exposure		*		*
No	62.1		63.3	
Yes	77.3		78.7	
Birth Order		*		*
One	85.1		84.6	
Two	75.2		77.1	
Three	68.7		68.6	
Four and more	59.1		58.3	
Child's Birth interval (in months)		*		*
>24 months	65.6		67.8	
24-36 months	64.9		66.7	
< 36 months	77.1		75.4	
Religion		*		*
Hindu	73.1		73.6	
Non-Hindu	68.5		64.2	
Caste		*		*
SC/ST	67.4		68.6	
Non-SC/ST	73.3		73.2	
Wealth Index		*		*
Poorest	59.6		59.7	
Poorer	66.7		74.1	
Middle	71.5		79.3	
Richer	78.7		83.8	
Richest	89.5		92.1	
Type of Residence		*		*
Urban	76.8		80.1	
Rural	69.8		71.0	
Total	71.8		72.0	

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05 (chi-square test); %: Percentage*

Table A3 show the percent distribution of using Skilled Birth Attendant (SBA) by background characteristics of women in eastern and western Uttar Pradesh. The prevalence of SBA for mother age <18 years at child birth is 62.6 % while 73.3 % and 70.9 % for age 18-29 and age >30 respectively in eastern Uttar Pradesh. The corresponding prevalence are nearly similar for age <18 and 18-29 year while 82.0 % for age >30 years in WUP. The percentage of SBA is increasing as the mother's education level increases in both EUP and WUP. The women who has media exposure are more likely to get SBA. The results show that the usage of SBA is high for first birth order and then

decreasing with increasing birth order in both EUP and WUP. The prevalence of SBA for birth Interval >24 month and 24-36 month is nearly similar while slight high in birth interval <36 month in EUP and WUP. Mother's belongs to Hindu community using 73.6 % SBA in compare to 64.2 % by Non-Hindu mothers in EUP. The corresponding percentage are 73.1 % and 68.5 % respectively in WUP. The Mothers belongs to SC/ST community are low in availing SBA services in compare to Non-SC/ST mothers in both the regions of Uttar Pradesh. Only 79.3 % mother belongs to Middle wealth quintile are assisted their delivery by SBA while 92.1 % by mother belongs to richest quintile in EUP. The mother who lives in urban areas receives 80.1 % SBA while only 71.0 % in rural areas of EUP and the corresponding percentage are 76.8 % in Urban areas and 69.8 % in rural areas of WUP.

Table-A4 Percentage distribution of post-natal care (PNC) by background characteristics in east and west Uttar Pradesh, NFHS 2015-16

Background characteristics	West		East	
	%	p<0.05	%	p<0.05
Maternal age at childbirth (in years)		*		*
<18	57.1		44.1	
18-29	68.8		57.5	
30+	74.4		57.7	
Education		*		*
Not educated	61.5		44.6	
Primary	63.9		54.6	
Secondary	72.2		64.8	
Higher	82.8		75.8	
Media Exposure		*		*
No	58.2		45.7	
Yes	73.1		63.8	
Birth Order		*		*
One	76.3		65.4	
Two	68.5		62.6	
Three	66.5		52.9	
Four and more	60.3		43.5	
Child's Birth interval (in months)		*		*
>24 months	65.1		52.9	
24-36 months	62.3		52.0	
< 36 months	71.0		58.5	
Religion		*		*
Hindu	67.4		57.4	
Muslim	68.6		48.8	
Caste		*		*
SC/ST	62.5		53.2	
Non-SC/ST	69.4		56.9	
Wealth Index		*		*
Poorest	55.6		43.5	
Poorer	63.4		56.5	
Middle	68.9		63.8	
Richer	74.6		67.8	
Richest	82.9		80.6	
Type of Residence		*		*
Urban	71.5		65.9	
Rural	66.2		54.7	
Total	67.7		56.0	

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05 (chi-square test); %: Percentage*

Table A4 Show the percent distribution of using Post-Natal Care (PNC) by background characteristics of women in eastern and western Uttar Pradesh. The prevalence of PNC for mother age <18 years at child birth is 44.1 % while 57.7 % for age >30 in eastern Uttar Pradesh but the corresponding prevalence are high in WUP. The percentage of PNC is increasing as the mother's education level increases in both EUP and WUP. The results show that the usage of PNC is high for first birth order and then decreasing with increasing birth order in both EUP and WUP. The prevalence of PNC increases with the increasing birth interval, for birth Interval >24 month and 24-36 month is nearly similar while slightly high in birth interval <36 month in EUP. The Mother's belongs to Hindu community using 57.4 % PNC services in compare to 48.8 % by Non-Hindu mothers in EUP. The Mothers belongs to SC/ST community are low in availing PNC services in compare to Non-SC/ST mothers in both the

regions of Uttar Pradesh. Only 43.5 % mother belongs to poorest wealth quintile are using PNC while 80.6 % by mother belongs to richest quintile in EUP. The mother who lives in urban areas receives 65.9 % PNC while only 54.7 % in rural areas of EUP and the corresponding percentage are 71.5 % in Urban areas and 66.2 % in rural areas of WUP.

Table-A5 Percentage distribution of full ante-natal care (ANC) by background characteristics in east and west Uttar Pradesh, NFHS 2015-16

Background characteristics	Full ANC
	OR (95% CI)
Maternal age at childbirth (in years)	
<18	Ref.
18-29	1.44*(1.11,1.87)
30+	2.61*(1.78,3.83)
Education	
Not educated	Ref.
Primary	1.43*(1.13,1.80)
Secondary	2.06*(1.71,2.49)
Higher	4.19*(3.40,5.17)
Media Exposure	
No	Ref.
Yes	1.31*(1.09,1.58)
Birth Order	
One	Ref.
Two	1.04(0.90,1.20)
Three	0.76*(0.63,0.91)
Four and more	0.71*(0.58,0.88)
Child's Birth interval (in months)	
>24 months	Ref.
24-36 months	0.99(0.82,1.20)
< 36 months	1.30*(1.09,1.54)
Religion	
Hindu	Ref.
Non-Hindu	0.89(0.8,1.03)
Caste	
SC/ST	Ref.
Non-SC/ST	1.28*(1.10,1.49)
Wealth Index	
Poorest	Ref.
Poorer	1.55*(1.20,2.00)
Middle	2.22*(1.72,2.88)
Richer	3.04*(2.33,3.97)
Richest	5.66*(4.30,7.44)
Type of Residence	
Urban	Ref.
Rural	0.72*(0.64,0.82)
Uttar Pradesh	
West	Ref.
East	1.28*(1.14,1.45)

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05; Ref: Reference; OR: Odds Ratio; CI: Confidence Interval*

Table A5 show the odds of full Ante-Natal care (ANC) services in east and west Uttar Pradesh. The odds of ANC are high [OR: 1.44;95%; CI;1.11-1.88] in maternal age at child birth 18-29 years by its reference category. Mothers with maternal age at child birth >30 year are two time more likely [OR: 2.61;95%; CI;1.78-3.8] to having full ANC Check-ups than its reference category. The odds of ANC check-ups are increasing as mother's level of education increases. Mothers who exposed to media are more likely [OR: 1.31;95%; CI;1.09-1.58] to having full ANC Check-ups than mothers who are not exposed to media. Mothers with birth order 3 or more than 3 are less likely to having Full ANC check-ups than mothers with one birth order. Mothers whose child birth interval is <36 month are 30% more likely [OR: 1.30;95%; CI;1.09-1.54] to having Full ANC check-ups the reference category. Mothers belongs to Non-Hindu community are less likely [OR: 0.89;95%; CI;0.80-1.03] to having Full ANC check-ups than Hindu Mothers. Mothers belongs to Non-SC/ST community are more likely [OR: 1.28;95%; CI;1.10-1.49] to having Full ANC check-ups than SC/ST Mothers. The odds of ANC check-ups are increasing as wealth quintile of mother increases and

increased to six time [OR: 5.66;95%; CI;4.30-7.44] for mother belongs to richest wealth quintile than poorest wealth quintile mother. The Mothers from east Uttar Pradesh are 28% more likely [OR: 1.28;95%; CI;1.14-1.45] to use Full ANC visits than mothers from western Uttar Pradesh.

Table-A6 Percentage distribution of using skilled birth attendant (SBA) by background characteristics in east and west Uttar Pradesh, 2015-16

Background characteristics	SBA
	OR (95% CI)
Maternal age at childbirth (in years)	
<18	Ref.
18-29	1.14*(1.05,1.24)
30+	1.18(0.92,1.51)
Education	
Not educated	Ref.
Primary	1.19*(1.1,1.29)
Secondary	1.67*(1.55,1.79)
Higher	2.99*(2.59,3.47)
Media Exposure	
No	Ref.
Yes	1.09*(1.02,1.16)
Birth Order	
One	Ref.
Two	0.67*(0.61,0.74)
Three	0.57*(0.52,0.63)
Four and more	0.49*(0.44,0.54)
Child's Birth interval (in months)	
>24 months	Ref.
24-36 months	1.09*(1.01,1.17)
< 36 months	1.25*(1.16,1.35)
Religion	
Hindu	Ref.
Non-Hindu	0.76*(0.71,0.82)
Caste	
SC/ST	Ref.
Non-SC/ST	1.09*(1.02,1.17)
Wealth Index	
Poorest	Ref.
Poorer	1.29*(1.2,1.39)
Middle	1.42*(1.3,1.56)
Richer	1.83*(1.64,2.04)
Richest	2.84*(2.46,3.27)
Type of Residence	
Urban	Ref.
Rural	1.23*(1.13,1.33)
Uttar Pradesh	
West	Ref.
East	1.00(0.95,1.06)

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05; Ref: Reference; OR: Odds Ratio; CI: Confidence Interval*

Table A6 show the odds of Skilled Birth Attendant (SBA) services in east and west Uttar Pradesh. The odds of SBA are high [OR: 1.15;95%; CI;1.06-1.25] in maternal age at child birth 18-29 years by its reference category. The mothers with higher education level are 2 times [OR: 2.90;95%; CI;2.51-3.36] more likely to assisted by SBA during delivery than her not educated mother. Mothers who exposed to media are more likely to assisted by SBA during delivery than mothers who are not exposed to media. Mothers with birth order 3 or more than 3 are less likely to having assisted by SBA during delivery than mothers with one birth order. Mothers whose child birth interval is <36 month are 24% more likely [OR: 1.24;95%; CI;1.15-1.34] to be assisted by SBA during delivery than reference category. Mothers belongs to Non-Hindu community are less likely [OR: 0.79;95%; CI;0.73-0.85] to be assisted by SBA during delivery than Hindu Mothers. Mothers belongs to Non-SC/ST community are more likely [OR: 1.09;95%; CI;1.02-1.16] to be assisted by SBA during delivery than SC/ST Mothers. The odds of SBA assistance during delivery are increasing as wealth quintile of mother increases from poorest to richest wealth quintile.

Table-A7 Percentage distribution of post-natal care (PNC) by background characteristics in east and west Uttar Pradesh, NFHS 2015-16

Background characteristics	PNC
	OR (95% CI)
Maternal age at childbirth (in years)	
<18	Ref.
18-29	1.25*(1.16,1.36)
30+	1.25*(1.01,1.56)
Education	
Not educated	Ref.
Primary	1.08(1.00,1.16)
Secondary	1.18*(1.10,1.26)
Higher	1.45*(1.30,1.62)
Media Exposure	
No	Ref.
Yes	1.30*(1.22,1.38)
Birth Order	
One	Ref.
Two	0.87*(0.8,0.94)
Three	0.81*(0.74,0.88)
Four and more	0.76*(0.7,0.83)
Child's Birth interval (in months)	
>24 months	Ref.
24-36 months	0.97(0.9,1.04)
< 36 months	1.08(1.00,1.15)
Religion	
Hindu	Ref.
Non-Hindu	0.95(0.89,1.02)
Caste	
SC/ST	Ref.
Non-SC/ST	1.03(0.97,1.09)
Wealth Index	
Poorest	Ref.
Poorer	1.27*(1.19,1.36)
Middle	1.49*(1.39,1.62)
Richer	1.83*(1.66,2.02)
Richest	2.74*(2.42,3.09)
Type of Residence	
Urban	Ref.
Rural	1.20*(1.11,1.29)
Uttar Pradesh	
West	Ref.
East	0.62*(0.59,0.66)

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05; Ref: Reference; OR: Odds Ratio; CI: Confidence Interval*

Table A7 show the odds of Post Natal Care (PNC) services in east and west Uttar Pradesh. The odds of PNC services are increasing as mother's level of education increases. Mothers who exposed to media are more likely [OR: 1.30;95%; CI;1.22-1.38] to have PNC than mothers who are not exposed to media. Mothers with birth order 4 or more are 13 % less likely to have PNC check-ups than mothers with one birth order. Mothers whose child birth interval is <36 month are 8% more likely [OR: 1.08;95%; CI;1.00-1.15] to have PNC check-ups the reference category. Mothers belongs to Non-Hindu community are less likely [OR: 0.95;95%; CI;0.89-1.02] to have PNC check-ups than Hindu Mothers. Mothers belongs to Non-SC/ST community are more likely [OR: 1.03;95%; CI;0.97-1.09] to have PNC check-ups than SC/ST Mothers. The odds of PNC check-ups are increasing as wealth quintile of mother increases. The women of EUP are less likely to have PNC check-ups compared to the WUP.

A. Factors determining child healthcare service utilization

The socio-economic profile of children under age 5 years of both the regions of Uttar Pradesh for the present study is given in the Table B1.

Table-B1 Socio-economic profile of children under five years in east and west Uttar Pradesh, 2015-16

Background characteristics	West		East	
	Sample	Percentage	Sample	Percentage
Maternal age at childbirth (in years)				
<18	2,545	9.7	1,743	11.2
18-29	23,185	88.8	13,603	87.0
30+	390	1.5	285	1.8
Education				
Not educated	10,909	41.8	7,155	45.8
Primary	4,005	15.3	2,009	12.9
Secondary	8,577	32.8	4,743	30.3
Higher	2,630	10.1	1,724	11.0
Media Exposure				
No	10,007	38.3	7,000	44.8
Yes	16,113	61.7	8,631	55.2
Birth Order				
One	8,108	31.0	4,659	29.8
Two	6,874	26.3	4,159	26.6
Three	4,552	17.4	2,896	18.5
Four and more	6,586	25.2	3,917	25.1
Child's Birth interval (in months)				
>24 months	5,630	21.6	2,936	18.8
24-36 months	5,752	22.0	3,430	21.9
< 36 months	14,738	56.4	9,265	59.3
Sex of the child				
Male	13,824	52.9	8,129	52.0
Female	12,296	47.1	7,502	48.0
Religion				
Hindu	19,829	75.9	13,056	83.5
Non-Hindu	6,291	24.1	2,575	16.5
Caste				
SC/ST	6,548	25.1	3,992	25.5
Non-SC/ST	19,572	74.9	11,639	74.5
Wealth Index				
Poorest	7,376	28.2	6,174	39.5
Poorer	5,928	22.7	4,113	26.3
Middle	4,751	18.2	2,613	16.7
Richer	4,103	15.7	1,662	10.6
Richest	3,961	15.2	1,069	6.8
Type of Residence				
Urban	7,193	27.5	1,684	10.8
Rural	18,927	72.5	13,947	89.2
Total	26,120	100.0	15,631	100.0

SC/ST: Scheduled Caste/Scheduled Tribe

Table-B2 Percentage distribution of full vaccination among children aged 12-23 months by background characteristics in east and west Uttar Pradesh, NFHS 2015-16

Background characteristics	West		East	
	%	p<0.05	%	p<0.05
Maternal age at childbirth (in years)		*		*
<18	46.5		27.0	
18-29	58.0		44.3	
30+	54.0		51.3	
Education		*		*
Not educated	50.5		31.1	
Primary	54.5		41.2	
Secondary	62.2		53.3	
Higher	75.9		56.4	
Media Exposure		*		*
No	49.4		35.0	
Yes	62.4		48.8	
Birth Order		*		*

One	65.0		52.3	
Two	57.7		45.1	
Three	56.0		39.6	
Four and more	49.5		30.6	
Child's Birth interval (in months)		*		*
>24 months	52.5		40.2	
24-36 months	53.6		36.6	
< 36 months	61.1		46.0	
Sex of the child		*		*
Male	60.1		44.8	
Female	55.1		40.6	
Religion		*		*
Hindu	59.8		45.6	
Non-Hindu	52.1		29.2	
Caste				
SC/ST	58.2		43.7	
Non-SC/ST	57.5		42.6	
Wealth Index		*		*
Poorest	48.5		33.3	
Poorer	51.7		45.8	
Middle	61.7		49.2	
Richer	61.9		52.8	
Richest	70.4		52.0	
Type of Residence				
Urban	59.1		42.2	
Rural	57.1		42.9	
Total	57.8		42.8	

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05 (chi-square test); %: Percentage*

Table B2 show the percent distribution of full vaccination among children aged 12-23 month by background characteristics in eastern and western Uttar Pradesh. The prevalence of Full vaccination for mother age <18 years at child birth is 27.0 % while 44.3 % and 51.3 % for age 18-29 and age >30 respectively in eastern Uttar Pradesh. The corresponding prevalence are nearly 46.5 % for <18 years and 54 % for more than 30 year of age in western Uttar Pradesh. The percentage of Full vaccination are increasing with maternal education. The mother who are not exposed to media their only 35 % children are getting full vaccination while 48.8 % children are getting full vaccination whose mother are exposed to media in eastern Uttar Pradesh. The corresponding percentage are 49.4 % and 62.4 % in Western Uttar Pradesh. First birth order children are getting more full vaccination than 2nd, 3rd and 4rth birth order children in eastern Uttar Pradesh. The results show that higher the birth interval, higher the full vaccination coverage in WUP regions whereas for birth interval 24-36 months (36.6%) the coverage is lower than the remaining groups in EUP. While there are some differences among regions. Results show that male children are having high full vaccination coverage than female children in both the regions. Non- Hindu children getting very low full vaccination (29.2%) in compare to Hindu children (45.6) in EUP whereas in WUP there is a difference of approximately 8 percent between Hindu and non-Hindu groups. The results show as the wealth quintile increases prevalence of full vaccination increases among children.

Table-B3 Percentage distribution of post-natal care among children under five years by background characteristics in east and west Uttar Pradesh, 2015-16

Background characteristics	West		East	
	%	**p<0.05**	**%**	**p<0.05**
Maternal age at childbirth (in years)		*		*
<18	33.7		15.9	
18-29	38.4		19.9	
30+	41.2		18.9	
Education		*		*
Not educated	36.9		15.9	
Primary	36.7		20.0	
Secondary	37.8		21.4	
Higher	44.2		26.9	
Media Exposure		*		*
No	31.7		14.7	
Yes	41.5		23.0	
Birth Order		*		*
One	40.5		21.2	

Two	38.3		21.7	
Three	36.2		19.4	
Four and more	38.8		15.7	
Child's Birth interval (in months)		*		*
>24 months	37.0		16.9	
24-36 months	33.5		18.2	
< 36 months	36.1		20.8	
Sex of the child				
Male	37.9		19.5	
Female	38.1		19.4	
Religion		*		*
Hindu	35.5		20.1	
Non-Hindu	45.1		16.3	
Caste		*		
SC/ST	32.5		19.3	
Non-SC/ST	39.8		19.5	
Wealth Index		*		*
Poorest	28.3		15.3	
Poorer	36.7		19.0	
Middle	39.5		22.1	
Richer	43.8		23.5	
Richest	46.7		29.3	
Type of Residence		*		*
Urban	41.9		23.6	
Rural	36.4		18.9	
Total	38.0		19.5	

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05 (chi-square test); %: Percentage*

Table B3 show the percent distribution of Post-natal Care (PNC) among children 5 years of age by background characteristics in eastern and western Uttar Pradesh. The prevalence of PNC among children under 5 year of age is 15.9 % to mother age at childbirth <18 years in Eastern Uttar Pradesh while the corresponding prevalence is 33.7 % in Western Uttar Pradesh. Like Full vaccination, the percentage of PNC is also increasing with maternal education. The percentage of PNC is 23.0 % if their mothers are exposed to media and only 14.7 % if their mother are not exposed to media in Eastern Uttar Pradesh. The results show that as the birth order are increasing level of PNC coverage are decreasing from 21.2 % for birth order one to 15.7 % in birth order four and more in eastern Uttar Pradesh. Likewise, PNC coverage increases with increase in birth intervals. The EUP has much lower PNC utilization among the children compared to the WUP by birth interval. Like full vaccination, there is high prevalence of PNC among children if their mothers belong to Hindu community than Non-Hindu community in Eastern Uttar Pradesh whereas in WUP non-Hindu have higher coverage of PNC. The percentage are almost same for SC/ST and Non-SC/ST children in eastern Uttar Pradesh. PNC prevalence increases with increasing in wealth quintile status from 15.3 % in poorest quintile to 29.3 % in richest quintile in eastern Uttar Pradesh. Children living in urban areas in both the regions are more likely to have PNC.

Table-B4 Logistic Regression estimates for full vaccination by background characteristics among children aged 12-23 months in east and west Uttar Pradesh, 2015-16

Background characteristics	Full vaccination
	OR (95% CI)
Maternal age at childbirth (in years)	
<18	Ref.
18-29	1.39*(1.17,1.64)
30+	1.37(0.88,2.12)
Education	
Not educated	Ref.
Primary	1.15(0.99,1.33)
Secondary	1.35*(1.19,1.53)
Higher	1.81*(1.49,2.20)
Media Exposure	
No	Ref.
Yes	1.19*(1.06,1.34)
Birth Order	
One	Ref.
Two	0.94(0.81,1.09)
Three	0.91(0.78,1.07)

Four and more	0.88(0.76,1.03)
Child's Birth interval (in months)	
>24 months	Ref.
24-36 months	0.98(0.85,1.13)
< 36 months	1.12(0.97,1.28)
Sex of the child	
Male	Ref.
Female	0.85*(0.77,0.93)
Religion	
Hindu	Ref.
Non-Hindu	0.73*(0.65,0.83)
Caste	
SC/ST	Ref.
Non-SC/ST	0.89*(0.79,0.99)
Wealth Index	
Poorest	Ref.
Poorer	1.18*(1.03,1.35)
Middle	1.37*(1.17,1.60)
Richer	1.59*(1.32,1.91)
Richest	1.81*(1.45,2.25)
Type of Residence	
Urban	Ref.
Rural	1.34*(1.17,1.53)
Uttar Pradesh	
West	Ref.
East	0.52*(0.47,0.58)

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05; Ref: Reference; OR: Odds Ratio; CI: Confidence Interval*

Table B4 show the odds of Full vaccination services in east and west Uttar Pradesh. The odds of Full vaccination are high [OR: 1.39;95%; CI;1.17-1.64] in maternal age at child birth 18-29 years by its reference category. The children if their mothers are higher in education level are 81 % more likely to [OR: 1.81;95%; CI;1.49-2.20] be getting Full Vaccination the reference category. The children if their mothers are exposed to media are more likely to be getting full vaccination than children if their mothers are not exposed to media. Children of birth order two three or four and more are less likely to be full vaccinated the children of first birth order. Female child is having low odds [OR: 0.85;95%; CI;0.77-0.93] of full vaccination than male child. Children belongs to Non-Hindu community are less likely [OR: 0.73;95%; CI;0.64-0.82] to be full vaccinated than children belong to Hindu community. Similarly, Children belongs to Non-SC/ST community are less likely [OR: 0.89;95%; CI;0.79-0.99] to be full vaccinated than children belong to SC/ST community. The odds of full vaccination are increasing as wealth quintile of mother increases from poorest to richest wealth quintile. The children belong to eastern Uttar Pradesh are having low odds [OR: 0.54;95%; CI;0.48-0.59] of full vaccination than children of western Uttar Pradesh.

Table-B5 Logistic Regression estimates for post-natal care by background characteristics among children under five years in east and west Uttar Pradesh, NFHS 2015-16

Background characteristics	PNC
	OR (95% CI)
Maternal age at childbirth (in years)	
<18	Ref.
18-29	1.12*(1.03,1.23)
30+	1.01(0.81,1.27)
Education	
Not educated	Ref.
Primary	0.99(0.91,1.07)
Secondary	0.90*(0.83,0.96)
Higher	1.01(0.91,1.13)
Media Exposure	
No	
Yes	1.3*(1.22,1.39)
Birth Order	
One	Ref.
Two	1.03(0.95,1.11)
Three	0.99(0.91,1.08)
Four and more	1.02(0.94,1.12)
Child's Birth interval (in months)	

	>24 months	Ref.
	24-36 months	0.98(0.90,1.06)
	< 36 months	1.06(0.98,1.14)
Sex of the child		
	Male	Ref.
	Female	0.98(0.93,1.03)
Religion		
	Hindu	Ref.
	Non-Hindu	1.17*(1.09,1.25)
Caste		
	SC/ST	Ref.
	Non-SC/ST	1.09(0.99,1.13)
Wealth Index		
	Poorest	Ref.
	Poorer	1.22*(1.12,1.32)
	Middle	1.35*(1.24,1.48)
	Richer	1.48*(1.34,1.64)
	Richest	1.74*(1.55,1.96)
Type of Residence		
	Urban	Ref.
	Rural	1.09*(1.02,1.17)
Uttar Pradesh		
	West	Ref.
	East	0.42*(0.39,0.44)

*SC/ST: Scheduled Caste/Scheduled Tribe; *if p<0.05; Ref: Reference; OR: Odds Ratio; CI: Confidence Interval*

Table B5 show the results of logistic regression model of PNC services in east and west Uttar Pradesh. The odds of PNC are high [OR: 1.12;95%; CI;1.03-1.23] in maternal age at child birth 18-29 years by its reference category. The children if their mothers are higher in education level are more likely to [OR: 1.01;95%; CI;0.91-1.13] be getting PNC services than the reference category. The children if their mothers are exposed to media are more likely to get PNC service. Female child is having low odds [OR: 0.98;95%; CI;0.93-1.03] of PNC check-ups than male child. Children belongs to Non-Hindu community are more likely [OR: 1.17;95%; CI;1.09-1.25] to be PNC check-ups than children belong to Hindu community. Similarly, Children belongs to Non-SC/ST community are more likely [OR: 1.09;95%; CI;0.98-1.12] to be PNC check-ups than children belong to SC/ST community. The odds of PNC check-ups are increasing as wealth quintile of mother increases from poorest to richest wealth quintile. The children belong to eastern Uttar Pradesh are having low odds [OR: 0.42;95%; CI;0.39-0.44] of PNC check-ups than children of western Uttar Pradesh.

3. CONCLUSION

The result of the paper clearly depicts that socio-economic factors like- mothers age, education, birth order, child birth interval, religion, place of residence, caste plays an important role in determining the maternal and child healthcare service utilization in Eastern Uttar Pradesh. This paper tried to examine the prevalence of these factors in two regions of Uttar Pradesh namely- Eastern and Western Uttar Pradesh. It has been found that the percentage use of full antenatal care services by mothers age is almost similar in both the regions. While the prevalence by education depicts a surprising result as women with higher education in WUP tend to have lesser utilization of full ANC as compared to the women of EUP of the same category. The prevalence for media exposure, caste, and birth order shows nearly similar percentage in both the regions. The prevalence for child birth interval is higher in EUP, whereas for the wealth index and type of residence it is higher among the mothers residing in WUP. The prevalence for SBA is almost similar in both the regions. Whereas, the mothers of eastern Uttar Pradesh lag behind in utilizing the PNC services as compared to the western Uttar Pradesh. It has been found that as the mothers age, education level, birth interval, and wealth quintile increase the utilization of ANC, SBA, and PNC also increases. Mothers belonging to Hindu community, and Non-SC/ST are more likely to utilize these services. Findings of our study are coherent with findings of other studies that Hindu, non-SC, and ST women are more expected to utilize ANC [19,20]. One of the studies found that Women from Scheduled Castes, Scheduled Tribes, and Other Backward Classes were found to be less likely to seek postnatal care [9].

The prevalence of full immunization, and PNC is tended to be higher among the children of western Uttar Pradesh. In Uttar Pradesh, wealth and education are two important contributors to the lack of comprehensive immunizations among children. Women in the higher quantiles and with more education were more likely to get their child vaccinated and have a PNC visit. It is suggested that education leads to a greater understanding of the advantages of healthcare services. In their study, [22] discovered

that the number of immunizations continues to be high, implying that educated women are more likely to participate in health-promoting behaviour. The chance of postnatal care utilisation reduces as women's age and birth order rise; however, the likelihood of PNC utilisation rises when mothers' education, access to mass media, and wealth rise.

4. RECOMMENDATIONS

- Attention should be paid to the young mothers as the evidences suggests that they are more vulnerable, the percentage of ANC utilization found to be less compared to the 30+ age group mothers.

- Eastern region of Uttar Pradesh requires more attention.

- Educating mother is very important to improve the uptake of services for both the mother and their child.

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ABBREVIATIONS:

ANC: Ante-natal care

PNC: Post-natal care

SBA: Skilled Birth Attendant

MCH: Maternal and Child Healthcare services

WUP: Western Uttar Pradesh

EUP: Eastern Uttar Pradesh

SC- Scheduled Caste

ST- Scheduled Tribe

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