Original article

Determinants or barriers associated with specific routine check-up in antenatal care in gestational period: A study from EAG states, India

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ABSTRACT

Background: For a long period of time Empowered Action Group States (EAG) of India are cursed with maternal mortality and morbidity. Most of the pregnant women are not acquiescent to receive the routine check-up during Antenatal Care (ANC) and many of them cautiously skip the same. The study aims to explore the obstacle of ANC in women's perspective and their participation in this.

Methods: The study has incorporated most recent fourth round of National Family Health Survey data conducted in 2015–16. Descriptive statistics along with association test and binary logistic regression model have been applied to understand the differential and determinants of ANC.

Result: The behaviour of not taking ANC check-ups (measuring the weight and BP, tested urine and blood sample, taking iron supplements) during pregnancy was significantly higher among women who married in early age (<18 years), had no formal education, belonged to poor socioeconomic status.

Conclusion: Most of the maternal health issues during the gestational period are associated with socio-economic and demographic aspects and mostly due to unawareness and ignorance of the people. It would be benevolent in increasing awareness and taking the necessary visit to receive the routine check-up in ANC is for the duo mothers and foetus.

1. Introduction

Maternal health always remains one of the priorities of global concern, mostly in developing and under developed countries. In fact, improving maternal health was one of the major priorities of Millennium Development Goal (MDG). Although, still 99% maternal death occurs in less developed countries with low resource settings.¹ In India every year, approximately 28 million women experiences pregnancy, out of these an estimated 1.3 lakhs maternal fatality occurs.² India has made remarkable progress in maternal health outcome over last three decades but still high maternal mortality persists across empowered action group (EAG) states.³ India accounts one fifth of maternal mortality worldwide.⁴ Most of the maternal health problem in EAG states continues to be associated with nutrition, socioeconomic marginalisation, poverty and mostly the unawareness and ignorance of the people.⁵ Majority of people of these states has poor knowledge regarding importance of receiving Antenatal Care (ANC), Delivery Care (DC) and Postnatal Care

(PNC).⁶ ANC foster physical and psychological health, welfare of women and prepare them for safe birth.⁷ ANC detects many complications occurring before childbirth and considerably look after the improvement of the health of mother and her child.^{8,9} It includes various diagnostics procedures, vaccination, counselling on nutrition and regular screening of pregnant women which can prevent early complexities and treat conditions that may threaten the health of mother along with foetus.¹⁰ It can detect maternal infections that are dangerous to the infant and other problems like-anaemia, hypertension, pre-eclampsia, vaginitis, urinary tract infections, HIV complications, malnutrition, poor foetal growth etc.¹¹

During gestation period the first visit of ANC consists of weight measurement, blood pressure (BP) measurement, blood test and urine test for the pregnant women, so the attending the first antenatal care visit is very crucial for pregnant women for improving health assessment.^{12,13} Weight measurement during maternity care is very important because it estimates the risk during pregnancy and customised growth

Abbreviations: MMR, Maternal Mortality Rate; ANC, Antenatal Care; BP, Blood Pressure; NFHS, National Family Health Survey.

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chart is calculated to assess the baby's progress. Routine measurement of weight of the pregnant women can assess excess weight gain or poor weight gain. Sometimes excess weight gain may cause pre-eclampsia.¹⁴ Eclampsia and pre-eclampsia, oedema, obesity, poly hydramnios etc. are the serious problem due to weight gain during pregnancy, causes maternal, fetal and neonatal illness and mortality.¹⁵ BP (Blood Pressure) examining is the most crucial diagnosis; frequently screening test is required during antenatal period to manage hypertensive disorder.^{16,17} Chronic hypertension analogous with adverse maternal outcome, it may be controlled by maintaining maternal BP and proper observation of foetal growth.¹⁸ Blood test is required in early pregnancy to examine haemoglobin level,¹⁹ Rh factor, blood group, iron deficiency and anaemia,²⁰ rubella immunity, syphilis, HIV, hepatitis B and hepatitis C.²¹ Routine urine test is also mandatory in each trimester know urinary tract infection, protein level and sugar in urine, to avoid pregnancy related complications that can push the health of mother and infant at risk.²² Precautions of Iron tablets or syrup and folic acid supplements are recommended for pregnant women to prevent anaemia, preterm birth, low birth weight, puerperal sepsis.²³ The distinguished socio-economic and demographic characters either facilitate or create obstacles on the way of receiving the routine check-up care and treatments during antenatal care in EAG states in India.²⁵ The recognized major socio-economic and demographic determinants might implicate ultimately on the response on desired ANC visit and create uneven health outcomes and increased incidence of maternal illness and mortality.^{26,27}

Govt. of India has prepared a list of eight states namely Empowered Action Groups or EAG states which are less developed or very poor in socio-economic as well as demographic index as compared to other states of India. EAG states comprise of Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand and Uttar Pradesh.²⁸ These states are among the lower-middle income economics where women are less privileged in respect of food, medical facilities and a large proportion of its population still living in poverty.²⁹ EAG states consists of 45% of India's population and lagging far behind in health and socio-economic dimension.³⁰ The percentage of Maternal Mortality Rate (MMR) is very high (61.6%) in these states.³¹ Better access, qualitative reproductive health care to improve maternal health of the women and to reduce MMR is the need of hour.³² The study gives its focus on the treatments provided to the pregnant women during ANC visit and to recognize the major non proximate determinants and its association with the proper utilisation of ANC treatments. The participation of pregnant women in utilisation of ANC treatments is largely influenced by their individual socio-economic background.³³ Most of the women are not willing to receive the routine check-up embedded within the ANC and many of them deliberately skip the same.³⁴ Earlier little study has been conducted on EAG states that investigate the determinant factors and its individual relevance on participation in receiving the desired ANC care. The prime objective of this study is to recognize the major determinants, its importance in receiving the various individual antenatal routine check-up care usages about mother in EAG states of India.

2. Materials and methods

2.1. Data source

The data for the research presented here come from the fourth round of the National Family Health Survey (NFHS-4), conducted in 2015–2016. This cross sectional, nationally representative survey was carried out under the guidance of the Ministry of Health and Family Welfare (MoHFW), Govt. of India and International Institute for Population Sciences (IIPS), Mumbai. Two stage stratified sampling design was adopted to select the sample. This face to face & door to door sample survey collects information for 601,509 households, 6, 99,686 women aged 15–49 years with a response rate of 97%, and 112,122 men aged 15–54 years with a response rate of 92%. The common objectives of this

survey were to obtain reliable data relating to fertility and family planning, utilisation of maternal and child health care treatments, infant and child mortality, nutrition, women empowerment, domestic violence and knowledge on HIV/AIDS etc.

2.2. Ethical statement

The study is based on a secondary data set from the recent NFHS-4 survey with no identifiable information on the survey participants. NFHS-4 obtained the consent before and during the survey. This dataset is available in the public domain for research use and, hence, no ethical approval was needed specifically for the present study. The data can be freely accessed from the DHS website at <https://www.dhsprogram.com/data>.

2.3. Study participants

This current study used women data file and total 1, 47,049 sample women of reproductive age (15–49 Years) group were interviewed for EAG states. However, after removing all the missing cases, and checking outlier, homogeneity, multicollinearity the final estimation was carried out based on 80,173 sample women of reproductive age group in EAG states. The married women who were pregnant at least once in her life time and taking the essential antenatal care treatments at least once are included in this present study. The study excluded all the pregnant who do not take any antenatal care treatments from any medical professionals and who are currently pregnant during the survey. The count variables were categorized and categorized variables were re-categorized based on study requirements.

2.4. Methodology adopted

To examining the determinants or barriers in receiving various antenatal care treatments initially, a non-parametric chi-square test statistic was performed at level $P < 0.05$ to determine the associations between respondent's individual characteristics and various essential antenatal care treatments (During pregnancy - weight measured, BP measured, Urine test, Blood test, Iron supplement taken). After that multivariate binary logistic regression model, including all potential determinants or barriers in receiving various antenatal care treatments was estimated to arrive at individually adjusted estimates. This likelihood ratio statistics can help to compare each category with reference to a particular category. Before going to any inferential statistics some descriptive measures have been performed such as frequency distribution, weighted percentage distribution, cross tabulation etc. to get an idea about the maternal (respondent's) background characteristics. Percentage distribution shown in this present work is weighted percentage but the numbers of samples (N) are actual number. All the statistical analysis was performed through IBM SPSS statistics software 25.

2.5. Outcome variables

The key outcome variables of interest in this present study were various essential ANC treatment not receiving behaviour during the gestational (from the last menstruation to 42 weeks) period of pregnant women. As per previous literatures it is very important for pregnant women to measure her weight, checking BP, test urine & blood sample and to take iron supplements to maintain her pregnancy related health.^{21–23} All of these essential ANC treatments were considered as outcome variables and the variables are dichotomize in nature, which mean if the respondent gives negative response, it coded as 1 and the affirmative response were coded as 0. This study was limited to those women who were pregnant at least once in her life course and take at least once ANC treatments from medical professionals.

2.6. Exposure variables

Based on the existing literature review some individual level characteristics and family level characteristics were considered as the exposure variables for this present study. The individual level characteristics were as follows – a. Women age (Categorized as < 20 Years, 20–30 Years, > 30 Years) b. Women education (Categorized as No education, Primary, Secondary, Higher) c. Age at first marriage (Categorized as < 18 Years, 18–25 Years, 26–30 Years and >30 Years) d. Number of taken antenatal care treatments (Categorized as 1 to 3 times, 4 to 5 times and >5 times). Family level characteristics were including – e. Place of residence (Dichotomized as Rural or Urban) f. Wealth quintile (Categorized as Poorest, Poorer, Middle, Richer, Richest) g. Religious belief (Categorized as Hindu, Muslim and Others) and h. Affiliation to a social category (Categorized as Schedule Caste [SC], Scheduled Tribe [ST] and Others). Wealth index is a proxy indicator of household's socioeconomic status. Household wealth quintile has been measured from the ownership of household assets including consumer items and dwelling characteristics. A score was generated for each individual using principal component analysis and categorized into five quintiles each represents 20% of the respondents, between 1 (poorest) and 5 (richest).

3. Results

3.1. Socio-demographic characteristics of the study participants

The present study included only reproductive woman whose age ranged from 15 years to 49 years, out of which more than 75% women were measured their weight (80.10%) and blood pressure (78.80%), test their urine sample (77.20%) and blood sample (75.80%) and also taken iron supplements (76.40%) under the guidance of any medical professionals during their gestational period. Table 1 shows majority of the participants 62,004 that is more the three of fourth (76.90%) were between the age group 20–30 years. Nearly 40% (39.20%) women were not attended in formal education and 38.80% women married before completing their legal age of marriage that is 18 years. Most of the women were rural (77.20%) resident and belonged in middle to poorest (71.5%) socioeconomic status. This study also showed that majority of the respondent (84.70%) believed in Hinduism and only 1% women were apart from any socially reserved (SC/ST) category. Current estimate also revealed that total 45,289 women (58.40%) in this present study were attained more than 3 antenatal care visits.

3.2. Behavioural characteristics of women in receiving various antenatal care treatments

Table 2 Shows that the women whose age were more than 30 years were comparatively less aware for taking various antenatal care related treatment such as weight measurement, BP measure, urine sample test, blood sample test and in taking iron supplements. Cross tabulation clearly indicates that the proportion in not taking various essential ANC treatments were higher in those women who had no formal education as well as married before completing the legal age that is 18 years. Very minimal proportion of women who resides in rural areas are mostly aware about their pregnancy health as compared to urban women. In this present estimation it is noticed that 24% rural pregnant women do not measure their BP, 25.6% pregnant women do not test their urine sample and 72.5% women do not test their blood sample in their gestational period. A noticeable proportion of women who were belonged to poorer and poorest socioeconomic status were far from receiving routine ANC treatments. The proportion in not taking ANC treatments were higher in those women who believed in Muslim religious belief and affiliated to socially reserved (SC/ST) category. It is perhaps clear from the background characteristics and the recent estimates that the women who visited more than 5 times for ANC, they have received a lot of these treatments as compared to the women who visited

Table 1

Background characteristics & weighted percentage distribution of reproductive age group women in EAG state who were received ANC treatments.

Background Characteristics	Number (N)	Weighted Percentage
Weight Measured		
Yes	67118	80.10
No	13055	19.90
BP Measured		
Yes	65222	78.80
No	14951	21.20
Get urine tested		
Yes	63233	77.20
No	16940	22.80
Blood tested		
Yes	62666	75.80
No	17507	24.20
Iron Supplements taken		
Yes	62891	76.40
No	17096	23.40
Don't Know/Missing	186	00.20
Women's Age		
<20 Years	2286	02.90
20–30 Years	62004	76.90
>30 Years	15883	20.20
Women's Education		
No education	30606	39.20
Primary	34816	42.00
Secondary	6153	07.70
Higher	8598	11.10
Age at First Marriage		
<18 Years	30591	38.80
18–25 Years	46988	58.10
26–30 Years	2303	02.80
>30 Years	291	00.40
Place of Residence		
Rural	60989	77.20
Urban	19184	22.80
Wealth Quintile		
Poorest	23379	29.70
Poorer	18887	23.70
Middle	14639	18.10
Richer	12128	14.90
Richest	11140	13.60
Religion		
Hindu	68103	84.70
Muslim	10242	13.70
Others	1828	01.60
Category		
SC	70350	90.70
ST	8947	08.30
Others	876	01.00
ANC Visit		
1 to 3	45289	58.40
4 to 5	19621	23.50
>5	15263	18.10

one to three times.

3.3. Test of significance between receiving various ANC treatments by the recipient and their background characteristics

Table 3 shows the bivariate association along with effect size through Chi-square test between selected dependent and independent variables. All most all the essential ANC treatments (During pregnancy weight measurement, checking BP, blood sample and urine sample test, taking iron supplement etc.) are significantly associated (at level $P < 0.05$) with respondent's personal and family level characteristics but the effect size is different for respondent's each individual level and family level characteristics. The effect of each independent variable on selected dependent variable is measured by Phi coefficient and Cramer's V approach, which are nothing but one kind of correlation coefficient and value can range from 0 to 1, with higher value indicating stronger association between the variables. Present estimation (Table 3) indicated that respondent's current age, education, age at marriage and wealth

Table: 2

Utilisation of ANC treatments by study population according to their background characteristics in EAG states, India.

Background Characteristics	Various ANC Treatments During Gestational Period									
	Weight Measured (%)		BP Measured (%)		Urine Sample Tested (%)		Blood Sample Tested (%)		Iron Supplements Taken (%)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Women's Age										
<20 Years	82.2	17.8	80.6	19.4	78.9	21.1	79.2	20.8	76.2	23.8
20–30 Years	82.0	18.0	80.1	19.9	78.5	21.5	77.4	22.6	77.2	22.8
>30 Years	76.4	23.6	73.6	26.4	71.9	28.1	69.2	30.8	74.4	25.6
Women's Education										
No education	73.8	26.2	69.5	30.5	67.4	32.6	64.3	35.7	69.7	30.3
Primary	83.8	16.2	82.6	17.4	81.2	18.8	80.6	19.4	78.7	21.3
Secondary	86.0	14.0	86.0	14.0	85.8	14.2	85.1	14.9	81.6	18.4
Higher	91.1	08.9	92.4	07.6	90.9	9.1	91.6	08.4	87.5	12.5
Age at First Marriage										
<18 Years	77.6	22.4	74	26	72.6	27.4	70.1	29.9	73.1	26.9
18–25 Years	82.6	17.4	81.4	18.6	79.7	20.3	78.9	21.1	78.2	21.8
26–30 Years	89.8	10.2	89.7	10.3	88.4	11.6	87.6	12.4	83.4	16.6
>30 Years	88.7	11.3	88.3	11.7	84.6	15.4	84.6	15.4	82.1	17.9
Place of Residence										
Rural	79.1	20.9	76.0	24.0	74.4	25.6	72.5	27.5	75.5	24.5
Urban	86.8	13.2	88.2	11.8	86.7	13.3	86.9	13.1	80.4	19.6
Wealth Quintile										
Poorest	75.0	25.0	68.7	31.3	66.4	33.6	63.1	36.9	72.8	27.2
Poorer	77.5	22.5	75.1	24.9	74.5	25.5	72.7	27.3	74.6	25.4
Middle	81.9	18.1	81.0	19.0	80.2	19.8	78.9	21.1	76.5	23.5
Richer	86.0	14.0	87.7	12.3	85.8	14.2	86.2	13.8	79.4	20.6
Richest	92.7	07.3	94.6	05.4	92.2	07.8	93.3	06.7	84.8	15.2
Religion										
Hindu	82.0	18.0	79.3	20.7	78.0	22.0	76.7	23.3	77.7	22.3
Muslim	72.5	27.5	74.3	25.7	71.8	28.2	69.6	30.4	67.3	32.7
Others	93.6	06.4	89.1	10.9	81.7	18.3	81.2	18.8	85.4	14.6
Category										
SC	79.7	20.3	78	22.0	76.8	23.2	75.2	24.8	75.5	24.5
ST	92.9	07.1	87.0	13.0	80.9	19.1	81.7	18.3	85.7	14.3
Others	85.6	14.4	83.7	16.3	82.6	17.4	80.7	19.3	80.4	19.6
ANC Visit										
1 to 3	73.7	26.3	69.7	30.3	67.9	32.1	65.5	34.5	70.8	29.2
4 to 5	89.2	10.8	89.5	10.5	88.1	11.9	88.2	11.8	82.9	17.1
>5	93.3	06.7	94.1	05.9	93.2	06.8	93.0	07.0	86.0	14.0

Table: 3

Chi-square associations between maternal background characteristics and different antenatal care treatments during gestational period in EAG state.

Background Characteristics	Antenatal Care Treatments During Gestational Period														
	Weight Measured			BP Measured			Urine sample Tested			Blood Sample Tested			Iron Supplements Taken		
	χ^2 -Value	P-Value	Effect Size	χ^2 -Value	P-Value	Effect Size	χ^2 -Value	P-Value	Effect Size	χ^2 -Value	P-Value	Effect Size	χ^2 -Value	P-Value	Effect Size
Women's Age	212.7	0.000	0.6	266.5	0.000	0.5	249.5	0.000	0.5	396.8	0.000	0.6	60.8	0.000	0.7
Women's Education	1640.2	0.000	0.8	2703.5	0.000	0.6	2822.6	0.000	0.5	3603.5	0.000	0.7	1376.7	0.000	0.5
Age at First Marriage	442.5	0.000	0.5	266.5	0.000	0.5	738.6	0.000	0.4	972.3	0.000	0.4	360.5	0.000	0.6
Place of Residence	330.4	0.000	0.3	968.7	0.000	0.2	1044.0	0.000	0.1	1357.9	0.000	0.2	138.2	0.000	0.1
Wealth Quintile	1276.4	0.000	0.7	3015.4	0.000	0.6	3058.5	0.000	0.5	3980.1	0.000	0.5	537.6	0.000	0.6
Religion	760.7	0.000	0.3	234.3	0.000	0.3	176.3	0.000	0.3	240.6	0.000	0.2	671.6	0.000	0.1
Category	783.2	0.000	0.2	316.1	0.000	0.3	60.1	0.000	0.2	145.6	0.000	0.3	429.2	0.000	0.2
ANC Visit	3569.7	0.000	0.7	5275.3	0.000	0.6	5551.7	0.000	0.6	6306.6	0.000	0.7	2148.5	0.000	0.5

Note: All Chi Square (χ^2) association of women background characteristics and different ANC treatments are significant at level $P < 0.01$; Effect Size has been measured through Phi coefficient and Cramer's V approach.

quintile has stronger effect and significant association with receiving every essential ANC service during their gestational period. On the other hand, women's religious belief, affiliation to a particular social category and their living place has little effect on their behavioural aspects in receiving various ANC treatments during the gestational period. ANC visit to a medical professional during gestational period is not a respondent's personal or family level characteristics rather than one can say it is a societal behavioural characteristic for pregnant women. Result shows there is a significant association between respondent's individual

level and family level characteristics and their response in antenatal check-up, such as during pregnancy weight measurement (χ^2 : 3569.7; P : < 0.001 ; Cramer's V: 0.7), checking blood pressure (χ^2 : 5275.3; P : < 0.001 ; Cramer's V: 0.6), urine sample test (χ^2 : 5551.7; P : < 0.001 ; Cramer's V: 0.6), blood sample test (χ^2 : 6306.6; P : < 0.001 ; Cramer's V: 0.7) and iron supplement taken (χ^2 : 2148.5; P : < 0.001 ; Cramer's V: 0.5).

3.4. Test of association along with likelihood ratio between not utilisation of ANC treatments by the recipients and their background characteristics

Table 4 represents the adjusted association along with likelihood ratio for recipient's various antenatal cares (ANC) related treatment not taking behaviour in their gestational period at each individual level & family level characteristic. Logistic regression for each (Do not weight measured/Do not BP measures/Do not urine sample test/Do not blood sample test/Do not iron supplements taken) antenatal care related treatment not taking behaviour and its background characteristics were performed separately but Table 4 represent here is a combined view.

3.4.1. Barriers in weight measurement

During pregnancy the behaviour of not taking ANC treatment for example weight measurement by the women is statistically and significantly associated with all most all the chosen maternal individual level and family level characteristics. The odds of women's not weight measurement behaviour during pregnancy was significantly higher (AOR: 1.44; $P < 0.001$; CI: 1.38–1.62) among those women whose current age were less than 20 years compared to those women who were more than 30 years old. Result revealed that the likelihood for not weight measurement during pregnancy was significantly higher among those women, who had no formal education (AOR: 1.59; $P < 0.001$; CI: 1.54–1.65), married before completing their age of 18 years (AOR: 1.46; $P < 0.001$; CI: 1.29–1.58), resided at rural environment (AOR: 1.64; $P < 0.001$; CI: 1.61–1.67), belonged to poor socio economic status, believed in Muslim religion (AOR: 1.53; $P < 0.001$; CI: 1.27–1.56), affiliated to

socially reserved category [SC(AOR: 1.21; $P < 0.001$; CI: 1.13–1.45) ST (AOR: 1.33; $P < 0.001$; CI: 1.23–1.51)] and attain less than 3 antenatal care visit (AOR: 1.25; $P < 0.001$; CI: 1.23–1.27) to a medical professional compared to those women who had higher education, married after 30 years of age, resides in urban environment, belonged to upper socio-economic status, believed in other religious belief rather than Hindu & Muslim, affiliated to general category and attain more than 5 ANC visit to the medical professionals.

3.4.2. Barriers in blood pressure (BP) measurement, urine sample test, blood sample test and taking iron supplements

The study estimation (Table 4) depicts that all the behaviour of not taking ANC treatments (not measuring the BP, not tested urine sample, not tested blood sample, not taking iron supplements) was significantly higher among those women whose age was less than 20 years, had no formal education, got married before completing their age 18, resides in rural environment, belonged to poor socioeconomic status, believed in Muslim religion, affiliated to socially reserved category and took at least 1 to 3 ANC visit to the medical professional compared to those women who had higher education, married after 30 years of age, resides in urban environment, belonged to upper socioeconomic status, believed in other religious belief rather than Hindu & Muslim, affiliated to general category and attain more than 5 ANC visit to a medical professionals. Table 4 delineates women having less than 20 years of age were (AOR 1.6; $P < 0.001$; CI: 1.43–1.84) times less likely to measured their BP and were(AOR: 1.27; $P < 0.001$; CI: 1.11–1.48) times less likely to tested their blood sample as compared to women aged more than 30

Table: 4

Adjusted odd ratios for not taking various ANC treatments by the recipients at each individual and family level characteristic in gestational period.

Background Characteristics	Behaviour of Not Taking ANC Treatments During Gestational Period									
	Did not Weight Measured		Did not BP Measured		Did not Urine sample Tested		Did not Blood Sample Tested		Did not Iron Supplements Taken	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Women's Age										
<20 Years	1.44	1.38–1.62	1.63	1.43–1.84	1.49	1.32–1.67	1.27	1.11–1.48	1.57	1.48–1.83
20–30 Years	.29	.22–.35	.30	.24–.36	.86	.51–.92	.36	.30–.42	.37	.30–.42
>30 Years (Ref.)										
Women's Education										
No education	1.59	1.54–1.65	1.55	1.49–1.61	1.55	1.51–1.61	1.52	1.47–1.57	1.57	1.49–1.68
Primary	1.09	1.00–1.13	1.08	1.00–1.12	1.07	1.00–1.11	1.11	1.08–1.22	1.05	0.90–1.23
Secondary	0.80	.71–.90	0.77	.68–.87	0.84	.75–.94	0.79	.71–.89	0.77	.71–.91
Higher (Ref.)										
Age at First Marriage										
<18 Years	1.46	1.29–1.58	1.48	1.32–1.74	1.61	1.42–1.88	1.49	1.34–1.73	1.38	1.2–1.51
18–25 Years	0.32	.27–.41	0.57	.38–.88	0.71	.49–.93	0.60	.41–.88	0.52	.48–.63
26–30 Years	0.27	.21–.42	0.92	.79–1.21	0.84	.76–.97	.60	.38–.69	0.79	.59–.91
>30 Years (Ref.)										
Place of Residence										
Rural	1.64	1.61–1.67	1.84	1.79–1.89	1.13	1.01–1.26	1.27	1.21–1.36	1.21	1.99–1.33
Urban(Ref.)										
Wealth Quintile										
Poorest	1.28	1.26–1.30	1.29	1.27–1.33	1.40	1.37–1.44	1.30	1.27–1.33	1.26	1.19–1.37
Poorer	1.30	1.28–1.33	1.35	1.32–1.39	1.51	1.47–1.57	1.40	1.36–1.44	1.31	1.29–1.36
Middle	0.37	.34–.41	0.42	.39–.48	0.60	.55–.66	0.47	.43–.52	0.37	.27–.39
Richer	0.50	.46–.67	0.60	.55–.68	0.74	.68–.82	0.64	.58–.71	0.50	.48–.71
Richest (Ref.)										
Religion										
Hindu	0.36	.21–.41	0.68	.58–.81	0.49	0.42–.86	0.87	.66–1.11	0.62	.51–.67
Muslim	1.53	1.27–1.56	1.50	1.43–1.61	1.69	1.60–1.80	1.26	1.14–1.34	1.09	1.02–1.14
Others (Ref.)										
Social Category										
SC	1.21	1.13–1.45	1.23	1.17–1.29	1.27	1.15–1.43	1.19	1.11–1.42	1.27	1.25–1.69
ST	1.33	1.23–1.51	1.43	1.29–1.71	1.42	1.31–1.51	1.35	1.26–1.44	1.24	1.17–1.37
Others (Ref.)										
ANC Visit										
1 to 3	1.25	1.23–1.27	1.19	1.18–1.21	1.20	1.19–1.22	1.19	1.18–1.21	1.24	1.21–1.26
4 to 5	0.67	.61–.73	0.61	.56–.66	0.61	.56–.66	0.65	.61–.71	0.75	.72–.78
>5 (Ref.)										

Note: AOR – Adjusted Odd Ratio; CI: Confidence Interval; All odds are significant at $P < 0.01$; Ref. – Reference Category.

years. Women having no education were (AOR: 1.55; $P < 0.001$; CI: 1.49–1.61) times less likely to checked their BP, (AOR: 1.55; $P < 0.001$; CI: 1.51–1.61) times less likely to tested urine sample and (AOR: 1.57; $P < 0.001$; CI: 1.49 = 1.68) times less likely to take iron supplements. Women reside in the rural area were (AOR: 1.84; $P < 0.001$; CI: 1.79–1.89) times less likely to measured their BP and (AOR: 1.27; $P < 0.001$; CI: 1.21–1.36) times less likely to tested their blood sample as compared to women who reside in urban area.

4. Discussion

Nowadays priority is given to provide the routine check-up treatments, constituent of the ANC treatments is available in many health facilities.³⁵ Nonetheless, these are poorly utilized because of ignorance from the part of recipient. Although the subject of routine check-up in ANC in gestational period has produced a large body of literature,^{36,37} there is much less about ANC with only few paper covering the importance of weight and BP measurement¹⁷ and importance of iron supplement.²³ Our result showed that EAG states shares a large proportion of women holds the tendency not to receive the routine check-up treatments within the desired ANC. They hardly care about the adverse consequences of apathy to receive the desired check-up. Despite the remarkable progress during last tenure on promotion of infrastructural background and treatments related to maternal health care especially towards ANC, the gap remains in effective disbursement of the treatments.³⁸ This study has identified a number of socio-economic and demographic inherited causes of the recipients for non utilisation of ANC treatments. Evidence has found that variability of socio-economic characteristics across the individual level has largely affect on the receiving of desired routine check-up in ANC service care.³⁹ A number of studies have documented that socio-economic status of household and maternal educational level are the strong predictor in receiving ANC treatments.³ Rural-urban residence of women has significant association with receiving antenatal check-ups during pregnancy. The study result shows rural women were less likely to receive ANC treatments as compared with those women who were living in urban area. This finding is consistent with other studies carried out in India.³ Urban women have higher educational knowledge, better health infrastructure in public and private health care facilities, greater awareness regarding their health, on the other hand rural women sometimes get these opportunities.⁴⁰ Delayed access to ANC associated with maternal and foetal mortality and morbidity.⁴¹ Educational attainment of mother has strong effect on reproductive behaviour and awareness related to health, hygiene, sanitation etc. No education or lesser educational attainment of women largely affect health seeking behaviour of a woman. If women endured deprived in their home and societies, that will definitely affect the health of the mother and new born. Women's education has a significant positive influence on the use of ANC treatments. Women with higher educational attainment are more cautious about the relevance of each routine-check-up in ANC treatments. Consistent with the findings of previous literature,^{3,35,39} our study also revealed that Women with no education or less education usually show the apathy to visit the nearby centre for routine check-up. It seems that they are hardly aware about the adverse consequences of non-receiving of routine care check-up during the gestational period. This finding highlighted the importance of women's education for improvement the behaviour in receiving ANC available in health facilities. Study result implies that higher educated women have better access to health care centre and they have better decision-making ability and they are much aware about negative consequences of not seeking ANC. In case of ANC utilisation, household economic status or the wealth status is likely to be most powerful factor.³ The result of this present study revealed that poorest women were less likely to visit ANC and skip regular check-ups as compared to the richest women. Furthermore, our study exhibited that the women who early get married (<18 years of age) were less likely to use ANC treatments as compared to women who get married after 30 years of age. This

finding is consistent with previous studies.³ The study also indicates that women belonged to socially marginalized category (SC/ST) have significantly lower likelihood of ANC treatments than the women belonged to forward caste. We compare our study results with result from studies which address analogous outcomes.³ The women of this marginalized caste were less aware about the desired precaution about do or don'ts during the gestation period. This finding can be demonstrated by the fact that mother belongs to marginalized (SC/ST) category are economically and educationally backward than the forward case. This study has found that the women believed in Muslim religion were less likely to take iron supplements, measured their weight and BP, tested blood and urine samples compared to the other religion. We found that the uptake of iron supplements, weight and BP measurement, test of blood and urine sample during gestational period were associated with socio-economic and demographic background of the study population. Some literature explained BP and weight measurement are very essential during pregnancy as because state of being more or less it causes hypertensive disorder, pre-eclampsia, eclampsia, oedema.^{12–14} Our study result showed that economically poor and less educated women were less likely to measured their weight and BP during gestational period. The study found that young women (<18 years) were less likely to took iron supplements. We compare our result with result from other studies which address similar outcome.³⁰ Compared to other study,^{19,20} this study also found that socio-economic and demographic variables play a significant role in receiving iron supplements which control the prevalence of anemia among women.³⁰ The study already has showed the result about the eagerness in receiving the desired routine ANC check-up among the women who visited health facilities more than 5 times. Another encouraging finding is that pregnant women who had more ANC visits were receiving more ANC treatments and experiencing lower risk of maternal and neo natal mortality. It seems that women having previous gestational period and birth experience feel more confident to ignore the treatments. Most of the women were availing the ANC treatments at their local health centres; govt. should encourage them to receive these treatments and should pay attention towards empowering women. Routine examination of the pregnant women and foetus may help to reduce adverse pregnancy outcome.

5. Conclusion

The findings of this study accentuated the importance of socio-economic and demographic factors which has a significant impact on the utilisation of ANC treatments. Large expansion in antenatal care coverage in EAG states are still needed. Women empowerment is necessary which starts with proper education, improving working status and by increasing their earning potential that may generate awareness about their reproductive health.⁴² It is possible to improve maternal health outcomes by analysing various social determinants. Degree of awareness of the mother depends upon various socio-economic factors which play the key role to receive the viable and better health care treatments. Socio-economic status of the women in rural areas in EAG states tends to be inferior to that of women residing in the urban areas. Limited access to economic resources, unequal opportunities, less ability to make decision, low social status of women in the society (caste, class, ethnicity), support from marital family and marital relationship, less opportunity for basic education, employment and income, gender norms, religion, woman's age, early marriage, health beliefs, social cohesion, poor guidance, these are the various socio-economic-demographic predictors which determine their perception about ANC treatments. It is possible to improve maternal health outcome through proper routine check-up taken during antenatal care visit. Necessary interventions and awareness at grass root level are very much needed for proper utilisation of routine check-up during gestational period. Some plan and policies also required to empower the rural women of EAG states that may help in implementation of proper utilisation of ANC treatments.

Ethical approval

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Declaration of competing interest

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Declaration of competing interest

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