

Maternal Health Situation in Assam and Rajasthan: A
Comparative Analysis of State National Family Health Survey
4 (2015-2016), India

By

Geetashri Baruah

*Dissertation submitted in partial fulfillment of the requirements of the degree
MBA Hospital and Health Management*

Academic year, 2018-2020



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TO WHOMSOEVER MAY CONCERN

This is to certify that **Ms. Geetashri Baruah**, student of MBA Hospital and Health Management from the IIHMR University, Jaipur has undergone internship training at **National Health Mission, Rajasthan** from **11/03/2020** to **10/06/2020**.

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific, and analytical. The Internship is in fulfilment of the course requirement.

I wish her all success in all her future endeavours.

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This certificate is awarded to

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In recognition of having successfully completed her

Dissertation & Internship in the department of

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and has successfully completed her Project on

**Factors associated with utilization of antenatal care services in the state of
Assam: Findings from National Family Health Survey 4 (2015-16)**

Date : 11th March to 10th June, 2020

She comes across as a committed, sincere & diligent person who has a strong drive and zeal for learning.

We wish her all the best for future endeavors.

Special Secretary
Medical, Health & Family Welfare
Mission Director, NHM
Rajasthan

THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled '**Maternal Health Situation in Assam and Rajasthan: A comparative analysis of State National Family Health Survey 4 (2015-2016), India**' and submitted by **Geetashri Baruah (Enrolment No. IIHMR-U/01/2018-20/0747)** under the supervision of **Dr. Sujata Verma** for award of MBA in Hospital and Health of the University carried out during the period from **11/03/2020** to **10/06/2020** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.



Signature

Acknowledgement

The completion of this undertaking could not have been possible without the participation and assistance of so many people whose names may not all be enumerated. Their contributions are sincerely appreciated and gratefully acknowledged. However, I would like to express my deep appreciation and indebtedness particularly to the following:

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Dr. Sujata Verma, professor, and mentor, IIHMR, for her valuable guidance in completion of my dissertation.

I thank you all.

Geetashri Baruah

MBA Health and Hospital Management (2018-20)

About the Organization

The National Health Mission (NHM) was launched on 1st May 2013 by Government of India that circumscribes two sub-mission as National Rural Health Mission (NRHM launched in 2005) and National Urban Health Mission (NUHM launched in 2013).

It is a national effort at ensuring provision of effective healthcare through a range of interventions at individual, household, community, and critically at the health system levels.

Vision

“Attainment of Universal Access to equitable, Affordable and Quality health care services, accountable and responsive to people’s needs, with effective inter-sectoral convergent action to address the wider social determinants of health.”

Objectives

- Reduction in Infant Mortality Rate (IMR) and Maternal Mortality Ratio (MMR).
- Universal access to public health services such as Women’s health, child health, water, sanitation & hygiene, immunization, and Nutrition.
- Prevention and control of communicable and non-communicable diseases, including locally endemic diseases.
- Access to integrated comprehensive primary healthcare.
- Population stabilization, gender, and demographic balance.
- Revitalize local health traditions and mainstream.
- Promotion of healthy lifestyles.

Abstract

Background: Giving birth to an individual is one of the most joyous moments of an women's life, but unfortunately it is also having its own share of risks that may change the mother's whole maternal experience. Globally each year, about 303,000 women die from complications related to pregnancy or childbirth and India is one of the two countries which accounts for 1/3rd of the worlds maternal deaths (WHO). India has made a remarkable progress in reducing MMR, ranging from 254 per 100,000 live births in 2004-06 to 130 per 100,000 live births in 2014-16. However, in India, there are large variations in MMR across states, ranging from 237 per 100,000 livebirths in Assam to 46 per 100,00 live births in Kerala.

Aim: The primary objective of this study is to assess the utilization of antenatal care services in the states of Assam and Rajasthan using the NFHS-4 (2015-16) data and comparing them. The secondary aim is to determine the underlying factors influencing the utilization of the antenatal care services in the states of Assam and Rajasthan.

Method: This study consisted of secondary data analysis of the India NFHS-4 (2015-2016) Data. The descriptive results were obtained by performing regression analysis between the dependent variables and socio-demographic factors.

Result: The coverage of ANC visits was found to be 46.9% in Assam and 38.8% in Rajasthan, administration of TT injection was 88.3% in Assam and 82.5% in Rajasthan. The consumption IFA tablets to be 13.9% in Assam and 15.6% in Rajasthan. The predictors of utilization of antenatal care services were found to be women's religion, wealth quintile of the women's family, educational attainment of the women, and household factor like getting permission to visit health facility.

Conclusion: It is found that utilization of antenatal care services in Assam and Rajasthan is not adequate across socio-economic groups and is determined by number of socio-economic and demographic factors. The findings of this study show the importance of education and economic improvement of women. Additionally, there is immense need to engage directly with communities, including women, men, community leaders and other stakeholders towards raising awareness about the adverse consequences of lower and untimely utilization of antenatal care services for women and their newborn.

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List of Abbreviations

ANOVA- Analysis of variance

ANC- Antenatal care

DHS- Demographic Health Survey

HPS- High Performing States

IFA- Iron Folic Acid

JSY- Janani Suraksha Yojana

LPS- Low Performing States

MMR- Maternal Mortality Ratio

NFHS- National Family Health Survey

NIPi- National Iron Plus Initiative

SEE- Standard Error of Estimate

SPSS- Statistical Software for the Social Sciences

TT- Tetanus Toxoid

WHO- World Health Organization

1. Introduction

1.1. Background

Giving birth to an individual is one of the most joyous moments of a woman's life, but unfortunately it is also having its own share of risks that may change the mother's whole maternal experience. Every year, about 303,000 women around the globe die due to the pregnancy or childbirth related complications and India is one of the two countries which accounts for 1/3rd of the world's maternal deaths (WHO). A successful pregnancy is important not only for the mother but also to the newborn health, and also impacts the adult life of the baby. Therefore, it is crucial to provide good antenatal care to the mothers to raise a strong future generation.ⁱ One study conducted in Ethiopia suggests that having undergone antenatal care services encourages a woman for institutional delivery which in turn avoids a lot of preventable causes of maternal and neonatal mortality.ⁱⁱ

1.2. Scenario in India

India has been able to reduce the MMR remarkably from 254 per 100,000 live births in 2004-06 to 130 per 100,000 live births in 2014-16.ⁱⁱⁱ This has been achieved mainly because of increased institutional deliveries, reduced cost services in public health facilities, and attempts to diminish social issues like increase in educational qualification and decline in poverty at household level. A huge discrepancy in MMR can be observed in India across the states, which ranges from 237 per 100,000 live births in Assam to 46 per 100,000 live births in Kerala. Assam remains at the bottom regarding Maternal Mortality Ratio, which is considered among the prime indicators of maternal health. It becomes important to analyse the probable factors that contribute to the ANC service utilization because it is considered crucial for both maternal and the child health. This variation in ANC utilization is partially justified by availability, access, socioeconomic and cultural variables. The socio-demographic factors that are related to service utilization of maternal health are age, religion, type of residence and mother's educational attainment. Other factors include cost, availability of service, household income, getting permission by family members to visit health facility.

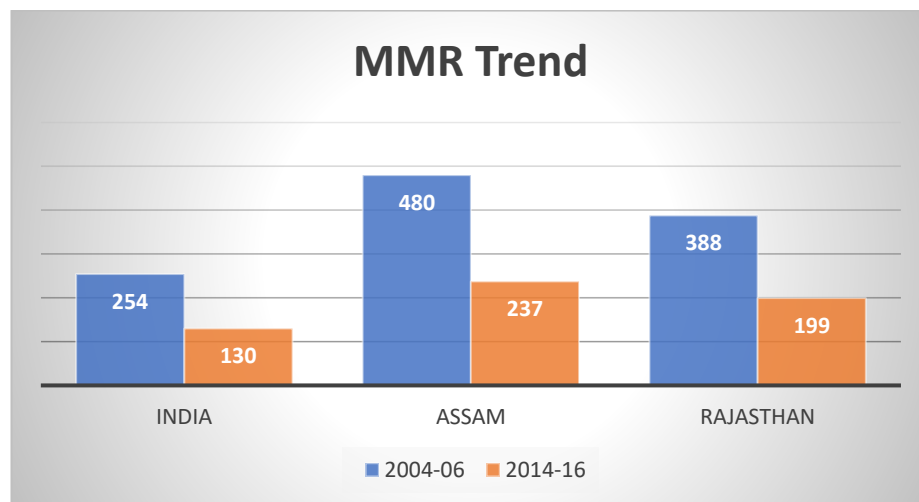
1.3. Interventions to increase utilization of maternal health care services

National Health Mission has launched a safe motherhood intervention called Janani Suraksha Yojana (JSY), with the objective of reducing maternal and neonatal mortality by encouraging institutional delivery amongst pregnant women from economically weak background. The scheme was launched on 12 April 2005 by the Hon'ble Prime Minister and has been operating in all the states and the Union Territories (UT), specially emphasising on low performing states. It is a centrally funded scheme, which amalgamates cash assistance with intra- and post-partum care. The cash assistance for women of LPS is Rs. 1400 in rural and Rs. 1000 in urban areas. For HPS, it is Rs. 700 for women in rural and Rs. 600 in urban areas.^{iv}

1.4. Rationale for the study

Since Assam has a very high MMR of 237 per 100,000 live births among the north-eastern states and Rajasthan has a poor MMR of 199 per 100,000 live births in the western states of India, this study would be concentrating only on the factors affecting ANC service utilization in the states of Assam and Rajasthan. Assam and Rajasthan still fall in the high maternal mortality state categories due to poor service utilization of health care by the antenatal mother, which is considered to be an important factor for high MMR in the states. The reason behind the poor service utilization of health care by the mothers of Assam and Rajasthan were found to be associated with many factors like, most of the people in Assam and Rajasthan lives in rural areas, have rigid familial hierarchy and class structure shaped by tradition and long-standing customs, remoteness caused by distance, poor communication and transport. Women also face issues of gender inequality in Assam and Rajasthan as they do not have the decision-making capacity when it comes to household decisions, owning assets or their own health.

Figure 1.1 - Maternal Mortality Ratio Trend of India, Assam, and Rajasthan from 2004-06 to 2014-16



1.5. Study Objective

The primary objective of this study is to assess the utilization of antenatal care services in the states of Assam and Rajasthan using the NFHS-4 (2015-16) data and comparing them. The secondary aim is to determine the underlying factors affecting the service utilization of the ANC services in Assam and Rajasthan.

1.6. Research Questions

- What is the status of service utilization of ANC services in the states of Assam and Rajasthan?
- What are the differences in the service utilization of antenatal services in Assam and Rajasthan?
- What are the associated factors of antenatal care service utilization?

2. Literature Review

As per WHO, pregnant mothers should have their first ANC visit in the first trimester and a minimum of four ANC visits during their pregnancy period. A study conducted in rural Assam concludes that utilization of ANC services is utmost necessary as it influences the well-being of the mother along with her baby.^v Another study conducted in nine high priority districts of India suggests that along with the factors at the individual and the household levels, factors at the community and the district levels factors also significantly affect the pattern of service utilization of maternal healthcare.^{vi} Educational qualification by women and wealth status at household level were found to be the major predictors of service utilization of maternal health care in India by a cross-sectional study by the National Family Health Survey 2005-2006.^{vii} The same findings were also validated by 2015-2016 National Family Health Survey.^{viii} A community based cross-sectional study done in a tribal dominated district of Madhya Pradesh revealed that education of mother and knowledge of mother about the needs of ANC were important contributing factors related to full utilization of ANC services by the tribal population.^{ix} Another cross-sectional study conducted in Panipat district studying the factors affecting ANC services of the rural areas in the district found that though a good number of women delivered their babies at a health facility, still most of them did not avail the minimum requirement of four antenatal visits.^x

One of the major elements of ANC visits is the administration of Tetanus Toxoid (TT) injection which is a vaccine against the bacteria named *Clostridium tetani* which causes muscle spasm in the neonates and there is substantial evidence of transplacental transfer of tetanus antibodies.^{xi} Neonatal tetanus prevails to be an important and avoidable cause of neonatal mortality worldwide and was responsible for nearly half a million of global neonatal deaths in early 1980s. Although deaths caused by neonatal tetanus have reduced drastically but still some 1,300,000 babies died from the disease in the year 2004. Despite the tremendous progress, two global elimination targets have been missed, last in 2005, to a rate of 'less than 1 case per 1000 live births in every district of every country'. Most of these deaths occur in countries with low coverage of facility births and tetanus toxoid immunization, such as India and Nigeria.^{xii} The only effective step against this was immunising the pregnant mothers with tetanus toxoid vaccine.^{xiii}

The other important component of ANC visits is the distribution and counselling of pregnant women to consume IFA tablets as it was found that the lack of iron is one of the

most common causes of anaemia in India.^{xiv} To deal with this, the government of India launched the National Iron Plus Initiative (NIPI) to provide 100 IFA tablets/syrups daily for a 100 days period of the pregnancy.^{xv} Nevertheless, even after adaptations of the NIPI programme to increase the provision of elemental iron from 60 mg to 100 mg, the anaemia prevalence in the country has not reduced significantly among the women of the age 15-49 years in the 10 years between NFHS-3 and 4. One study suggest that “to prevent this very high prevalence of anaemia in pregnancy, there is a need for mandatory regular supply of IFA tablets to adolescent and pregnant women from 4th month onwards till 3-6 months post-partum along with correction of other nutritional deficiencies and timely intervention for reducing the burden of related diseases”.^{xvi} Apart from benefits of IFA to the pregnant women, there is also benefit to the newborn baby as a randomized control trial conducted in Nepal concluded that there is positive association between the features of intellectual functioning which includes inhibitory control, fine motor functioning, and working memory among offspring and prenatal iron/folic acid supplementation.^{xvii}

3. Methodology

3.1. Data Source

This study utilized the National Family Health Survey (NFHS-4) data of 2015-2016. The datasets are availed by enrolling at the official website of DHS and a request being submitted to access and download the data. The sample of NFHS-4 was 699,686 women of age 15-49 years, 601,509 households, and 112,122 men of age 15-54 years. The Birth Recode file of Assam and Rajasthan has been used for this study.

3.2. Sampling Plan

Stratified two-stage sampling design was used for the sample for NFHS-4. It composed of 28,586 clusters; 20,059 in rural, 8,397 in urban, and 130 from slums list acquired from Municipal Corporations Offices (MCOs). The 2011 Indian Population and Housing Census was used as sampling frame for NFHS-4. Sampling procedure is provided in detail in the national report of NFHS-4.^{xviii} For this study, the data for the states of Assam and Rajasthan were extracted from the dataset of India. The NFHS-4 fieldwork for Assam state was conducted from 6 November 2015 to 31 March 2016 in all 27 districts by Nielsen (India) Private Limited, and the information was collected from 24,542 households, 28,447 women aged 15-49 years, and 4,191 men aged 15-54 years. In the state of Rajasthan, the fieldwork was conducted from 23 January to 21 July 2016 in all the 33 districts by the Institute of Health Management Research (IIHMR University) and the information was collected from 34,915 households, 41,965 women age 15-49 years and 6,309 men age 15-54 years.

3.3. Target Population

The last pregnancy of the mothers who had delivered in the past five years from the date of interview.

3.4. Measures

3.4.1. Dependent Variables

The outcome indicator was ‘complete ANC’ and a women was counted as having complete ANC, if she had made minimum of 4 ANC visits, received at least one dose of

tetanus toxoid (TT) injections and consumed at least 100 iron folic acid (IFA) tablets during their last pregnancy.

3.4.2. Independent Variables

Independent variables were: (i) individual (women) level factors: women's age, educational attainment, religion, type of place of residence and number of months pregnant when pregnancy was registered. (ii) Household level factors: Wealth index quintiles which categorised the household from the poorest to the richest and getting permission by the family members to visit health facility. (iii) Village level factors: difficulty faced by the women to visit health facility due to distance from their house.

3.5. Analytical Strategy

The typical statistical method used for estimating the relationship between independent and dependent variables is regression analysis. It describes the quantitative relationship between complete ANC indicators and socio-demographic factors in a very simple manner. Hence, the multiple regression analysis method is selected for establishing the relationship between complete ANC indicators and socio-demographic factors. Initially, the relationship types between selected socio-demographic factors (independent variables) and complete ANC indicators (dependent variables) were individually checked with the help of correlation analysis and curve estimation. This indicated the linear relationship between the dependent and independent variables. Therefore, the linear multiple regression analysis was done in this study, and the enter method was used for linear regression analysis. The collinearity was tested within each variable prior to performing regression analysis. All analyses were carried out using SPSS version 22.

3.6. Ethical Considerations

The National Family Health Survey 2015-16 was approved by the International Institute for Population Sciences (IIPS) ethical review board in Mumbai, India, and the institutional review boards of the funding agencies and the technical assistance agencies. The data collection procedures were also monitored and approved by ICF Macro, Calverton, Maryland, USA. All individuals selected in the survey were given both

informed voluntary as well as written consent. Each individual's approval was sought, and only then was the interview conducted.

4. Results

Figure 4.1 - Distribution of four or more ANC in the states of Assam and Rajasthan

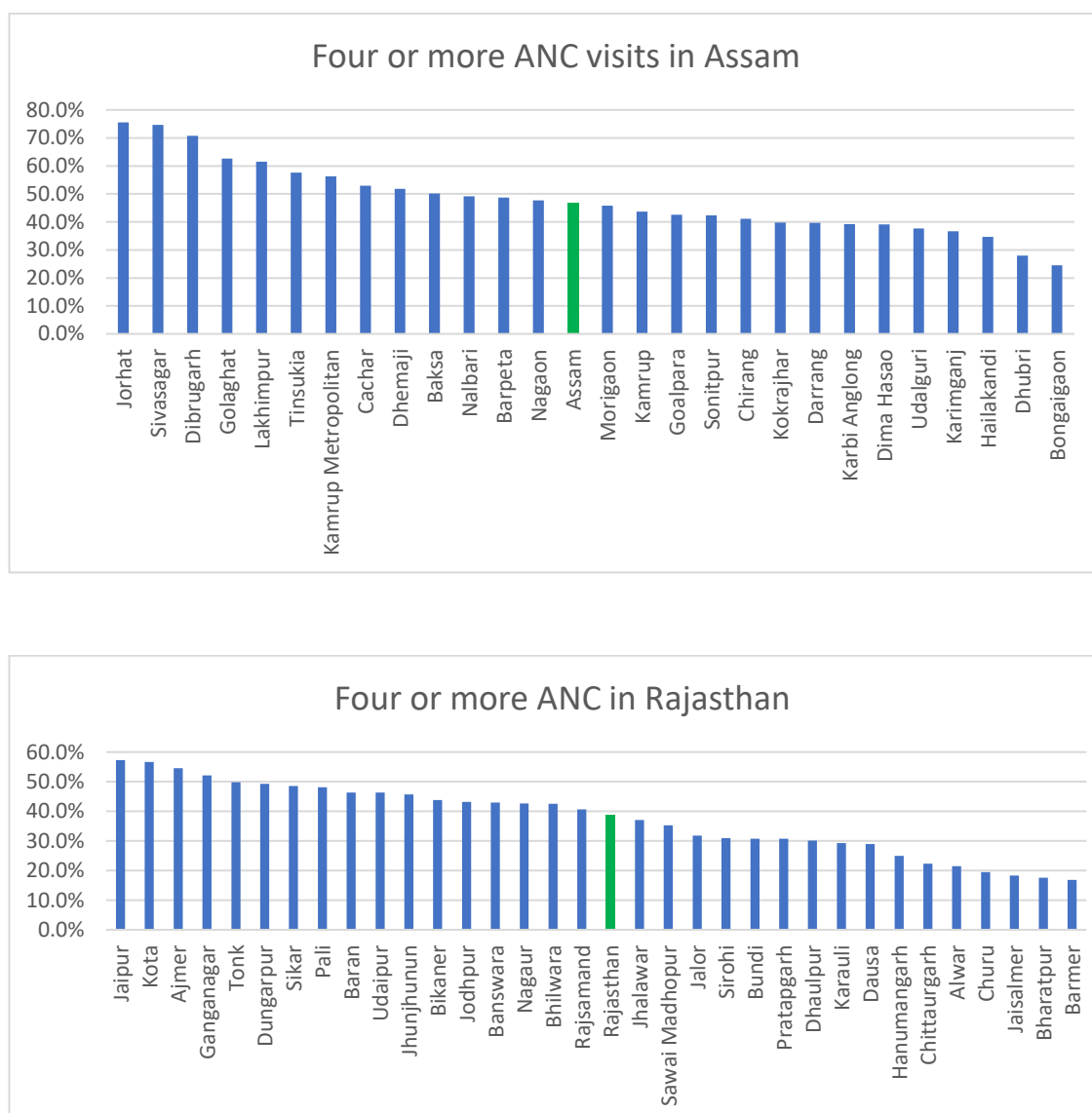


Figure 4.1 shows the variation of receiving four or more ANC visits across the state of Assam. In some of the upper Assam districts such as Jorhat, Sivasagar and Dibrugarh, greater than 70% of the women had four or more ANC visits. Unfortunately, there are also districts like Dhubri and Bongaigaon, where less than 30% of the women had four or more ANC visits. The state average itself is low at less than 50%. When it comes to Rajasthan, the district with highest Four or more ANC visits was in the district of Jaipur with less than 60% and lowest in the district of Barmer with less than 20%. The state average is at 38.8%.

Figure 4.2 - Distribution of at least one TT injection in the states of Assam and Rajasthan

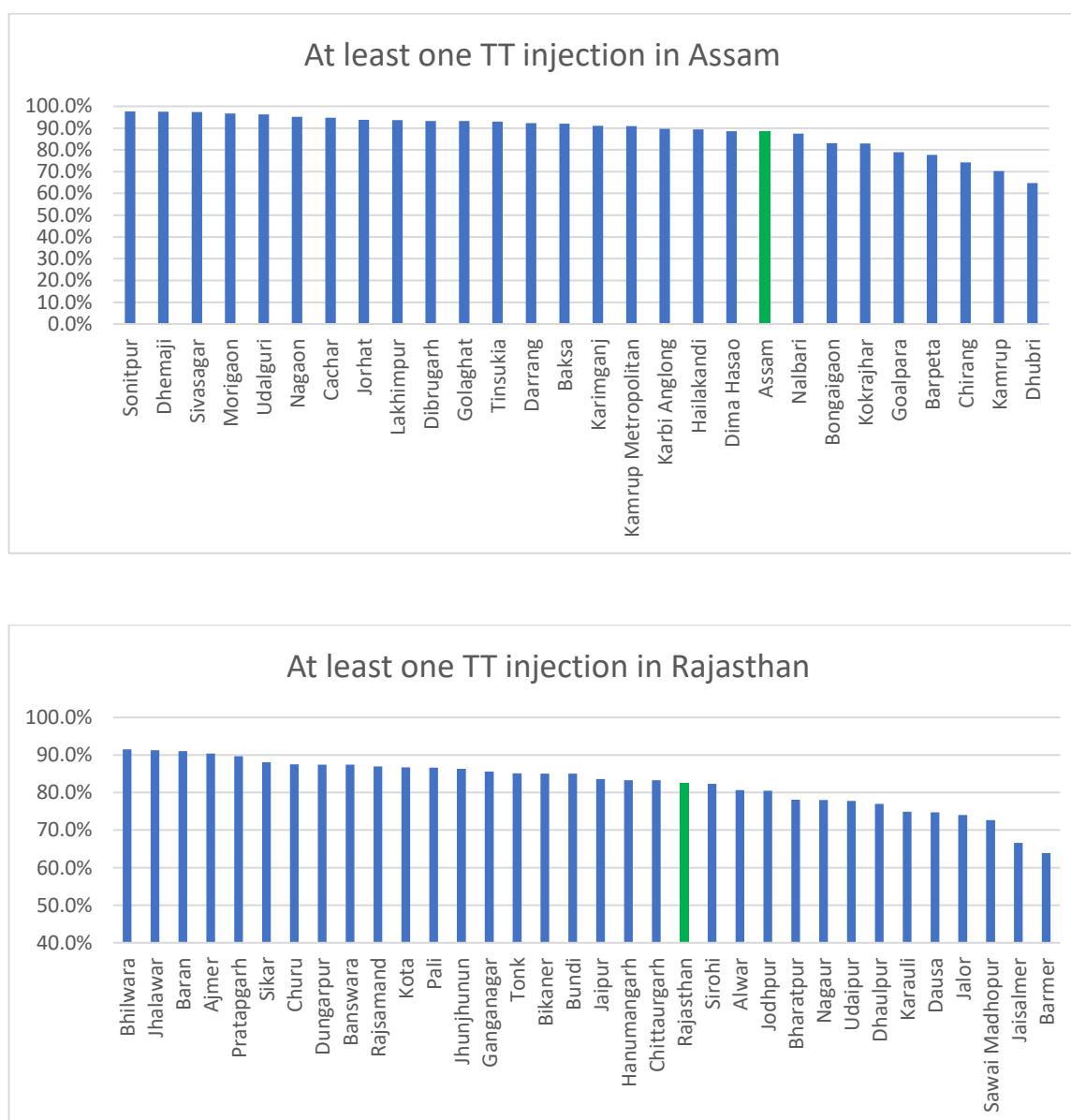


Figure 4.2 depicts the administration of at least one TT injection to the women in the states of Assam and Rajasthan. The state average of Assam is 88.3% and most of the districts have more than the state average. Dhubri is the only district with less than 70% of the women to have at least one TT injection.

In the state of Rajasthan, District Bhilwara is having slightly more than 90% in at least one TT injection and the least is in Barmer district at 63.9%. The state average stands at 82.5%.

Figure 4.3 - Distribution of 100 IFA tablets in the states of Assam and Rajasthan

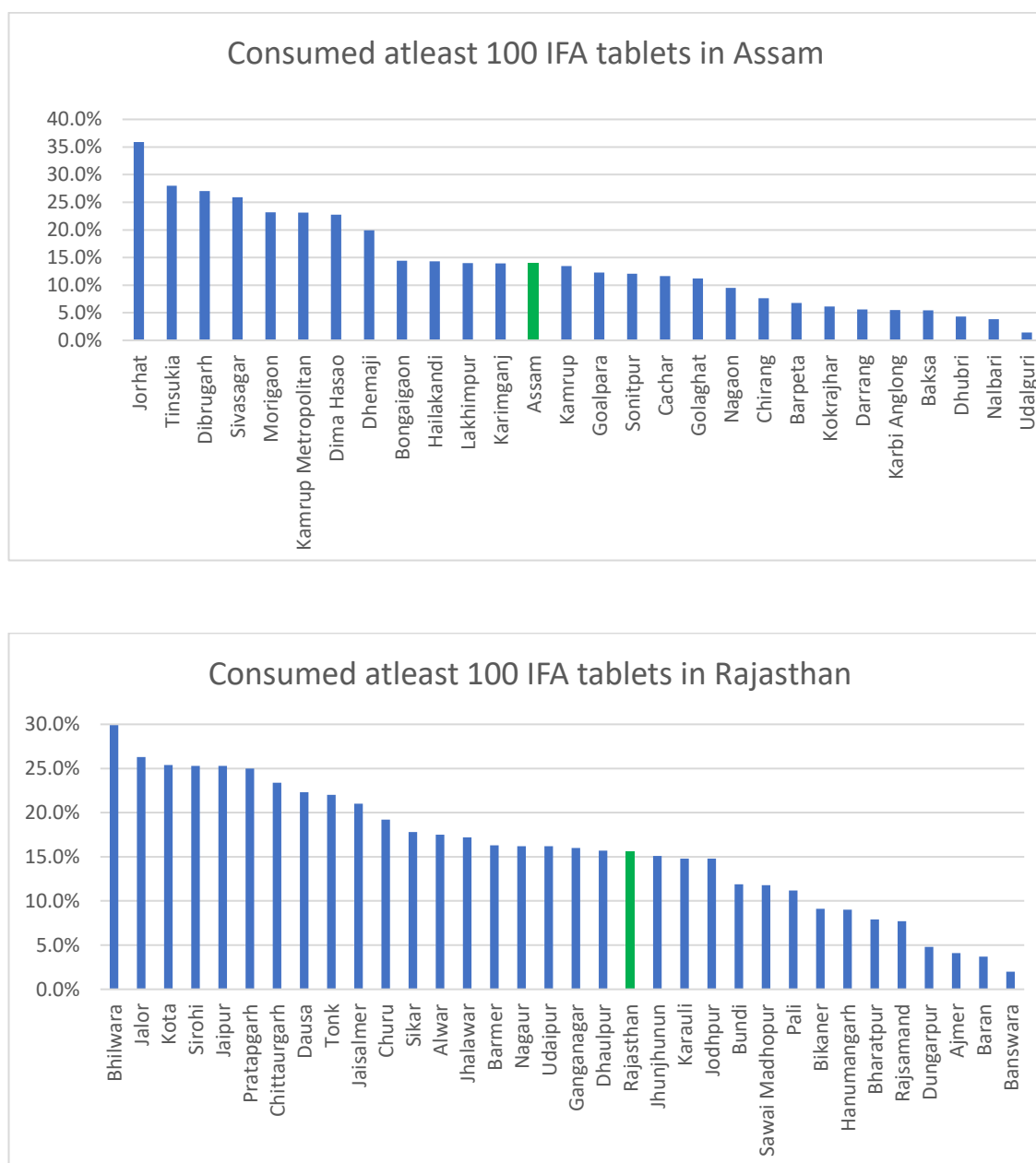


Figure 4.3 shows the unfortunate scenario of consumption of IFA tablets in both the states of Assam and Rajasthan. The district with highest consumption of IFA tablets in Assam is Jorhat district which is at a very low of only 35.9%. The state average is at 13.9%. Some districts like Dhubri, Nalbari and Udalguri have even less than 5% women who have consumed at least 100 IFA tablets.

In the state of Rajasthan, the highest consumption of more than 100 IFA tablets is in the district of Bhilwara with 29.9% and lowest in the district of Banswara at 2%. The state average is also very low at 15.6%.

Table 1- Socio-demographic characteristics of the states of Assam and Rajasthan

Variables	Assam		Rajasthan	
	%	n	%	n
Women's age in years				
15-24	8.7	4522	8.4	7041
25-34	32.2	16733	35.9	29985
35-49	59.1	30697	55.7	46515
Type of Residence				
Urban	10.3	5338	23.8	19884
Rural	89.7	46614	76.2	63657
Women's education level				
No education	39.4	20478	62.8	52437
Primary	17.8	9270	14.3	11961
Secondary	40.3	20954	18.9	15790
Higher	2.4	1250	4.0	3353
Women's Religion				
Hindu	58.8	30570	88.9	74284
Muslim	36.5	18982	9.4	7888
Others	4.6	2400	1.6	1369
Wealth quintile				
Poorest	29.6	15392	18.9	15814
Poorer	40.4	20992	24.6	20592
Middle	17.2	8944	21.3	17818
Richer	9.1	4750	17.9	14919
Richest	3.6	1874	17.2	14398
Number of months pregnant when pregnancy registered				
< 3 months	12.7	6614	10.2	8534
3-6 months	2.6	1330	1.9	1601
> 6 months	.1	69	.2	178
Missing values	84.6	43939	87.7	73228
Getting permission to visit health facility				
No problem	61.4	31909	68.3	57067
Big problem	14.2	7354	10.8	9057
Not a big problem	24.4	12689	20.8	17417
Difficulty to reach health facility due to distance				
No problem	21.9	11396	35.5	29686
Big problem	35.0	18207	30.1	25124
Not a big problem	43.0	22349	34.4	28731

Table1 depicts the socio-demographic characteristics of the women. In the state of Assam, majority of the women were in the 35-49 years age group, resided in rural areas and believed in Hinduism. Approximately 40% of the women never had any formal education. Majority of the women in the state of Assam belonged to the poorest and poorer wealth quintile category. 12.7% women had their pregnancy registered in the first three months

of pregnancy. 61.4% of the women did not have any problem to get permission to visit the health facility and around 35% of the women had a big problem in visiting health facility due the distance from their home.

In the state of Rajasthan also, majority of the women were in the 35-49 years age group, resided in rural areas and believed in Hinduism. Approximately 60% of the women lacked formal education. Majority of the women were from the lower quintile of wealth category. Around 10% of the women in the state of Rajasthan registered their pregnancy in the first three months. 68.3% and 35.5% of the women did not have any difficulty to get permission to visit health facility and long distance between their home and the health facility, respectively.

Table 2- Utilization of antenatal care services by socio-demographic characteristics of women in Assam and Rajasthan

Variables	Four or more ANC		At least one TT		Consumed at least 100 IFA tablets	
	Assam	Rajasthan	Assam	Rajasthan	Assam	Rajasthan
Women's age in years						
15-24	46.5	40.6	89.44	93.7	14.7	14.9
25-34	48.9	38.9	88.78	92.6	13.8	16.4
35-49	40.1	30.8	83.53	86.8	11.9	13.5
Type of Residence						
Urban	60.5	54.1	92.5	96	23	23
Rural	45.4	38.8	87.9	91.4	12.8	13
Women's education level						
No education	33.3	26.5	80.7	87.7	10.1	10.7
Primary	38.6	38.5	86.9	93.7	10.3	13.8
Secondary	52.2	47.4	91.2	96.3	14.8	16.8
Higher	73.9	61.6	94.1	97.4	27.1	28
Women's Religion						
Hindu	54.2	38.8	91.2	93	16	15.5
Muslim	35.3	38.1	83.6	86.9	10	17.6
Others	48.4	46.8	90.5	97.8	12.7	14.5
Wealth quintile						
Poorest	32.8	21.9	82	84.5	10.5	8.1
Poorer	44.8	30.9	89.6	91.1	12.1	10.5
Middle	57	37.3	92.2	94.7	14.1	14.6
Richer	67	48.1	92.6	95.5	19.3	17.5
Richest	76.9	60.6	94.2	97.6	36.3	26.2
Number of months pregnant when pregnancy registered						
< 3 months	52.1	45.8	91.3	97.5	13.8	15.9

3-6 months	34.1	29.6	90.9	95.6	15.5	12.7
> 6 months	29	20.2	77.9	88.2	4.3	13.3
Getting permission to visit health facility						
No problem	52.3	41.9	91.7	93.3	14.2	16.6
Big problem	38.8	28.3	78.6	88.5	15.7	11.1
Not a big problem	40	35.6	86.6	92.4	12.1	14.8
Difficulty to reach health facility due to distance						
No problem	53.4	45.8	90.4	95.2	15.8	20.3
Big problem	39.6	32.1	83.8	88.8	11.7	12.3
Not a big problem	49.4	37.4	90.9	92.9	14.5	13.3

Table 2 represents the service utilization of ANC services based on socio-demographic factors across the states of Assam and Rajasthan. It can be seen from the table that there are marked variations in the service utilization of ANC services amongst the women. Women of the age group of 15-24 and 25-34 years old and urban residents utilized the ANC services more than their counter parts. If we look at the service utilization of the ANC services by the educational attainment of the women, then it is clearly visible that women with greater educational qualification used the services more than the women who lacked formal education. Women following Hinduism utilized the services more. Utilization of the services is also much higher in the women belonging to the richest wealth quintile.

Women who registered their pregnancy in the first three months had highest four or more ANC visits and a minimum of one TT injection. Women who had no problem in getting the permission to visit the health facilities also availed the services the most. Distance to the health facility seems crucial in getting four or more ANC visits however, not much in getting a minimum of one TT Injection and 100 IFA tablets.

Table 3- Analysis of variance (ANOVA) results

Quantity		Sum of Squares	df	Mean Square	F	Sig.
Four or more ANC	Regression	270.128	8	33.766	103.249	.000 ^b
	Residual	2617.576	8004	.327		
	Total	2887.704	8012			
At least one TT injection	Regression	57.875	8	7.234	21.360	.000 ^b
	Residual	2698.699	7968	.339		
	Total	2756.574	7976			

At least 100 IFA tablets	Regression	17.061	8	2.133	18.064	.000 ^b
	Residual	812.861	6885	.118		
	Total	829.922	6893			

ANOVA table for Assam

Quantity		Sum of Squares	df	Mean Square	F	Sig.
Four or more ANC	Regression	336.820	8	42.102	124.080	.000 ^b
	Residual	3496.326	10304	.339		
	Total	3833.146	10312			
At least one TT injection	Regression	33.034	8	4.129	21.988	.000 ^b
	Residual	1934.999	10304	.188		
	Total	1968.032	10312			
At least 100 IFA tablets	Regression	29.639	8	3.705	29.369	.000 ^b
	Residual	886.710	7029	.126		
	Total	916.349	7037			

ANOVA table for Rajasthan

To control the fitness of the regression equations, analysis of variance (ANOVA) was performed as represented in Table 3. It includes regression and residual sums of squares, mean squares, F values and significance level of regression (p value). This ANOVA table is evident of high predictive powers with $p < 0.05$. The spectacular performance of the linear regression models to explain the relationship between our variables and dependent variables are nearly linear.

Table 4- Goodness of fit statistics of models

Assam				
Statistical Parameters	R	R Square	Adjusted R Square	Std. Error of the Estimate
Four or more ANC	.306 ^a	.094	.093	.57187
At least one TT	.145 ^a	.021	.020	.58197
Consumed at least 100 IFA	.143 ^a	.021	.019	.34360

Rajasthan				
Statistical Parameters	R	R Square	Adjusted R Square	Std. Error of the Estimate
Four or more ANC	.296 ^a	.088	.087	.58251
At least one TT	.130 ^a	.017	.016	.43335
Consumed at least 100 IFA	.180 ^a	.032	.031	.35518

Table 4 show the goodness of fit statistics of our models: multiple R, R square, adjusted R square and standard error of the estimate (SEE). From the table we can see that 9.4% of the variance in Assam and 8.8% in Rajasthan in the dependent variable of Four or more ANC can be explained by our independent variables. Similarly, 2.1% of the variance in Assam and 1.7% in Rajasthan of the dependent variables of at least one TT can be explained by the independent variables. In case of at least 100 IFA tablets 2.1% of variance in Assam and 3.2% in Rajasthan can be explained by the independent variables.

Table 5- Regression coefficients, t-values and significance level of our t-values of our linear regression model for Four or more ANC

Statistical parameters	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.438	.062		23.047	.000
Women's age in years	-.012	.010	-.013	-1.177	.239
Type of Residence	.038	.023	.019	1.639	.101
Women's educational level	.049	.009	.072	5.740	.000
Women's Religion	-.098	.011	-.095	-8.749	.000
Wealth quintile	.098	.008	.176	13.071	.000
Number of months pregnant when pregnancy registered	-.168	.016	-.114	-10.663	.000
Getting permission to visit health facility	-.065	.008	-.093	-8.496	.000
Difficulty to reach health facility due to distance	.030	.008	.039	3.534	.000

Regression co-efficient table for Assam

Statistical parameters	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.500	.049		30.461	.000
Women's age in years	-.018	.010	-.018	-1.839	.066
Type of Residence	-.079	.015	-.056	-5.092	.000
Women's educational level	.057	.007	.098	8.420	.000
Women's Religion	-.030	.015	-.019	-1.967	.049
Wealth quintile	.067	.006	.151	11.965	.000
Number of months pregnant when pregnancy registered	-.153	.013	-.109	11.448	.000
Getting permission to visit health facility	-.038	.007	-.052	-5.208	.000
Difficulty to reach health facility due to distance	-.005	.007	-.006	-.636	.525

Regression co-efficient table for Rajasthan

The coefficient table depicts the individual variables significance in predicting the dependent variable. In Table 5 we can see that in Assam, except for Women's age in years and type of residence, the dependent variable of four or more ANC is significantly predicted by all other independent variables.

In the state of Rajasthan, type of residence, educational level, wealth quintile, number of months pregnant when pregnancy registered and allowance to visit health facility plays a significant role in prediction of four or more ANC.

Table 6- Regression coefficients, t-values and significance level of our t-values of our linear regression model for At least one TT injection

Statistical parameters	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.799	.064		28.258	.000
Women's age in years	-.016	.010	-.018	-1.554	.120
Type of Residence	.017	.024	.009	.734	.463
Women's educational level	.039	.009	.058	4.414	.000
Women's Religion	-.058	.011	-.057	-5.054	.000
Wealth quintile	.022	.008	.041	2.903	.004
Number of months pregnant when pregnancy registered	-.051	.016	-.036	-3.188	.001
Getting permission to visit health facility	-.047	.008	-.069	-6.052	.000

Difficulty to reach health facility due to distance	.043	.009	.057	4.952	.000
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Regression co-efficient table for Assam

Statistical parameters	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.959	.037		53.474	0.000
Women's age in years	.002	.007	.002	.211	.833
Type of Residence	-.013	.011	-.013	-1.141	.254
Women's educational level	.006	.005	.015	1.241	.214
Women's Religion	-.014	.011	-.013	-1.276	.202
Wealth quintile	.014	.004	.045	3.445	.001
Number of months pregnant when pregnancy registered	-.107	.010	-.107	10.829	.000
Getting permission to visit health facility	-.005	.005	-.009	-.860	.390
Difficulty to reach health facility due to distance	.001	.005	.003	.263	.793

Regression co-efficient table of Rajasthan

In table 6, we can see that women's age in years and type of residence in not a strong predictor of the dependent variable of administration of at least one TT injection in Assam. In Rajasthan, only wealth quintile and number of months pregnant when pregnancy registered are significant predictors of administration of at least one TT injection.

Table 7- Regression coefficients, t-values and significance level of our t-values of our linear regression model for Consuming at least 100 IFA tablets

Statistical parameters	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.174	.040		29.391	.000
Women's age in years	-.013	.006	-.024	-2.009	.045
Type of Residence	-.045	.015	-.040	-3.064	.002
Women's educational level	.013	.006	.032	2.321	.020
Women's Religion	-.027	.007	-.045	-3.699	.000
Wealth quintile	.028	.005	.087	5.735	.000

Number of months pregnant when pregnancy registered	.017	.011	.019	1.620	.105
Getting permission to visit health facility	-.006	.005	-.014	-1.113	.266
Difficulty to reach health facility due to distance	.010	.005	.023	1.880	.060

Regression co-efficient table of Assam

Statistical parameters	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.144	.037		31.167	.000
Women's age in years	.002	.007	.004	.330	.742
Type of Residence	-.032	.011	-.039	-2.785	.005
Women's educational level	.019	.005	.056	3.825	.000
Women's Religion	-.015	.011	-.016	-1.325	.185
Wealth quintile	.027	.004	.105	6.559	.000
Number of months pregnant when pregnancy registered	-.012	.010	-.013	-1.135	.256
Getting permission to visit health facility	.003	.005	.008	.604	.546
Difficulty to reach health facility due to distance	-.018	.005	-.043	-3.403	.001

Regression co-efficient table of Rajasthan

Table 7 depicts that only type of residence, women's religion and wealth quintiles are strong predictors for the dependent variable for consumption of at least 100 IFA tablets in Assam. Whereas, in the state of Rajasthan, women's educational level, wealth quintile and difficulty to reach health facility due to distance are the strong predictors of consumption of at least 100 IFA tablets.

5. Discussion

In spite of efforts at both national and international levels for the betterment of the ANC service utilization, a significant proportion of women fail to get adequate ANC services in Assam and Rajasthan.

This study has found several socio-demographic factors for the ANC service utilization. It was found that urban women are more likely to have an ANC visit compared to the rural population and majority of the women in Assam and Rajasthan reside in rural areas. Hence it is important for the antenatal care services to reach to the remotest areas of the state. However, no significant difference was observed in utilization of antenatal care services based on the age of the women. Role of religion played an important factor in this study as it was found that women belonging to Hindu religion are more likely to use the ANC services in comparison with the women belonging to Muslim and other religious communities. The same results have also been found out in another study conducted in India which stated that there is positive relation between religion and ANC services utilization among the women.^{xix} Women's educational attainment has also been found to have positively impacted the ANC services utilization. The women with a minimum of primary level education used more maternity services, as compared with women lacking any kind of formal education. Thus, the study findings agree with several other previous studies conducted in low- and middle-income countries. This study also highlighted the necessity for women's education in improving the antenatal care services. Moreover, women with education have more decision-making ability when it comes to using health care services. The women's household wealth quintile is one of the most significant factors of maternal health care utilization. In accordance with the findings of earlier studies, our study verified that wealthier economic status significantly impacts the utilization of maternity care services in a positive manner. Women from economically good families have better access to health care information and prefer better hospital facility.

Through this study we could also find out that women who had early registration of their pregnancy could avail the services as compared to the women who registered their pregnancy late. Getting permission to visit health care facility from the family members is also important in getting access to the antenatal care services. The scenario is prevalent because women in the household are not empowered to take decisions on their own health. Therefore, it is crucial for the government to empower women with basic skills and ensure

their rights to be protected against violence and inequality, but this cannot be achieved without involving the whole family in the process of women empowerment.

Assam and Rajasthan being a place with mostly rural population with vast remote areas, difficulty to avail services due to long distance of the facility from their home is also crucial in accessibility of ANC services. Therefore 78% women had stated some form of problem to avail the services due to the distance of health facility from their home.

On comparing between the dependent variables of Assam and Rajasthan, there is slightly more ANC service utilization in Assam as compared to Rajasthan.

6. Conclusion and Recommendations

The social and the demographic factors of ANC services have been examined in the study which included a minimum of four ANC visits, minimum one TT injection and intake of at least 100 IFA tablets in the states of Assam and Rajasthan. The ANC service utilization in Assam and Rajasthan are found to be inadequate throughout socio-economic groups and is governed by various socio-economic as well as demographic factors. The findings of the study indicate the need of targeted and evidence-based interventions with more than one level approach to deal with the limitations in the antenatal care services coverage. Considering the status of the educational level in the women of the states, strategies should focus extensively on easing the limitations and incorporating the interventions that effectively increase the educational level of the women. Likewise, women belonging to poor households must be given awareness about the benefits of maternity schemes that are made available by the government for the economically vulnerable section of the society. The current government interventions should strengthen their efforts and there is a necessity to be more inclusive to decrease discrepancies in service utilization across different religious and social groups.

The study results emphasize on the requirement of envisaging factors at the individual and the household levels. Implementing interventions at community level along the district level can prove to be a critical step in increasing the ANC service utilization. Additionally, engaging directly with the communities is equally important. This includes increasing the awareness among men, women, community leaders and other stakeholders, regarding the ill effects of inadequate and inappropriate use of ANC services for the mothers and their newborn. This engagement with the community will also empower the women towards proper knowledge regarding their health and helping them in decision-making. Many women have cited difficulty in availing services due to distance of the health facility from their home, which also implies the need of development in health infrastructure at the rural level.

Appendix

Table 1: Distribution of ANC visits in the states of Assam and Rajasthan, NFHS-4

No. of ANC visits	Assam		Rajasthan	
	%	n	%	n
No ANC	9.5	811	13.4	1599
1-3 ANC	43.6	3718	47.8	5712
>= 4 ANC	46.9	4005	38.8	4639

Table 2: Distribution of TT immunization in the states of Assam and Rajasthan, NFHS-4

TT Immunization	Assam		Rajasthan	
	%	n	%	n
No Immunization	11.7	988	7.5	896
Partial Immunization	3.7	311	10	1196
Fully Immunization	84.7	7171	82.5	9858

Table 3: Distribution of No. of IFA tablets taken in the state of Assam, NFHS-4

No. of IFA tablets taken	Assam		Rajasthan	
	%	n	%	n
< 100 IFA tablets	86.1	6105	84.4	6419
>= 100 IFA tablets	13.9	984	15.6	1190

Table 4: Descriptive analysis of independent variables by No. of ANC visits in the states of Assam and Rajasthan, NFHS-4

Variables	No ANC		1-3 ANC		>= 4 ANC	
	Assam	Rajasthan	Assam	Rajasthan	Assam	Rajasthan
Age Group						
15-24	8.3	11.7	45.2	47.7	46.5	40.6
25-34	8.8	13.3	42.2	47.8	48.9	38.9
35-49	15.5	20.9	44.4	48.2	40.1	30.8
Type of Residence						
Urban	6.1	6.7	33.5	39.2	60.5	54.1
Rural	9.9	15.5	44.7	50.5	45.4	34.1
Women's Education Level						
No education	18.9	21.5	47.8	52.1	33.3	26.5
Primary	10.3	11.1	51.2	50.4	38.6	38.5
Secondary	6.2	7.7	41.6	44.9	52.2	47.4

Higher	2.6	3	23.5	35.4	73.9	61.6
Women's Religion						
Hindu	6.7	12.9	39.1	48.3	54.2	38.8
Muslim	14.1	17.8	50.6	44.2	35.3	38.1
Others	8.2	11.1	43.4	42.1	48	46.8
Wealth Quintile						
Poorest	17	26.2	50.2	51.9	32.8	21.9
Poorer	8.9	16.3	46.3	52.8	44.8	30.9
Middle	4.3	12	38.7	50.7	57	37.3
Richer	2.6	7.1	30.4	44.8	67	48.1
Richest	1.9	3.1	21.2	36.2	77	60.6
Number of months pregnant when pregnancy registered						
< 3 months	5	6.3	42.9	47.9	52.1	45.8
3-6 months	8.6	10.7	57.3	59.7	34.1	29.6
> 6 months	21.7	14.6	49.3	65.2	29	20.2
Getting permission to visit health facility						
No problem	7.6	10.8	40.1	47.3	52.3	41.9
Big problem	12.2	24.3	49.1	47.4	38.8	28.3
Not a big problem	12	15.1	48	49.3	40.0	35.6
Difficulty to reach health facility due to distance						
No problem	7.3	8.2	39.3	46.1	53.4	45.8
Big problem	12.3	18.9	48.1	49	39.6	32.1
Not a big problem	8.4	14	42.2	48.6	49.4	37.4

Table 5: Descriptive analysis of independent variable by Immunization status in the states of Assam and Rajasthan, NFHS-4

Variables	No Immunization		Partial Immunization		Fully Immunization	
	Assam	Rajasthan	Assam	Rajasthan	Assam	Rajasthan
Age group						
15-24	10.6	6.3	3.3	9.7	86.1	84
25-34	11.2	7.4	3.5	10.5	85.3	82.1
35-39	16.5	13.2	5.3	8	78.3	78.8
Type of Residence						
Urban	7.5	4	3.8	8.2	88.7	87.8
Rural	12.1	8.6	3.7	10.6	84.2	80.8
Women's Education Level						
No education	19.3	12.2	6	10.5	74.7	77.2
Primary	13.1	6.3	3.9	11.4	83	82.3
Secondary	8.8	3.7	2.9	9.9	88.3	86.4
Higher	6	2.5	1.7	5.9	92.4	91.5

Women's Religion						
Hindu	8.8	6.9	3.4	10.1	87.8	82.9
Muslim	16.4	13	3.9	9	79.7	77.9
Others	9.5	2.1	5.8	8.9	85	88.9
Wealth Quintile						
Poorest	18	15.5	5.5	11.6	76.5	72.9
Poorer	10.4	8.9	3.3	11.5	86.3	79.6
Middle	7.8	5.3	2.9	10	89.3	84.7
Richer	7.4	4.5	1.8	9.4	90.8	86.1
Richest	5.8	2.3	2.9	6.8	91	15.3
Number of months pregnant when pregnancy registered						
< 3 months	8.7	2.5	2.9	8.7	88.4	88.8
3-6 months	9.1	4.4	6.5	13.4	84.4	82.2
> 6 months	22.1	11.8	17.6	24.7	60	63.5
Getting permission to visit health facility						
No problem	8.3	6.7	4.1	9.8	87.6	83.5
Big problem	21.4	11.5	2.9	10	75.7	78.5
Not a big problem	13.4	7.6	3.2	10.6	83.3	81.8
Difficulty to reach health facility due to distance						
No problem	9.6	4.8	3.3	9.6	87.1	85.6
Big problem	16.2	11.2	4.7	10.2	79.1	78.6
Not a big problem	9.1	7.1	3	10.3	87.8	82.6

Table 6: Descriptive analysis of independent variables by consumption of IFA tablets in the states of Assam and Rajasthan, NFHS-4

Variables	< 100 IFA		>= 100 IFA	
	Assam	Rajasthan	Assam	Rajasthan
Age Group				
15-24	85.3	85.1	14.7	14.9
25-34	86.2	83.6	13.8	16.4
35-49	88.1	86.5	11.9	13.5
Type of Residence				
Urban	77.2	77.1	22.8	22.9
Rural	87.2	87	12.8	13
Women's Education Level				
No education	89.9	89.3	10.1	10.7
Primary	89.7	86.2	10.3	13.8
Secondary	85.2	83.2	14.8	16.8
Higher	72.9	72	27.1	28
Women's Religion				
Hindu	83.9	84.5	16.1	15.5
Muslim	90	82.5	10	17.6
Others	87.3	85.5	12.7	14.5
Wealth Quintile				
Poorest	89.5	91.9	10.5	8.1

Poorer	87.9	89.5	12.1	10.5
Middle	85.9	85.4	14.1	14.6
Richer	80.7	82.5	19.3	17.5
Richest	63.7	73.8	36.3	26.2
Number of months pregnant when pregnancy registered				
< 3 months	86.2	84.1	13.8	15.9
3-6 months	84.5	87.3	15.5	12.7
> 6 months	95.7	86.7	4.3	13.3
Getting permission to visit health facility				
No problem	85.8	83.4	14.2	16.6
Big problem	84.3	88.9	15.7	11.1
Not a big problem	87.9	85.2	12.1	14.8
Difficulty to reach health facility due to distance				
No problem	84.2	79.7	15.8	20.3
Big problem	88.3	87.7	11.7	12.3
Not a big problem	85.5	86.7	14.5	13.3

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