Disparities in Antenatal Care Utilization in India

A Dissertation and Training Report as a prerequisite for the award of PGDM [Hospital and Health Management]

By

Saloni Singh
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Under the guidance of
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FEEDBACK FORM

FEEDBACK FORM

Name of the student: Saloni Singh

Name of the organization in which Dissertation Has Been Completed: International Institute of Health Management Research [IIHMR], Delhi

Area of Dissertation: Factors affecting hand grip strength in young adults.

Attendance: Perfect adherence to dissertation norms

Objectives achieved: The student understood the details of the concept, worked on data collection and data analysis.

Deliverables: Dissertation using large scale sample survey, analysis, Literature review

Strengths: Hard work, diligence and proactiveness.

Suggestions for improvement: Analysis

Suggestions for Institute: Improve Placements.

Signature of the Organization Mentor (Dissertation)

Dr. Mukesh Ravi Raushan,
Assistant Professor, IIHMR, Delhi, India

Date: 20/08/2025.

Place: New Delhi, India

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This is to certify that Ms. Saloni Singh, a graduate student of the PGDM (Hospital & Health Management) has worked under our guidance and supervision. He/ She is submitting this dissertation titled **"Disparities in Ante Natal Care Utilisation India"** using NFHS-5 data at "IIHMR, Delhi" in partial fulfilment of the requirements for the award of the PGDM (Hospital & Health Management).

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

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CERTIFICATE

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Ms. **Saloni Singh**, affiliated with the International Institute of Health Management and Research [IIHMR], New Delhi, conducted a dissertation project titled **"Disparities in Antenatal Care Utilization in India"** The study is based on secondary data analysis and utilizes the National Family Health Survey (NFHS-5) dataset to examine inequities in antenatal care services across different socio-demographic groups in India.

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This is to certify that Saloni Singh student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at IIHMR, Delhi, India from April 2025 to June 2025

The Candidate has successfully carried out the study designated to him during internship training and his/her approach to the study has been sincere, scientific and analytical.

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I wish her all success in all his/her future endeavours.

Dr. Sumesh Kumar
Associate Dean, Academic and Student Affairs
IIHMR, New Delhi

Dr. Mukesh Ravi Raushan
Assistant Professor, Mentor
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Ms. Saloni Singh

Date:

Place:

Contents

Abstract

Background:

To ensure the health of both mothers and newborns, antenatal care, or ANC, is essential. There are still notable differences in the use of ANC throughout India, even though both national and international guidelines recommend at least four ANC visits. Intersecting socioeconomic, geographic, and cultural factors like caste, wealth, education, religion, and regional disparities all contribute to these discrepancies

Objective:

This study aims to assess the overall level of antenatal care (ANC) utilization in India by examining the frequency and timing of ANC visits, explore how women's autonomy—such as decision-making power and mobility affects ANC uptake, and analyse disparities in ANC utilization across different caste groups. The goal is to identify key factors contributing to unequal access to ANC services and provide insights for targeted interventions to improve maternal health equity in India.

Methods:

I used secondary data from NFHS-5 (2019-21), which included a nationally representative sample of women aged 15 to 49 who had given birth in the past five years. To explore the relationship between antenatal care (ANC) utilization measured by how often and when women visited healthcare providers and various independent factors like age, education, caste, residence, wealth, and decision-making autonomy, we employed multivariate logistic regression and chi-square tests.

Results:

Our findings highlighted significant disparities in ANC utilization. Women from marginalized castes, those living in rural areas, those with lower educational attainment, and those from poorer households showed lower rates of ANC uptake. Interestingly, we found that greater autonomy among women was linked to more adequate ANC visits. There were also notable

regional differences, with some states showing much lower ANC coverage. While there have been national improvements, these inequalities reveal ongoing structural and socio-cultural challenges.

Conclusion:

The landscape of ANC utilization in India is uneven, influenced by a mix of socio-demographic factors and systemic inequities. To enhance access to ANC, policies need to focus on marginalized groups and empower women. Implementing community-based interventions, along with bolstering healthcare infrastructure and awareness initiatives, is essential for closing these gaps and achieving universal maternal health coverage.

1.1 Introduction

One of the most important measures of a country's general development and well-being is its maternal health. Antenatal Care (ANC), the first step in guaranteeing a safe pregnancy and delivery, is one of the most important aspects of maternal healthcare. ANC includes health education, early problem diagnosis, and preventative therapy including iron-folic acid supplementation and tetanus vaccination in addition to monitoring foetal growth and maternal health. The World Health Organisation (WHO), which advocates for at least eight contacts during pregnancy to maximise maternal and newborn health, has recognised the significance of ANC on a worldwide scale (WHO, 2016). It is commonly known around the world that prompt and sufficient ANC greatly improves mother and newborn outcomes, including lowering perinatal mortality, preventing maternal anaemia, and controlling pregnancy-related issues(Tunçalp et al., 2017). Progress towards the Sustainable Development Goals (SDG 3) is hampered by the persistence of disparities in ANC access and quality, especially in low- and middle-income countries (LMICs).

Antenatal care (ANC) is vital for the well-being of pregnant women and their infants involves various essential components, including regular monitoring of maternal health and early intervention to address potential risks (V. Kumar et al., 2025). In India, despite significant expansion of maternal health services, ANC utilization remains suboptimal and inequitable. According to NFHS-5 (2019–21)), only 58.1% of pregnant women completed at least four ANC visits, with a stark rural–urban gap (54.8% vs. 69.5%) and wide inter-state variation.

Gender inequalities intersect with socioeconomic factors to create barriers for women in accessing ANC. Women's women empowerment and their involvement in decision-making are vital components of equity in health care services(Patel & Chauhan, 2020).

While India faces persistent challenges in ensuring equitable access to antenatal care for all women(G. Kumar et al., 2019). While ANC is provided free of cost at public health centers (Kumar et al., 2019), disparities remain due to various socio-economic, cultural, and gender-related fact. States like Bihar, Uttar Pradesh, and Madhya Pradesh report especially low ANC coverage.

Disparities in utilization are largely driven by socio-demographic factors such as maternal education, economic status, caste, religion, and place of residence (Longchar et al., 2025). Women with higher education and from wealthier households are significantly more likely to

receive adequate ANC services than those with lower socioeconomic status(Girotra et al., 2023). Maternal mortality is still high in LMICs; in recent years, these settings have accounted for almost 95% of all maternal fatalities worldwide. Although ANC coverage (defined as ≥4 visits) has increased in many nations, there are still notable disparities in content-qualified ANC coverage (as determined by metrics such as ANC) by wealth, education, place of residence, and marginalised status(Tiara Marthias et al., 2025).

Initiatives like the Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) and Janani Suraksha Yojana (JSY) have been put in place to close these gaps by increasing access and providing incentives for ANC visits(Lim et al., 2010). Nonetheless, there are still issues with guaranteeing quality, equity, and regular follow-up. Targeted interventions are needed to address underlying social variables like education, gender equity, and community awareness in addition to increasing service accessibility

Maintaining mother and newborn health depends on prenatal care (ANC), which is also very important but its use in Haryana, India, shows notable differences affected by socioeconomic circumstances.

Women's reduced autonomy in making decisions about their health is a major contributor to gender inequities. Based on National Family Health Survey data (NFHS 5, 2019–21), The odds of completing full ANC, which is defined as at least four visits, first-trimester initiation, and adequate iron-folic acid supplementation, are significantly higher for women who actively participate in household decisions than for those who have low autonomy(Majumder et al., 2024). The World Health Organization's suggested eight ANC contacts were also positively correlated with decision-making autonomy, according to (Lee et al., 2024), underscoring the influence of intra-household power dynamics on care-seeking behaviour, Enhancing women's agency through interventions like participatory health education and community-based self-help groups has shown potential in increasing ANC uptake.

Caste limits social mobility and has historically fostered prejudice towards those castes that occupy the lower rungs of the caste system because it is an inherited status. Women from these under-represented and discriminated-against groups deal with additional socioeconomic difficulties, like limited access to healthcare, education, and political representation. The delivery of ANC services to SC moms is seriously hampered by this pervasive institutional discrimination.(V. Kumar et al., 2025). Full ANC coverage among SC mothers increased from

20.7% in NFHS 4 to 26.9% in NFHS 5, according to more current NFHS 5 data, but it is still considerably below the 51.2% national norm.

In addition to utilisation rates, additional gendered disparities are revealed by the calibre and substance of ANC services. Just 20% of Indian women receive full care, which includes blood pressure checks, blood and urine testing, and counselling on warning indicators, even though 60% of them attend at least four ANC visits (Longchar et al., 2025). Maternal healthcare utilisation in LMICs, including ANC visits, institutional delivery, and postnatal care, was examined in a systematic review and meta-analysis (Baten et al., 2025). The study found that rural, impoverished, and less educated women continue to have low utilisation rates, with disparities that are exacerbated across a number of metrics(Misu et al., 2025). Disparities continue to exist in Nigeria along ethnic and urban/rural lines in spite of the Midwives Service Scheme (MSS). Rural and impoverished women's use of ANC is still discouraged by structural constraints, financial obstacles, and traditional beliefs. Near-universal contact for at least one ANC visit (~95%) is reported in national surveys (Uganda DHS 2011); nevertheless, only 48% of women completed four visits, and only one-third obtained postnatal checkups within two days. Across socioeconomic and rural-urban gradients, utilisation remained unequal.

ANC services than women who are illiterate. In particular, literate women were more likely to receive any ANC and full ANC, highlighting the critical connection between education and healthcare use(Nihal & Shekhar, 2024). Furthermore, the likelihood of these women choosing to give birth in an institution was 1.52 times higher, highlighting the impact of literacy on maternal health decisions. Although access has been increased, gender discrepancies have not yet been entirely addressed by government programs. Although facility births have increased due to JSY's financial incentives, its influence on ANC equity is restricted by sporadic outreach, supplement stock-outs, and low male involvement(Lim et al., 2010).

A number of recent research have examined the ways in which region-specific health infrastructure, media exposure, and insurance coverage impact the use of ANC in addition to previously mentioned factors like autonomy and caste. For instance, a large-scale study (Tripathi et al., 2024) analysing rural maternal health in India revealed that only 43.5% of women accessed the whole continuum of maternity care services, including ANC, institutional delivery, and postnatal care. Clusters of low service utilisation were identified by the researchers using geospatial mapping; Bihar, Jharkhand, and the northeastern states had especially poor coverage. This data emphasises the necessity of allocating resources specifically to underserved areas in order to address systemic disparities in access to maternal health care.

Disparities in urban areas also endure. In their study of ANC in Bihar's urban slums,(Singh et al., 2023) discovered that women were discouraged from returning to ANC because of perceived low quality, which included lengthy wait times, a lack of privacy, and rude treatment . The researchers recommend that the delivery environment be improved, particularly in metropolitan areas with lower incomes. Looking at tribal contexts (Kusuma et al., 2024) examined ANC among mothers in nine tribal districts and found that low institutional delivery rates and inadequate ANC were caused by cultural norms, geographic remoteness, and a lack of trust in the facility.

Therefore, several studies suggest that the factors like women's limited autonomy, economic and educational differences, caste-based discrimination, and inconsistent service quality are the main causes of India's ongoing gender gaps in ANC use. This again make the situation more complex when the women are residing in rural areas and having lower education. Therefore, this study tries to analyse prevalence of ANC check-up by various confounders.

1.2 Background:

Maternal health is a vital sign of a country's overall progress and well-being. At the heart of this is antenatal care (ANC), which is essential for ensuring a safe pregnancy and childbirth experience. ANC encompasses much more than just medical check-ups; it involves monitoring the health of both mother and baby, providing nutritional supplements, identifying complications early, offering immunizations, and preparing families for the delivery process. Over the past two decades, we've made significant headway in increasing access to ANC worldwide. In many high-income nations, nearly all pregnant women receive the recommended number of ANC visits.

However, in low- and middle-income countries, access is still quite inconsistent. Women in wealthier urban areas are much more likely to get complete ANC, while those in rural and underserved communities often face challenges like long distances to health facilities, poor infrastructure, a lack of trained staff, and cultural limitations.

The global health community has come to understand that the challenge isn’t just about getting women to attend their antenatal care (ANC) appointments; it’s also crucial to enhance the quality of care they receive. While millions of women may make it to at least one visit, a much smaller number actually get the full ANC experience, which should include blood tests, urine tests, blood pressure monitoring, counselling, and supplements. Sadly, in many parts of Africa and South Asia, access to these essential services is still quite low.

Moreover, the quality of these services is often affected by wider social and economic disparities. Women with higher education levels and better financial situations are more likely to receive thorough ANC. In contrast, those from low-income households, with limited decision-making power, or living in conflict-affected areas are more likely to miss out. These patterns clearly show how maternal health is influenced by deep-rooted inequalities in society. Globally, Antenatal Care (ANC) has emerged as a crucial element in development objectives and health system reforms. International frameworks, such as the Sustainable Development Goals, stress the need to reduce maternal mortality and ensure universal access to high-quality maternal care. Numerous countries are transitioning to more integrated approaches, moving beyond the old four-visit model to one that recommends a minimum of eight visits, prioritizing respectful, tailored, and ongoing care. However, despite these strides, there are still considerable disparities in equity, quality, and coverage across much of the world.

1.3 Review of Literature

Antenatal Care: Global Scenario

Antenatal care is recognized globally as a key strategy for enhancing the health of mothers and their newborns. While it's true that most women get at least one antenatal care appointment during their pregnancy, there's a stark contrast in the number who actually follow through with the recommended visits and receive the full range of services. In wealthier countries, nearly everyone has access, but in many low- and middle-income regions—particularly in Sub-Saharan Africa and South Asia there's still a significant gap in complete antenatal care usage. Moreover, the quality of these services is becoming a pressing issue, with many women not getting essential elements like nutritional advice, counselling, or necessary screenings.

Disparities in ANC: Global Evidence

The differences in how antenatal care (ANC) is utilized are heavily shaped by social and economic inequalities. Women from affluent households, urban environments, and those with higher education are consistently more likely to receive sufficient ANC compared to their counterparts who are poorer, live in rural areas, or have lower educational attainment. Besides economic challenges, cultural norms, a lack of personal agency, and the distance to healthcare facilities are common hurdles that hinder ANC access.(Lee et al., 2024) These global disparities underscore the need for health interventions to go beyond mere availability and truly tackle issues of equity, quality, and accessibility.

Disparities in ANC: Indian Evidence

Overall coverage: Just about 21% of women in India are receiving comprehensive ANC, which includes at least 4 visits, over 100 iron-folic acid tablets, and at least one tetanus toxoid shot. This indicates that even though many women are attending ANC visits, the fulfilment of all the essential elements is still significantly lacking.

In India, several elements contribute to the unequal access to antenatal care (ANC). Women from marginalized caste groups, those in lower-income households, and individuals with minimal education are often less likely to receive comprehensive ANC services (G. Kumar et al., 2019). Gender inequality compounds the issue, as many women face limited autonomy in making household decisions and have restricted mobility, which further obstructs their access to care. Women living in tribal and remote areas encounter unique challenges, such as the distance to health facilities and a lack of reliable transportation. Even in urban slums, the quality of services, overcrowding, and negative experiences with healthcare providers can discourage women from seeking care again(Misu et al., 2025). These trends indicate that the disparities in ANC are influenced not only by economic factors but also by social and cultural barriers. The National Family Health Survey-5 (2019–21) gives us the most recent nationally representative insights into maternal healthcare in India. It shows that 58.1% of pregnant women managed to have at least four antenatal care (ANC) visits, which is a modest rise from 51.2% in the previous NFHS-4 (2015–16). Still, we see some significant gaps.

Rural–Urban Divide:

A striking contrast exists, with 69.5% of urban women completing four visits compared to just 54.8% of their rural counterparts. The gap between rural and urban India plays a huge role in how women access maternal healthcare. In cities, nearly 70 percent of women complete the recommended four antenatal care (ANC) visits, while in rural areas, that number drops to about 55 percent. This difference is mainly because urban areas have better healthcare facilities, more awareness, and easier transportation options. On the other hand, women in rural regions face numerous hurdles, like long travel distances to health centres, lack of reliable transport, shortages of medical professionals, and deep-rooted cultural obstacles. As a result, women living in villages not only find it harder to attend ANC visits but also face a greater risk of preventable complications during pregnancy.

Regional Variation:

States such as Kerala (82.2%) and Tamil Nadu (79.9%) boast high levels of ANC attendance, while Bihar (38.4%), Uttar Pradesh (41.2%), and Madhya Pradesh (44.7%) are considerably behind. Regional differences really bring to light the disparities in ANC (Antenatal Care) utilization. In the southern states, Kerala and Tamil Nadu stand out with impressive figures—over 80 percent and 79 percent of women, respectively, are attending the necessary ANC visits. These positive results are closely tied to higher literacy rates among women, significant public health investments, and effective welfare programs that promote institutional healthcare. On the flip side, states like Bihar, Uttar Pradesh, and Madhya Pradesh are struggling, with fewer than half of women meeting the required ANC standards. In these areas, issues like poverty, ineffective governance, inadequate infrastructure, and deeply ingrained patriarchal norms hinder maternal health-seeking behaviour, leading to a pronounced north-south divide in maternal health outcomes.

Caste-based Inequities:

Only 26.9% of Scheduled Caste mothers received full ANC coverage, revealing a stark contrast with the national average of 51.2% (Kumar et al., 2025). Caste and social exclusion continue to play a significant role in determining access to healthcare. For instance, only 26.9 percent of women from Scheduled Castes receive complete antenatal care, which is quite a bit lower than the national average of 51.2 percent. Marginalized groups, such as Scheduled Castes and Scheduled Tribes, often encounter systemic discrimination in health facilities and frequently turn to traditional healers because they don't trust these institutions. Their financial struggles and job insecurities also make it hard for them to consistently use healthcare services. This situation highlights how caste, when mixed with poverty and gender inequalities, creates a complex web of disadvantages for maternal health.

Quality Gaps:

While it’s encouraging that 60% of women attended four ANC visits, less than 20% actually received all the recommended components like blood pressure monitoring, urine and blood tests, iron–folic acid supplementation, and counselling. Access alone doesn’t ensure that outcomes are meaningful, and the state of ANC services in India shows a significant quality gap. While about 60 percent of pregnant women make it to four ANC visits, less than 20 percent actually receive all the recommended interventions, like blood pressure checks, blood and urine

tests, iron–folic acid supplements, and counselling. The overall experience is hampered by a shortage of trained healthcare workers, a lack of essential medicines, and poor service delivery. On top of that, instances of disrespect and negligence at health centres often discourage women from coming back for follow-up visits, underscoring the importance of quality and respectful maternity care alongside accessibility.

Factors Contributing to Disparities in ANC Utilization:

The disparities in Antenatal Care (ANC) access in India arise from of socioeconomic, cultural, and systemic factors:

Socioeconomic Status:

Wealth significantly impacts access to transportation, diagnostic tests, and medications. discovered that women in the richest quintile were nearly three times as likely to receive complete ANC compared to those in the poorest quintile.

Education:

Maternal education serves as a crucial predictor of ANC utilization noted that literate women had better chances of receiving adequate ANC and were 1.5 times more likely to choose institutional delivery.

Caste and Social Exclusion:

Caste-based discrimination continues to shape healthcare-seeking behaviours emphasized that women from Scheduled Castes are still disproportionately lacking full ANC, despite some progress.

Gender Inequality:

Women's ability to make decisions, move around freely, and achieve financial independence is vital. Research by revealed that women with more decision-making power were significantly more likely to complete their antenatal care (ANC).

Geographic Barriers:

Women living in rural and tribal areas often face challenges like poor infrastructure, long distances, and inadequate transportation highlighted that these barriers led to a drop in ANC uptake among tribal women in nine different states.

Quality of Care:

The quality of care including respectful maternity services, access to diagnostics, and counselling greatly influences whether women continue to seek care found that women in urban slums were less likely to return for follow-up visits due to concerns about the quality of care they received.

Chapter 2: Methodology

2.1 Data and methods:

Data source:

Every day, electronic data from the 2019–21 National Family Health Survey was received through the data was kept on a password-protected computer at the International Institute for Population Sciences Sync Cloud system. Secondary data modification was necessary to address discrepancies found by the computer and open-ended question coding, were carried out by the Field Agencies both at their central office and in the field. IIPS reviewed the secondary edits prior to the dataset's completion.

Receiving at least four ANC visits and receiving ANC of sufficient quality are important outcome variables. We looked at sociodemographic factors including caste, education, wealth, religion, and place of residence.

Dependent Variables:

This study examined two primary outcome variables. The first was ANC Completeness (score_serv) which is constructed from five service components: abdomen examination (s419e_1), blood pressure measurement (m42c_1), urine sample collection (m42d_1), blood sample collection (m42e_1), and ultrasound in pregnancy (s220b_01). Using the egen rowtotal command in Stata, a row total score between 0 and 5 was generated, with higher scores indicating greater completeness of ANC service. The second dependent variable derived from six indicators of decision making and mobility was the Women Women empowerment Category (cat_emp) : decision on visiting a health facility (v743a), decision on large household expenditure (v743b), decision on visiting relatives (v743d), going to the market (s930a), visiting a health facility unaccompanied (s930b), and travelling outside the village (s930c). The scores had a minimum and maximum of 0 and 6, and were categorized into two groups: low women empowerment (0–3) and high women empowerment (5–6).

Independent Variable:

Socio-demographic and economic predictors are classified as age category (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49 years), caste (SC, ST, OBC, and General), place of residence (urban, rural), wealth index (poor, rich; modified from v190), women’s education level (low,

high), education of women's partner (low, high), religion (Hindu, Muslim, Christian, other), and children 's number (1-2, 3-4, 5+ children).

2.2 Data Management and recoding:

I conducted all of the cleaning and variable recoding in Stata 17. Categorical variables were re-coded through the gen and replace functions and response category merging was done with theoretical rationale and sample size in mind. As described in the operational definitions above, composite indices for ANC completeness and women's women empowerment were created. All descriptive and regression analyses contained sampling weights, which were computed as wt=v005/1,000,000. To enhance output table clarity, label define and label values commands were used for variable and value description.

I carried out variable recoding to make sure everything was consistent and easy to interpret. For the dependent variable Antenatal Care Utilization I put together a composite score based on whether women received specific ANC services: - Abdomen examination (s419e_1) - Blood pressure measurement (m42c_1) - Urine sample collection (m42d_1) - Blood sample collection (m42e_1) Each service was coded as 1 (Yes) or 0 (No), and we generated an ANC service score by summing these binary indicators. The score ranged from 0 to 5, with higher scores reflecting more comprehensive ANC coverage.

In analysis, I also recoded independent variables into categorical groups. To measure women's autonomy, I looked at decision-making variables such as health care (v743a), household purchases (v743b), and visits to family (v743d). I coded these as 1 for when the woman was involved (either alone or jointly) and 0 for when she wasn't involved at all. Caste was derived from the (v131) variable and divided into categories: Scheduled Caste (SC), Scheduled Tribe (ST), Other Backward Class (OBC), and Others. I categorized age groups (v012) into three ranges: 15–24, 25–34, and 35–49 years. Education level (v106) was recoded into four categories: no education, primary, secondary, and higher. The wealth index (v190) was kept in the original five categories from the DHS, ranging from poorest to richest. For place of residence (v025), we classified it as either urban or rural.

2.3 Statistical Analysis

Descriptive Statistics:

The frequency and weighted percentages for the women empowerment indicators and ANC service utilized were calculated. The cross-tabulations were done by using tabulate and tab1

commands to describe the distributions by state (v024) and some other sociodemographic variables.

Bivariate Analysis :

The ANC completeness and women empowerment category background characteristics were analysed using independence Chi square tests (tab var1 var2, chi2). Statistically significant variables observed in bivariate analyses alongside background characteristics were considered for further multivariate modelling.

Multivariate Analysis :

Two outcomes, ANC completeness and women empowerment category were estimated using binary logistic regression (logistic) models. The predictors included: age group, caste, place of residence, wealth index, education of women, education of spouse, and religion. The findings were reported as adjusted odds ratios (AOR) with 95% confidence intervals. All models used survey weights with the weight option ([pw=wt]) to adjust for complex sampling design of NFHS-5.

The analytical methods used in this study were thoughtfully designed to align with the main goal of investigating the differences in antenatal care (ANC) usage in India. The ANC utilization score, which serves as the dependent variable, was calculated based on indicators from NFHS-5 that highlight crucial ANC services. These include measuring blood pressure, collecting urine and blood samples, conducting abdominal examinations, blood pressure taken, urine sample taken and blood sample taken. To capture the essence of women's autonomy, independent variables were chosen to reflect their decision-making power, social group, and important socioeconomic and demographic traits.

To delve into the disparities linked to women's autonomy, the analysis included variables that represent their decision-making authority in personal health care, significant household purchases, and visits to family or relatives. The impact of social group was assessed through caste categories—Scheduled Caste (SC), Scheduled Tribe (ST), Other Backward Class (OBC), and Others. Additionally, broader socioeconomic and demographic factors, such as the education levels of mothers and partners, household wealth quintiles, living conditions, and age groups, were also taken into account. Initially, bivariate associations between each independent variable and ANC utilization were analysed using Chi-square tests. This was

followed by multivariate logistic regression models to calculate adjusted odds ratios while controlling for potential confounding factors.

3.1 Introduction:

In India, the issues of maternal and neonatal mortality are still very much alive, making antenatal care (ANC) a key opportunity to avert complications and ensure safe outcomes. Despite numerous national initiatives aimed at bolstering maternal health services, the rate of complete ANC coverage in India lags behind global standards. The World Health Organization recommends that women have at least eight ANC visits during their pregnancy, but a large number of women in India struggle to even complete four visits and access the vital components of ANC.

This gap shows that while maternal health has garnered some policy attention, challenges related to accessibility, equity, and quality continue to exist. Understanding the current state of ANC in India is crucial for evaluating health programs and identifying the disparities that prevent equitable progress. The NFHS-5 data offers a thorough overview of these trends, highlighting who is receiving ANC and, just as importantly, who is being overlooked.

3.2 Causes & Contributing Factors:

The NFHS-5 data illustrated in Table 1 reveals a range of socio-demographic and service-related factors that affect antenatal care (ANC) usage across India. These factors not only reflect personal characteristics but also highlight the wider structural and social determinants that impact maternal health.

A significant aspect to consider is residence. About 75.2 percent of the sample population lives in rural areas, while only 24.8 percent are in urban locales. Since rural women often contend with limited health infrastructure, fewer facilities, and longer travel times, this rural majority plays a significant role in the lower ANC utilization rates observed at the national level.

Economic status also stands out as a vital factor. Nearly 43 percent of women come from impoverished households, while 57.2 percent belong to wealthier ones. Women from poorer backgrounds are more likely to face financial hurdles, which can restrict their ability to pay for transportation, supplements, and diagnostic tests, ultimately reducing their chances of receiving complete ANC.

Education is a key factor for both women and their partners. In the case of mothers, 23.1% had low education levels, while a notable 76.9% had higher education. For their partners, 18.2% also fell into the low education category. Education significantly impacts awareness of maternal

health, decision-making skills, and communication with healthcare providers, so the high percentage of low-educated women plays a role in the ongoing challenges with antenatal care (ANC) utilization.

Caste identity further affects access to ANC. Scheduled Castes (20.4%), Scheduled Tribes (19.7%), and Other Backward Classes (40.4%) together represent a large segment of the population. These groups have faced systemic exclusion throughout history and often live in remote areas where health facilities are scarce. Their overrepresentation in the population helps explain some of the inequities in service access.

Religious affiliation also highlights these inequalities. Most women in the sample identified as Hindu (75.4%), with Muslims making up 12.5%. Both groups have historically reported lower ANC coverage compared to Christians and other minorities, who are often found in states with better healthcare systems.

The data underscores how crucial it is for women to have autonomy and the power to make decisions. A striking 81.5 percent of women reported being part of healthcare decisions, leaving 18.5 percent feeling left out. In terms of purchasing decisions, 20.4 percent weren't involved, and 18.3 percent had no say in family visits. These statistics reveal that a significant number of women are missing out on control over their health choices, which directly limits their ability to access timely antenatal care (ANC) services.

Another important aspect is women's mobility. While most women indicated they could move around to some extent, 7.1 percent were not permitted to leave their village, and 5.8 percent couldn't travel for health reasons. Even though these percentages might seem small, they represent tens of thousands of women in the study. Limited mobility makes it hard for them to visit healthcare facilities on their own, leading to dependence on family members and creating obstacles to regular ANC visits.

Lastly, the indicators for service coverage highlight some concerning gaps in the quality of care. For instance, while 93 percent of women had their abdomen checked and 96.7 percent had their blood pressure taken, only 87.2 percent received iron supplements, and just 82.4 percent underwent an ultrasound. These discrepancies suggest that many women are getting only partial ANC instead of the comprehensive care they need, pointing to issues in service delivery and follow-up.

3.3 Results:

Table 1: Profile of study population, India, 2019-21

Variable	Category	N	%
Total		724115	
Abdomen examined	No	11799	7.1
	Yes	153582	92.9
During pregnancy: blood pressure taken	No	5533	3.3
	Yes	159848	96.7
During pregnancy: urine sample taken	No	10172	6.2
	Yes	155209	93.8
During pregnancy: blood sample taken	No	9114	5.5
	Yes	156267	94.5
During pregnancy, given/bought iron tablets/syrup	No	22097	12.5
	Yes	154235	87.2
	Don't know	511	0.3
Ultrasound test	No	34053	17.6
	Yes	159964	82.4
Age group	15–19	122480	16.9
	20–24	118700	16.4
	25–29	118379	16.3
	30–34	101049	14
	35–39	98068	13.5
	40–44	81380	11.2
	45–49	84059	11.6
Caste	SC	139957	20.4
	ST	135239	19.7
	OBC	276881	40.4
	General	133347	19.5
Residence	Rural	544580	75.2
	Urban	179535	24.8
Wealth	Poor	310184	42.8
	Rich	413931	57.2
Education level (mother)	Low Education	167304	23.1
	High Education	556811	76.9
Education level (partner)	Low Education	14862	18.2
	High Education	66625	81.8
Religion	Hindu	546007	75.4
	Muslim	90729	12.5
	Christian	52146	7.2
	Other	35233	4.9
Decision making power	Other	14199	18.5
	Self/Joint Part.	62711	81.5

Purchase decision	Other	15653	20.4
	Self/Joint Part.	61257	79.6
Movement outside village	Not at all	7692	7.1
	Alone/Someone else	101093	92.9
Movement for health	Not at all	6297	5.8
	Alone/Someone else	102488	94.2
Visit family	Other	14057	18.3
	Self/Joint Part.	62853	81.7

The study involved a substantial sample of 724,115 women. In Table 1 you can find the sociodemographic details and antenatal care characteristics of the participants. When it comes to the use of specific antenatal care (ANC) services, a significant number of women reported that their abdomen was examined during pregnancy (92.9%), their blood pressure was measured (96.7%), a urine sample was taken (93.8%), and a blood sample was collected (94.5%). Regarding iron–folic acid supplementation, 87.2% of the women indicated they had received or purchased iron tablets or syrup during their pregnancy, while 12.5% did not receive them, and 0.3% were unsure. Additionally, 82.4% of respondents reported having undergone ultrasound testing, while 17.6% did not.

The age distribution of the sample is quite balanced across different reproductive age groups. Women aged 15–19 years made up 16.9% of the sample, closely followed by those aged 20–24 years (16.4%) and 25–29 years (16.3%). Women in the 30–34 years group accounted for 14.0%, while those aged 35–39 years made up 13.5%, 40–44 years represented 11.2%, and 45–49 years comprised 11.6%.

In terms of caste, Other Backward Classes (OBC) represented the largest group at 40.4%, followed by Scheduled Castes (SC) at 20.4%, Scheduled Tribes (ST) at 19.7%, and the General category at 19.5%. A significant majority of respondents lived in rural areas (75.2%), with 24.8% residing in urban settings. Looking at household wealth, 57.2% of respondents fell into the richer wealth quintiles, while 42.8% were in the poorer quintiles. Educational levels among women showed that 76.9% had high education, while 23.1% had lower education levels. The educational background of partners mirrored this trend, with 81.8% having high education and 18.2% having low education. In terms of religion, the sample was predominantly Hindu (75.4%), followed by Muslims (12.5%), Christians (7.2%), and other religions (4.9%).

Indicators of women's autonomy showed that a significant 81.5% were involved in household decision-making, either on their own or jointly. In terms of purchasing decisions, 79.6% reported similar participation, while 20.4% indicated that others made those choices for them. When it comes to freedom of movement, an impressive 92.9% could venture outside their village or town, either alone or with someone else, leaving just 7.1% who couldn't. For health facility travel, 94.2% were able to go alone or with company, while 5.8% faced restrictions. Regarding family visits, 81.7% could do so independently or with others, while 18.3% reported otherwise.

Overall, the study included a diverse group of Indian women, representing various ages, castes, education levels, residences, and wealth brackets. While there was strong coverage for many key components of antenatal care, some gaps still exist in specific services like iron supplementation and ultrasound test.

As shown in Table 1, paints a comprehensive picture of antenatal care (ANC) service usage in India. With a total of 724,115 women in the sample, the findings reveal both some positive strides and ongoing challenges in maternal health coverage. Most women reported receiving essential ANC services, although there are still some discrepancies. About 93 percent mentioned that their abdomen was examined during pregnancy, and 96.7 percent had their blood pressure checked. Additionally, 93.8 percent underwent urine tests, and 94.5 percent had blood samples taken, indicating that these basic diagnostic procedures are quite common across India.

However, there are still gaps, as roughly one in every fifteen women missed out on these routine checks. When it comes to preventive care, the issue of iron and folic acid (IFA) supplementation is still a concern. While 87.2 percent of women said they were given or bought IFA tablets or syrup, over 12 percent did not receive any supplementation, and a small fraction (0.3 percent) were unsure. This gap is particularly significant given the high rates of maternal anaemia in India, highlighting that even when women do access health services, the quality of care can still fall short.

Ultrasound services are not as accessible as other aspects of antenatal care (ANC). Around 82.4% of women indicated they had an ultrasound during their pregnancy, which leaves almost one in five women without access to this critical diagnostic tool. This is quite troubling, given that ultrasound tests are essential for monitoring fetal development, detecting complications, and facilitating timely medical interventions.

Looking at the socio-demographic data gives us a clearer picture of how ANC services are distributed. For instance, adolescent women aged 15–19 represent 16.9% of the sample, while the largest demographic is women aged 20–29, who make up about 32.7%. It's noteworthy that younger mothers often report lower rates of service uptake compared to those in their late twenties, indicating a generational difference in the use of ANC services.

Caste continues to significantly influence access to maternal healthcare. In the sample, Scheduled Castes (20.4 percent) and Scheduled Tribes (19.7 percent) represented a large portion, but their antenatal care (ANC) coverage indicators are still behind those of women from the general caste group (19.5 percent). This indicates that long-standing social hierarchies are still affecting how people seek health services and their accessibility. The urban-rural divide is also a major factor. A notable 75.2 percent of the women in the sample lived in rural areas, where healthcare facilities are often lacking. On the other hand, urban women (24.8 percent) reported better access to both routine check-ups and diagnostic tests. Wealth distribution further reveals that women from poorer households made up 42.8 percent of the sample, while 57.2 percent were from wealthier families. The utilization of services was consistently higher among the wealthier group, highlighting how crucial economic resources are for accessing complete ANC.

Education has a profound impact on healthcare access. Among mothers, a notable 76.9 percent had attained higher education, while just 23.1 percent had lower education levels. Women with higher education were far more likely to take advantage of antenatal care (ANC) services, including ultrasounds and iron-folic acid (IFA) supplements, compared to those with less education. A similar trend was evident among partners: 81.8 percent of them had higher education, which was associated with better ANC utilization.

Religion also plays a crucial role in this context. Most women were Hindu (75.4 percent), followed by Muslims (12.5 percent), Christians (7.2 percent), and others (4.9 percent). While Hindu and Muslim women generally had lower service usage, Christian women—often residing in southern states—reported higher levels of coverage.

The indicators of women's autonomy show a strong connection to how often antenatal care (ANC) is utilized. In a recent survey, 81.5 percent of women indicated they were involved in healthcare decision-making, either on their own or with their partners, while 18.5 percent felt they had no say. When it comes to financial decisions, 79.6 percent participated in purchasing choices, leaving 20.4 percent out of the decision-making process. Mobility is another telling

factor: 92.9 percent of women reported they could travel outside their village, and 94.2 percent could do so for health-related reasons. However, a small but significant minority—about 6 to 7 percent—were not allowed to travel independently, which limits their access to health services.

Overall, these findings suggest that while many ANC services, such as abdominal checks, blood pressure monitoring, and urine or blood tests, are widely accessible, there are still considerable gaps in other essential areas like IFA supplementation and ultrasound availability. Key factors such as socio-economic status, education, caste, religion, and women's autonomy are crucial in determining whether women receive complete ANC during their pregnancies.

Table 2: **Percentage distribution of ANC utilization by** States of India, 2019-21

State	Low	High
Chandigarh	5.000	4.197
Puducherry	5.000	4.576
Goa	4.723	4.380
Karnataka	4.596	4.482
Andhra Pradesh	4.585	4.545
Sikkim	4.564	4.022
Telangana	4.533	4.558
Dadra & Nagar haveli	4.485	4.729
Lakshadweep	4.460	4.008
Haryana	4.445	4.361
Rajasthan	4.443	4.357
Kerala	4.435	4.477
Ladakh	4.380	4.236
Gujarat	4.348	4.413
Tamil Nadu	4.303	4.478
Himachal Pradesh	4.275	4.356
Odisha	4.263	4.400
Chhattisgarh	4.250	4.331
West Bengal	4.242	4.274
Maharashtra	4.231	4.372
Jammu & Kashmir	4.193	4.413
Manipur	4.136	4.309
Nct of delhi	4.110	4.567
Uttarakhand	4.109	4.113
Assam	4.075	4.112
Madhya Pradesh	4.040	4.093
Punjab	4.036	4.356
Mizoram	3.947	3.996
Uttar Pradesh	3.851	3.938
Jharkhand	3.566	3.745
Arunachal Pradesh	3.442	3.702

Meghalaya	3.266	3.661
Tripura	3.224	3.739
Andaman & Nicobar Island	3.204	4.500
Bihar	3.131	3.063
Nagaland	1.745	2.968

The table showcases the weighted mean scores for antenatal care (ANC) utilization across different states in India, categorized by women's women empowerment status into low and high. These scores highlight notable geographic differences in ANC uptake, along with some disparities linked to women empowerment levels within the states. For instance, Union Territories like Chandigarh and Puducherry report the highest ANC utilization means for the low women empowerment group, both at 5.0. This indicates impressive coverage even among women with less women empowerment. However, the scores for the high women empowerment group in these areas are slightly lower, yet still robust at 4.20 and 4.58, respectively.

On the other hand, states such as Goa, Karnataka, Andhra Pradesh, Kerala, Tamil Nadu, Gujarat, and Maharashtra consistently show high ANC utilization means for both women empowerment groups, with only minor gaps between the low and high categories. This suggests that access to antenatal services is relatively equitable, likely bolstered by stronger health infrastructure and effective maternal health programs.

In contrast, several states in eastern and northeastern India including Bihar, Jharkhand, Nagaland, Meghalaya, Tripura, and Arunachal Pradesh display much lower ANC utilization scores, often falling below 3.5 for both women empowerment categories. This points to ongoing challenges in service delivery and uptake, regardless of women empowerment levels. Some regions, like the Andaman & Nicobar Islands and the National Capital Territory of Delhi, reveal significant gaps where women with high women empowerment have much higher ANC utilization means compared to those with low women empowerment, highlighting disparities within these states. While many states display only slight variations in women empowerment categories, it's clear that geography and the overall health system play a significant role in how often antenatal care (ANC) is utilized. However, the noticeable gaps in certain areas highlight the need to focus on women empowerment as a key part of improving maternal health services.

3.4 Conclusion:

This data analysis gives us a thorough look at antenatal care usage in India, showing that while we've made some progress in enhancing maternal health services, there are still notable gaps. On the bright side, basic antenatal care services like abdominal exams, blood pressure checks, and urine and blood tests have surpassed 90 percent coverage. This indicates that a large majority of women are engaging with the healthcare system during their pregnancies, reflecting the effectiveness of national maternal health initiatives in delivering essential diagnostic services.

On the flip side, the findings also highlight some worrying issues. For example, iron and folic acid supplementation, which is crucial for preventing anaemia, is still not reaching over 12 percent of pregnant women. Moreover, access to ultrasound testing is particularly scarce, with nearly one in five women stating they didn't receive this important diagnostic procedure. These service delivery gaps mean that many women are missing out on the full advantages of antenatal care, which not only puts maternal health at risk but also heightens the chances of adverse neonatal outcomes.

The socio-demographic trends we see in the data really shine a light on the disparities in antenatal care (ANC) usage. Women in rural areas, those from less affluent households, and those with minimal education consistently report having lower access to full ANC services. We also see ongoing caste and religious inequalities, with women from Scheduled Castes, Scheduled Tribes, and Muslim communities lagging behind their peers. Age is another important factor, as both very young and older mothers are less likely to receive complete ANC compared to women in their twenties.

Moreover, the findings about women's autonomy highlight just how vital empowerment is for enhancing maternal health outcomes. Women who have a say in household decisions and enjoy greater mobility are much better positioned to access the services they need. On the flip side, those who are excluded from decision-making often find themselves at a disadvantage. This really shows that beyond just providing services, social and cultural influences are crucial in shaping how women approach their maternal health care.

In India, the quality of antenatal care (ANC) is still not up to par and is unevenly distributed. It's encouraging to see a high rate of basic examinations, but issues like incomplete service delivery, ongoing inequalities among various socio-economic and demographic groups, and restrictions on women's autonomy continue to undermine the effectiveness of ANC. These

observations stress the importance of a dual approach—improving the quality and completeness of ANC services while also addressing the structural inequalities tied to poverty, education, caste, religion, and gender norms. Only by closing these gaps can India ensure fair maternal healthcare and make strides toward its maternal and child health goals.

Chapter 4: Disparities in ANC Utilization by Women's Autonomy and Caste in India

4.1 Introduction:

Antenatal Care (ANC) is a vital part of maternal and child health services. Even with various government initiatives and improvements in healthcare facilities, there are still significant disparities in India, especially regarding women's autonomy and caste. A woman's autonomy plays a crucial role in her ability to make healthcare decisions on her own, manage her finances, and move freely, all of which directly affect her access to antenatal services. Caste, too, remains a powerful social divider, influencing not just economic opportunities but also access to healthcare.

According to the National Family Health Survey (NFHS-5, 2019–21), while 58.1% of women in India made at least four ANC visits, only 20% received what is considered complete ANC, which includes essential services like blood and urine tests, blood pressure monitoring, iron-folic acid supplementation, and counselling. Notably, there are significant gaps between different caste groups and between women who have greater autonomy compared to those who face limitations in their decision-making power.

In this chapter, we thoroughly explore the gaps in antenatal care (ANC) usage among women in India, particularly through the lenses of women's autonomy and caste. We start by unpacking the causes and factors that contribute to these disparities, then delve into the health implications that come with them. The chapter presents descriptive results to illustrate background trends, and we interpret logistic regression findings to assess the impact of autonomy and caste on ANC utilization. We also examine interaction effects to better understand how these two dimensions overlap.

4.2 Causes & Contributing Factors:

Literatures suggest that with aged women get exposure and experience of ANC related activities and it has close association with ANC components awareness. Similarly, other factors such as education, place of residence, wealth status, religion, caste has was tested for its statistical association with the ANC utilization.

Age was closely linked to both autonomy and the use of antenatal care (ANC). Older women had a greater chance of feeling empowered and utilizing ANC services. The chi-square analysis indicated a significant relationship between age and ANC ($\chi^2 = 5{,}158.86$, $p < 0.001$). According to logistic regression, women aged 40 to 44 had 2.5 times the likelihood of receiving ANC,

while those aged 45 to 49 had nearly 10 times the likelihood (OR = 9.99) compared to the youngest group. Sadly, younger women, who often depend on family members for decisions, are at a disadvantage.

Caste:

Caste was another major factor contributing to inequities. The chi-square results (χ^2 = 2,523.44, $p < 0.001$) and regression findings underscored the disadvantages faced by Scheduled Caste (SC) women. Women from the General caste had almost double the odds of receiving complete ANC (OR = 1.89, $p < 0.001$), while Scheduled Tribe women had slightly better odds (OR = 1.22)

Education:

The education level of both women and their partners is a key factor. Chi-square results highlighted significant connections with empowerment and the utilization of antenatal care (ANC). According to regression analysis, women with higher education had double the chances of receiving ANC (OR = 2.02, $p < 0.001$), and a partner's education increased those odds by 68% (OR = 1.68, $p < 0.001$). Education provides women with the knowledge and skills they need to advocate for their healthcare.

Wealth Status:

Economic status emerged as one of the key predictors. The chi-square analysis (χ^2 = 8,136.18, $p < 0.001$) and regression findings showed that the wealthiest women were over five times more likely to access antenatal care (ANC) (OR = 5.53, $p < 0.001$) compared to the poorest. Financial resources help eliminate obstacles related to transportation, diagnostics, and service fees, while poverty severely restricts access to ANC.

Place of Residence:

The differences between urban and rural areas were striking. Chi-square results (χ^2 = 1,649.82, $p < 0.001$) and regression analysis indicated that urban women were 41% more likely to complete their ANC (OR = 1.41, $p = 0.012$) than those in rural areas. Urban settings benefit from superior infrastructure and healthcare staff, while rural areas often struggle with distance, transportation, and less effective healthcare systems.

Religion:

Religion has also played a part in creating disparities. The chi-square analysis ($\chi^2 = 2{,}322.04$, $p < 0.001$) and regression results indicated that Muslim (OR = 0.73, p = 0.005) and Christian women (OR = 0.69, p = 0.006) were less likely to receive antenatal care (ANC) compared to Hindu women. These differences could reflect cultural practices, health-seeking behaviours, or varying levels of trust in formal healthcare systems.

Women's Autonomy:

omen's autonomy, which is absolutely central. Chi-square tests showed strong connections between autonomy and socio-demographic factors. The regression results revealed that empowerment tends to increase with age, education, the education level of partners, and living in urban areas. Women who lack autonomy those who are left out of decision-making or have limited mobility were consistently less likely to complete ANC, highlighting the impact of gender power dynamics on health outcomes.

4.3 Health Consequences of Disparities:

Consequences for Mothers:

When complications go undiagnosed and untreated Skipping antenatal care (ANC) means that serious conditions like gestational diabetes, hypertension, and preeclampsia can slip under the radar. This oversight can lead to life-threatening situations during delivery.

Maternal anaemia:

Women from marginalized communities, such as Scheduled Castes and Scheduled Tribes, often start their pregnancies with inadequate nutritional reserves. Without proper iron and folic acid supplements or regular check-ups, anaemia can worsen, raising the risks of postpartum haemorrhage, sepsis, and even maternal death.

Psychological burden:

Women who have limited control over their lives may feel overlooked or powerless in managing their health, which can lead to increased stress, anxiety, and even postpartum depression.

Consequences for Infants Poor birth outcomes:

Insufficient antenatal care (ANC) means fewer chances for important interventions such as tetanus toxoid vaccinations, nutritional support, and ultrasound monitoring. This raises the likelihood of low birth weight, intrauterine growth restriction, and preterm births.

Increased neonatal mortality:

Without proper ANC, high-risk pregnancies can slip under the radar, leading to a rise in stillbirths and early neonatal deaths.

Long-term effects on child health:

Babies born in poor health may face a greater risk of infections, stunted growth, cognitive challenges, and chronic illnesses later in life.

Consequences for Families and Communities Economic strain:

Complications during pregnancy and health issues in infants can lead to significant out-of-pocket expenses for families that are already facing financial hardships. Gendered repercussions: Families might unjustly hold women responsible for adverse pregnancy outcomes, which perpetuates cycles of discrimination and diminishes women's independence.

Consequences for Society:

Intergenerational malnutrition: A malnourished mother often gives birth to a low-birth-weight baby, who is then more likely to experience undernutrition, continuing the cycle of poor health through generations.

Productivity losses:

When maternal and child health suffers, it can result in increased absenteeism, higher disability rates, and a decline in workforce productivity.

Deepening inequalities:

If women from SC and ST backgrounds struggle more to access antenatal care, it exacerbates the disparities in health and socioeconomic outcomes, reinforcing the structural inequities rooted in the caste system.

4.4 Result:

ANC disparity by Women's Autonomy in India:

This study sheds light on how crucial women's autonomy is when it comes to completing antenatal care (ANC) visits in India. Women who have more autonomy defined as having a say

in healthcare choices, shopping, and their ability to move freely are much more likely to access full ANC services.

The logistic regression analysis found that women with empowerment had significantly higher chances of using ANC compared to those with less autonomy, even after considering other socio-demographic factors like age, education, caste, wealth, residence, and religion. Moreover, chi-square tests showed that women's autonomy is closely tied to several demographic factors, particularly education (for both mothers and their partners), age, and religion, emphasizing its social context. However, the data also revealed that autonomy wasn't significantly linked to wealth or whether women lived in rural or urban settings, indicating that empowerment is a complex issue that goes beyond just economic status or geographic factors.

The interaction effects revealed that autonomy plays a role in lessening the inequities faced by lower caste groups. Empowered women from the Scheduled Caste (SC) and Scheduled Tribe (ST) showed higher rates of antenatal care (ANC) utilization than their disempowered peers within the same caste.

Still, autonomy by itself couldn't completely eliminate the structural challenges posed by caste discrimination and poverty, particularly in marginalized rural areas. This suggests that while women's agency is essential, it must be paired with structural reforms in health systems and efforts for social inclusion to be truly effective.

Caste continues to be a major factor influencing disparities in antenatal care (ANC) usage. The regression findings clearly indicate that women from the General caste have a significant edge, with nearly double the likelihood of completing their ANC visits compared to women from Scheduled Castes (SC) ($OR = 1.89$, $p < 0.001$). This difference underscores the persistent social exclusion mechanisms at play: lower caste women often encounter discrimination in healthcare access, live in poorer and more isolated regions, and have less social capital and knowledge about the advantages of ANC.

While women from Scheduled Tribes (ST) saw a slight but meaningful increase in their odds ($OR = 1.22$, $p = 0.038$) compared to SC women, Other Backward Classes (OBC) did not show any significant differences, indicating that many socially disadvantaged groups are still lagging behind. Even after adjusting for socioeconomic status, education, residence, and religion, the caste disparities remained, highlighting that caste serves as a distinct axis of social stratification that influences access to healthcare beyond mere economic factors.

The interaction analysis brought to light the way disadvantages can multiply. Women from Scheduled Castes (SC) with low autonomy experienced the most significant differences in antenatal care (ANC) coverage compared to their empowered counterparts from higher castes. There were also regional disparities; for example, Kerala and Tamil Nadu had smaller gaps in ANC utilization due to their strong public health systems and inclusive social policies. In contrast, states like Bihar, Jharkhand, and Madhya Pradesh displayed stark intersecting disadvantages tied to caste, disempowerment, poverty, and poor infrastructure.

These results shed light on the intersectional nature of ANC disparities in India. Women's autonomy is key to accessing maternal healthcare, as it enhances their decision-making abilities. Yet, this empowerment exists within a larger social context where caste hierarchies lead to systemic exclusion. The fact that caste-related inequities persist even when accounting for other factors highlights the lasting effects of social stratification on maternal health equity.

Moreover, while wealth and education can be powerful tools for empowerment, they don't fully make up for the disadvantages of caste or disempowerment. Urban living does provide some advantages, likely due to improved infrastructure and service availability, but rural women, especially those from SC/ST groups with limited autonomy and economic means, remain at a disadvantage.

The complex relationship between individual choices, social identities, and structural influences reveals the urgent need for a comprehensive strategy. We must enhance women's empowerment through education and community participation, specifically confront caste-based discrimination in healthcare, and bolster health systems in underserved areas. By taking these steps, India can effectively empower marginalized women and dismantle entrenched social barriers, ultimately leading to more equitable access to antenatal care for all.

Table 4.1: Test result of the covariates with women's autonomy

Variable Name	Chi^2	P-value
Age Group	25709.3	<0.001
Caste	9.0	0.030
Wealth	1.9	0.172
Residence	0.1	0.762
Education level	1771.5	<0.001
Partner's education	268.3	<0.001
Religion	170.8	<0.001

To explore the relationships between the outcome variable, women empowerment, and several key socio-demographic factors like age group, caste, wealth, place of residence, educational level, parental education, and religion I conducted chi-square tests of independence. Each test was carried out individually by cross-tabulating with each categorical predictor variable. I used the tabulate command along with the chi2 option to calculate the Pearson chi-square statistic and the corresponding p-value. The results, including chi-square statistics and p-values, were pulled from the Stata output and neatly organized into a summary matrix for easier interpretation. This method helped us determine if the distribution of empowerment categorical(cat_emp) varied significantly across different groups within each socio-demographic variable.

The findings revealed strong associations between women's autonomy and factors like age group, educational level, parental education, and religion, as indicated by large chi-square statistics and p-values below 0.001. This suggests that women empowerment status varies significantly based on these demographic factors. Caste also showed a statistically significant, though somewhat weaker, association with women empowerment ($p = 0.0297$), indicating some differences in women's autonomy status among various caste groups.

On the other hand, wealth and place of residence didn't show significant relationships with women's autonomy, with p-values exceeding the 0.05 threshold. This indicates that women's autonomy is independent of wealth and residence in the population we studied.

Table 3.1: Association between ANC service utilisation and Socio-demographic Variables Chi-square Test Results

Variable Name	**Chi2**	**P value**
Age group	5158.861	<0.001
Caste	2523.44	<0.001
Wealth	8136.185	<0.001
Residence	1649.821	<0.001
Education level	4305.289	<0.001
Partner's education	279.644	<0.001
Religion	2322.04	<0.001

To dive into how health service usage relates to various socio-demographic factors, we ran chi-square tests of independence using Stata. I looked at several variables, including age group, caste, wealth status, place of residence, educational level, parental education, and religion. The findings show strong, significant links between health service utilization and all these socio-

demographic traits, as evidenced by high chi-square statistics and p-values below 0.001 for each factor. For instance, the chi-square values were striking: wealth (8136.19), age group (5158.86), educational level (4305.29), caste (2523.44), religion (2322.04), place of residence (1649.82), and parental education (279.64). These numbers clearly indicate that how people use health services varies widely among different groups. Age is particularly important, with certain age brackets showing a greater tendency to access and utilize available health services. Caste also plays a significant role, reflecting deeper social and cultural divides. Wealth status stands out as a major factor, highlighting the economic inequalities that affect healthcare access. Additionally, the differences between urban and rural areas contribute to these disparities, likely due to varying infrastructure and availability of services. Education, both for individuals and their parents, also plays a crucial role in health service usage, emphasizing how important it is to raise awareness and promote health interventions. Lastly, religious beliefs seem to influence health-seeking behaviours, possibly shaped by cultural norms or community practices. Overall, these insights highlight that health service utilization isn't uniform across the board; it varies significantly based on socio-demographic factors.

4.5 Result of logistic Regression:

Caste and ANC Utilisation:

Caste and ANC Utilization General caste women have a notable advantage (OR = 1.89, $p < 0.001$): They are almost twice as likely to receive complete ANC compared to SC women. This situation reflects the structural privileges they hold, including better access to education, financial resources, healthcare networks, and less discrimination in health facilities.

ST women have a slight edge (OR = 1.22, $p = 0.038$): This modest advantage may be due to targeted government programs in tribal areas, like ASHA workers or the Janani Suraksha Yojana. However, this benefit isn't as strong as that enjoyed by general caste women, and ST communities still face challenges like geographic isolation and barriers to accessing services.

When looking at OBC versus SC women, there's no significant difference: This suggests that, despite being ranked higher socially, many OBC women still deal with similar structural issues-such as poverty, marginalization, and limited decision-making power—that affect their access to ANC.

The results highlight that caste remains a significant source of inequality in maternal health, with SC and OBC women experiencing the greatest disadvantages.

Women's Autonomy & Empowerment:

Higher autonomy leads to increased ANC uptake. When women feel empowered, they're more likely to make decisions about visiting clinics, managing their finances, and negotiating with their partners or families regarding healthcare.

Predictors of empowerment:

Age:

Older women often earn more respect and wield greater decision-making power. Education (both their own and their partner's) Education provides women with essential knowledge about the benefits of ANC, boosts their confidence in dealing with healthcare providers, and encourages collaborative decision-making within their households.

Urban residence:

Living in cities exposes women to health campaigns, peers who utilize health services, and supportive networks of other women. Implication: There's a strong connection between women's health behaviours and their level of agency. Therefore, initiatives that empower women to make decisions are just as crucial as ensuring access to health facilities.

Wealth

Wealth and Education Wealth (OR = 5.53, $p < 0.001$): This is the most significant factor. Women with more financial resources can easily access transportation, private healthcare facilities, and better nutrition, which makes antenatal care (ANC) much more attainable for them.

Higher education (OR = 2.02, $p < 0.001$): Education empowers women to understand the importance of ANC, challenge cultural barriers, and navigate the healthcare system more effectively. Educated women are also more likely to identify pregnancy complications early and seek help promptly.

Poverty and a lack of education create some of the biggest obstacles to accessing ANC. Even in regions where healthcare services are available, women from poorer backgrounds often struggle to access or maintain them.

Residence and Religion Urban advantage (41% higher odds): Women living in urban areas benefit from better healthcare infrastructure, easier access, and greater exposure to maternal

health campaigns. In contrast, rural women face hurdles like long travel distances, inconsistent services, and dependence on underfunded public health facilities.

Religious disparities:

Muslim and Christian women have lower odds compared to Hindu women. This may be linked to cultural norms that limit women's mobility, a lack of trust in public health systems, or being located in underserved regions. Like Muslim women in northern states often deal with a mix of poverty, gender restrictions, and discrimination.

Religion, when combined with regional and cultural factors, creates complex but significant barriers. Public health initiatives need to adopt community engagement strategies that are sensitive to faith.

Table 4: Logistic Regression analysis of complete ANC services and socio-demographic factors.

Socio-demographics Characteristics	**Odds Ratio**	**Std. Err.**	**z**	**P>z**	**Confidence Interval**	
					Lower CI	Upper CI
Age group						
15-19	Ref.					
20-24	0.607	0.156	-1.95	0.051	0.367	1.003
25-29	0.451	0.113	-3.19	0.001	0.276	0.736
30-34	0.667	0.170	-1.59	0.112	0.405	1.099
35-39	1.253	0.330	0.86	0.392	0.748	2.098
40-44	2.498	0.705	3.24	0.001	1.436	4.345
45-49	9.989	3.361	6.84	<0.001	5.165	19.318
Caste						
Scheduled Caste	Ref.					
Scheduled Tribe	1.222	0.118	2.07	0.038	1.011	1.476
Other Backward Class	1.143	0.101	1.52	0.129	0.962	1.358
General	1.893	0.264	4.57	<0.001	1.440	2.488
Residence						
Rural	Ref.					
Urban	1.413	0.194	2.52	0.012	1.080	1.848
Wealth						
Poor	Ref.					
Rich	5.531	0.583	16.23	<0.001	4.499	6.800
Educational attainment						
Lower education	Ref.					
High education	2.019	0.165	8.59	<0.001	1.720	2.370
Partner's Education						

Table 4: Logistic Regression analysis of complete ANC services and socio-demographic factors.

Socio-demographics Characteristics	Odds Ratio	Std. Err.	z	P>z	Confidence Interval	
					Lower CI	Upper CI
Lower education	Ref.					
High education	1.678	0.138	6.28	<0.001	1.428	1.972
Religion						
Hindu	Ref.					
Muslim	0.734	0.081	-2.8	0.005	0.592	0.912
Christian	0.69	0.093	-2.74	0.006	0.529	0.899
Other	0.762	0.177	-1.17	0.243	0.483	1.202
_Cons	12.147	3.184	9.53	<0.001	7.267	20.304

This logistic regression table lays out the adjusted relationships between various socio-demographic factors and the chances of pregnant women getting complete antenatal care (ANC) services, which is shown through the binary outcome variable score_serv_. The odds ratios (OR) help us understand how the likelihood of completing ANC varies across different predictor categories compared to their reference groups, while keeping other variables steady. An OR greater than 1 means higher odds of receiving complete ANC, whereas an OR less than 1 indicates lower odds.

Looking at age groups, the findings reveal that women aged 20–24 years have about 39% lower odds of receiving complete ANC compared to the reference group, with borderline significance ($p = 0.051$). The 25–29 years group shows a significant drop in odds (OR = 0.45, $p = 0.001$), suggesting these women are less likely to complete ANC services. On the flip side, older women, especially those aged 40–44 and 45–49 years, have much higher odds (OR = 2.50 and 9.99 respectively, both highly significant) of completing ANC. This points to the idea that maternal age plays a role in seeking care, possibly because older mothers are more aware of the importance of ANC or face greater pregnancy risks that drive them to seek complete care.

When it comes to caste, the Scheduled Tribes (ST) group shows a modest yet significant boost in the odds of complete ANC (OR = 1.22, $p = 0.038$), while the Other Backward Classes (OBC) group doesn't show a significant difference from the reference. Women from the General caste have nearly double the odds (OR = 1.89, $p < 0.001$) of completing ANC, highlighting the social disparities in healthcare access and usage that are tied to caste-based social stratification.

The place where someone lives really matters; women in urban areas have a 41% higher chance of completing their antenatal care (ANC) compared to those in rural areas (OR = 1.41, p = 0.012). This likely points to better access to health facilities, services, and awareness in cities. Wealth status is a major factor: women who are considered wealthy are over five times more likely (OR = 5.53, p < 0.001) to complete their ANC than those in lower wealth brackets. This highlights how crucial economic resources are for accessing healthcare, shining a light on the financial hurdles that poorer women face.

Education level also plays a big role in ANC completion. Women with higher education have double the odds (OR = 2.02, p < 0.001) of receiving complete ANC compared to those with less education. Plus, having more educated parents is linked to better odds (OR = 1.68, p < 0.001), showing how family background can shape health awareness and behaviours. Religious affiliation impacts ANC completion too. Muslim and Christian women have significantly lower odds (OR = 0.73 and 0.69 respectively) of completing ANC services compared to the reference religion, hinting at possible cultural, social, or systemic barriers to healthcare access in these communities. Women from other religions don't show any significant differences. The constant term, with an odds ratio of 12.15 (p < 0.001), indicates the baseline odds of completing ANC when all predictors are at their reference categories, suggesting a relatively high underlying probability of complete ANC when other risk factors are not present.

Table 4.1: Logistic Regression Analysis of Women's Empowerment and Socio-Demographic Factors.

Socio-demographics	Category	Odds Ratio	Std. Err.	z	P > z
Age group	20–24	1.795	0.119	8.8	<0.001
	25–29	2.307	0.150	12.86	<0.001
	30–34	2.745	0.182	15.22	<0.001
	35–39	2.999	0.201	16.37	<0.001
	40–44	2.847	0.193	15.41	<0.001
	45–49	2.382	0.161	12.85	<0.001
Caste	ST	1.084	0.042	2.09	0.037
	OBC	0.980	0.029	-0.67	0.503
	General	1.041	0.039	1.08	0.278
Residence	Urban	1.151	0.034	4.76	<0.001

Wealth	Rich	1.001	0.026	0.03	0.975
Education Level	High Education	1.140	0.033	4.48	<0.001
Partner's Education	High Education	1.290	0.041	7.98	<0.001
Religion	Muslim	0.841	0.032	-4.58	<0.001
	Christian	1.055	0.081	0.69	0.491
	Other	1.032	0.064	0.5	0.614
_cons		0.707	0.049	-5.05	<0.001

This logistic regression table sheds light on the adjusted relationships between women's empowerment and a range of socio-demographic factors. These factors include age group, caste, place of residence, wealth status, educational level, parental education, and religion. The model provides odds ratios (OR) along with standard errors, z-values, p-values, and 95% confidence intervals. Starting with age groups, the odds of empowerment rise steadily with age compared to the reference category (which is likely the youngest group, not shown here). Women aged 20–24 years have 1.8 times higher odds of being empowered (OR = 1.80, $p < 0.001$), and this trend continues, peaking in the 35–39 age group with nearly three times the odds (OR = 3.00, $p < 0.001$). Although there's a slight dip in the oldest age group (45–49 years, OR = 2.38), all age categories show significantly higher odds of empowerment compared to the reference group, indicating that autonomy tends to increase as women age.

When it comes to caste, women from Scheduled Tribes (ST) have slightly higher odds of empowerment (OR = 1.08, $p = 0.037$). While this is statistically significant, the effect size is modest. Women from Other Backward Classes (OBC) and the General caste don't show significant differences from the reference group, suggesting that while caste does play a role in empowerment, the impact varies among different groups. Women living in urban areas are 15% more likely to be empowered than their rural counterparts (OR = 1.15, $p < 0.001$). This reflects the advantages of urban living, such as better access to education, job opportunities, and social services that foster autonomy.

Interestingly, wealth doesn't seem to have a strong link to women's empowerment in this model ($OR \approx 1.00$, $p = 0.975$). This suggests that just having money might not be enough to guarantee autonomy when we take other factors into account.

On the other hand, educational attainment is clearly tied to empowerment. Women who have pursued higher education enjoy a 14% increase in their odds of being empowered (OR = 1.14, $p < 0.001$). This really highlights how vital education is for boosting women's decision-making

abilities and control over their lives. Additionally, when it comes to parental education, having educated parents raises the odds of empowerment by about 29% (OR = 1.29, $p < 0.001$). This points to the idea that coming from an educated family can really help foster a sense of autonomy .Looking at religion, it's notable that Muslim women face significantly lower odds of empowerment compared to the reference religious group (OR = 0.84, $p < 0.001$). This might indicate that there are cultural or community-level barriers at play. Meanwhile, Christian women and those from other religious backgrounds don't show any statistically significant differences.

4.6 Result of Interaction Model:

Autonomy and Caste Offsetting the effects of autonomy:

The observation that empowered SC/ST women made greater use of ANC services compared to their disempowered counterparts within the same caste suggests that having agency can help mitigate structural disadvantages. Even among marginalized groups, when women can make choices, seek out health services, and push back against resistance within their households, they tend to achieve better maternal health outcomes.

Limits of offsetting: That said, empowerment doesn't completely eliminate inequities—an empowered SC woman might still encounter external obstacles like discrimination in healthcare settings, geographic isolation, or financial constraints when compared to a similarly empowered woman from the General caste. This highlights the need for both personal empowerment and structural changes (like reducing caste-based exclusion) to achieve fair outcomes.

Low Autonomy Across Castes Consistent disadvantage:

Women with low autonomy reported lower ANC utilization across all caste groups, indicating that autonomy is a key factor influencing maternal health behaviour, no matter their social standing. Steepest gap among SC women the impact of low autonomy was particularly pronounced in SC groups. This likely points to a situation of double marginalization facing both caste-based deprivation and disempowerment within the household. Consequently, a low-autonomy SC woman is not only limited by her family but also sidelined by societal structures, placing her at the lowest tier in terms of ANC usage.

Autonomy becomes even more crucial where caste disadvantages are already severe, meaning the repercussions of disempowerment hit hardest for the most marginalized groups.

Regional Differences:

Inclusive states (like Kerala and Tamil Nadu) have made significant investments in public health systems, community outreach, female education, and gender-inclusive policies. Because of this, access to antenatal care (ANC) is more widespread, and the gaps related to caste are narrower. In these areas, health services serve as a great equalizer.

Lagging states (such as Bihar, Madhya Pradesh, and Jharkhand) face challenges due to under-resourced public health systems and persistent caste hierarchies. Here, caste and socioeconomic status are closely intertwined, which worsens the inequities in maternal care.

The way regional governance and health infrastructure are set up plays a crucial role in either reducing or reinforcing social inequalities. This highlights the importance of state-level health policies and their implementation, which are just as vital as individual factors.

Intersectionality

The most vulnerable group consists of poor, rural women from Scheduled Castes and Scheduled Tribes (SC/ST) who have little autonomy. They face multiple layers of exclusion:

Economic exclusion → they struggle to afford transport or private healthcare.

Caste-based discrimination → they often encounter reluctance or outright denial of services.

Gendered disempowerment → they lack the ability to decide when or if to seek care.

Geographic isolation → they have to travel long distances to reach health facilities.

These overlapping disadvantages result in the lowest ANC coverage, leading to the highest risks for maternal and neonatal mortality. On the other end of the spectrum are wealthy, urban, educated women from General castes who enjoy high levels of autonomy. They benefit from a favourable structural position, financial resources, and personal empowerment, which gives them nearly universal access to ANC.

This reinforces the intersectionality framework inequalities don’t just add up they multiply. The accumulation of disadvantages creates barriers, while overlapping privileges lead to substantial advantages in maternal health outcomes.

4.7 Conclusion:

In this chapter, we explore how women's autonomy and caste are key factors influencing the use of antenatal care (ANC) in India. It shows that health behaviours are deeply affected by

intertwined social and structural elements. Women who have more autonomy are generally in a better position to make decisions, negotiate within their families, and seek timely care, which leads to higher ANC utilization rates. On the flip side, caste-based disparities remain a significant issue, with women from Scheduled Castes and other marginalized communities often experiencing limited access due to discrimination, poverty, and geographic barriers. While gaining empowerment can help lessen some of the caste-related disadvantages, it doesn't fully break down the entrenched structural challenges.

Creating fair maternal healthcare requires action on two levels. On an individual level, we can empower women by promoting education, encouraging economic participation, forming self-help groups, and involving family members. This boosts their confidence and helps them make informed health choices. On a broader scale, we need to confront caste-based inequalities by ensuring that service delivery is inclusive and non-discriminatory, while also reaching out to marginalized communities that often miss out on care. However, just focusing on empowerment and equity isn't enough we also need strong health systems. In many rural and low-performing regions, issues like weak infrastructure, staff shortages, and poor service quality only heighten the risks for the most vulnerable mothers and infants.

The findings from this chapter thus reinforce the importance of pursuing an intersectional approach where caste, class, gender, religion, and geography are recognized as overlapping disadvantages rather than isolated variables. By addressing structural inequities through health system reforms and reducing discrimination, while at the same time enhancing women’s individual agency through empowerment and inclusive education, India can move closer to ensuring not only universal ANC coverage but also truly equitable and high-quality maternal healthcare.

5.1 Result:

The study looked at a substantial group of 724,115 women, providing clear insights into antenatal care (ANC) coverage and socio-demographic trends throughout India. The sample was mostly rural, with 75.2% of participants coming from these areas, and a significant portion belonging to the wealthier quintiles at 57.2%. In terms of education, 76.9% of the women and 81.8% of their partners had attained higher education. The religious breakdown showed a predominance of Hindus at 75.4%, followed by Muslims at 12.5% and Christians at 7.2%. When it came to essential ANC services, the coverage was impressive: abdomen examinations were conducted at a rate of 92.9%, blood pressure checks at 96.7%, urine tests at 93.8%, and blood tests at 94.5%. Additionally, 87.2% reported receiving or purchasing iron–folic acid (IFA), and 82.4% utilized ultrasounds, indicating a strong engagement with key aspects of routine ANC. These findings align with the trend of improved national contact with ANC, although there are still concerns regarding the quality of the services, as noted in previous studies on ANC adequacy and equity in India.

When it comes to women's autonomy and mobility, the indicators revealed that 81.5% of women reported being involved in household decision-making, either on their own or jointly, while 79.6% had a say in purchasing decisions. Mobility restrictions were not very common; 92.9% could leave their village or town, whether alone or with someone, and 94.2% could travel for healthcare, again with or without accompaniment. Visiting family was possible for 81.7% of women, either independently or together with someone. These patterns of autonomy are crucial for understanding the variations in ANC uptake and resonate with the established connection between, health-seeking behaviour, and adherence to the continuum of care highlighted in maternal health research.

When we look at ANC utilization across different states, breaking it down by levels of women's empowerment reveals some interesting patterns. For instance, Union Territories like Chandigarh and Puducherry stand out with some of the highest scores in the low-empowerment category, showing that even women with less empowerment can achieve impressive results in certain areas. Meanwhile, southern and several western states generally show strong mean scores across both empowerment levels. However, there are still noticeable gaps in parts of central and eastern India, as well as in some northeastern states, where both low- and high-

empowerment groups fall behind the national leaders in ANC utilization. This suggests that in regions where high ANC utilization exists, even among women with lower empowerment, effective supply-side strategies and thoughtful program design play a crucial role in overcoming barriers to access.

This trend points to the robustness of their health systems, urban infrastructure, and the effective implementation of programs. These areas enjoy a well-connected network of health facilities, proactive outreach from community health workers, and strong governance that ensures initiatives like Janani Suraksha Yojana (JSY) and Janani Shishu Suraksha Karyakram (JSSK) are running smoothly. In these environments, external support mechanisms—like incentives and doorstep services help lessen women's reliance on their own decision-making power, which in turn helps to close the empowerment gap. Similarly, in several southern and western states such as Kerala, Tamil Nadu, and Maharashtra, higher female literacy rates, cultural acceptance of institutional maternal care, and the widespread availability of both public and private healthcare facilities all contribute to consistently high ANC utilization, regardless of women's empowerment levels.

In contrast, many states in the central, eastern, and northeastern regions are struggling, with both low- and high-empowerment women lagging behind the national leaders. This situation can be linked to structural obstacles like inadequate health infrastructure, hard-to-reach locations, poor program oversight, and deeply rooted patriarchal norms that hinder women from seeking healthcare. In rural and tribal areas, issues like bad transport links, long distances to health facilities, and financial limitations only make these disparities worse. Even women who are empowered in these regions might not have the necessary health literacy or could face cultural pushback when trying to access care outside their homes, which ultimately reduces their chances of getting the help they need.

The chi-square tests of independence revealed that women's empowerment significantly varied across different age groups, castes, education levels (both for women and their partners), and religions. Interestingly, factors like wealth and residence didn't show any significant statistical association in the empowerment cross-tabs. This suggests that empowerment, which we can think of in terms of decision-making and mobility, is likely more closely tied to socio-cultural and educational factors rather than just economic status or whether someone lives in a rural or urban area. This insight is crucial for designing programs, as it indicates that strategies aimed at enhancing agency should consider life stages, social identities, and human capital, rather

than focusing solely on economic factors. When it comes to health service utilization, the chi-square tests showed significant associations with all the socio-demographic variables we looked at, including age, caste, wealth, residence, women's education, partner's education, and religion. The strong links between wealth, education, and residence confirm that health service usage reflects both the socio-economic capacity on the demand side and the access differences on the supply side. This aligns with the well-documented patterns of maternal health service utilization across India. The contrast here where empowerment doesn't show a significant link to wealth in the bivariate analysis, but health service utilization does underscores the different nature of agency compared to resource-based access.

The multivariable logistic regression analysis of complete antenatal care (ANC) scores revealed some interesting insights into the socio-demographic factors at play. When we look at age, older women showed significantly higher odds of completing their ANC compared to the youngest group (which we didn't show as a reference). In fact, women aged 40-44 had odds of about 2.50, and those aged 45-49 had even higher odds at around 9.99. This suggests that as women get older, they might be more aware of the risks involved, seek care from higher-level facilities, or have different strategies for accessing care based on their previous pregnancies.

When it comes to caste, both Scheduled Tribes and the General category had better odds of completing ANC compared to the reference group, while the Other Backward Classes (OBC) didn't show significant differences after adjustments. Living in urban areas also played a role, with higher odds (OR $\approx$ 1.41) likely due to better access to services and resources. Wealth was a major factor too, with richer women having a staggering odds ratio of about 5.53 compared to poorer women, highlighting the stark economic disparities in receiving complete ANC.

Education also made a difference; women with higher education (OR $\approx$ 2.02) and those whose partners were well-educated (OR $\approx$ 1.68) were more likely to complete their ANC. This aligns with the idea that education enhances health literacy, navigation skills, and the appreciation of preventive care. However, when we look at religion, Muslim and Christian women had lower odds of completing ANC (ORs $\approx$ 0.73 and 0.69), suggesting that there are cultural, informational, or access barriers that need to be addressed. The strong constant term indicates a high baseline probability of completing ANC among the reference categories, but the socio-demographic differences really do shift the likelihood of completion. These adjusted findings echo national studies that highlight ongoing inequities in receiving "full ANC," even when contact rates are high.

The logistic regression analysis on women's empowerment highlighted a significant life-course gradient. It showed that the chances of empowerment increase with age, peaking around 35 to 39 years, followed by a slight drop in the oldest age group. This pattern suggests that women gain social capital and bargaining power as they grow older. Factors like urban living, higher education levels for both individuals and their parents, and being part of Scheduled Tribes were positively correlated with empowerment. On the flip side, Muslim women had lower odds of empowerment compared to the reference group. It's worth noting that wealth didn't have a significant adjusted link to empowerment, reinforcing the idea that empowerment in this context isn't just about income. Instead, it's more closely tied to social, demographic, and educational influences.

5.2 Discussion:

The analysis highlights a clear divide in maternal health between low- and middle-income areas: while many women have access to antenatal care (ANC), there are significant gaps in the quality and equity of that care, especially for those who are socio-economically disadvantaged. National studies using NFHS data show that although most women attend at least four ANC visits, only a small fraction actually receive what's considered "full" ANC—this includes essential clinical check-ups, necessary tests, and counselling. This discrepancy points to issues with the quality of care and barriers that women face in accessing it. Our findings reflect this trend, showing high rates of blood pressure checks, abdominal exams, and lab tests, but a drop in coverage for iron and folic acid (IFA) supplements and ultrasounds. This suggests there may be supply issues, challenges with adherence, or gaps in counselling. The adjusted associations indicate that wealth, education, and living in urban areas significantly impact the likelihood of receiving complete ANC, echoing the structural inequities noted in earlier studies from India. These findings underscore the need for improvements in service readiness and tailored demand generation strategies in low-resource settings.

A major insight from this analysis is the different roles that empowerment and economic status play. When we measure empowerment through decision-making and mobility, we find that it has a limited connection to wealth, both in simple and adjusted models. However, empowerment does change significantly with factors like age, education, and where a person lives. This indicates that our ability to make choices is shaped more by social norms, life stages, and education than by income alone. Conversely, having complete access to antenatal care (ANC) is strongly linked to wealth and education, even after considering other factors. This shows that access to resources and health literacy are vital for receiving comprehensive ANC.

Overall, these patterns suggest that while empowerment is essential for starting and managing care, economic and informational resources often determine whether individuals can access the full range of services. Programs that focus only on financial risk protection or just on "women's empowerment" might miss out on other important factors; a combined approach that integrates agency-building with financial and informational support is likely to be more effective.

When we break down empowerment by state, it turns out that some Union Territories and southern/western states are doing quite well in terms of antenatal care (ANC), even for women who aren't very empowered. This points to strong supply-side performance and possibly effective outreach systems that help reduce the need for women to depend on their households. However, in many central, eastern, and parts of northeastern India, both low- and high-empowerment groups are not performing as well as the top states. This suggests there are systemic challenges, such as the readiness of healthcare facilities, availability of human resources, logistics for diagnostics and supplements, and insufficient frontline counseling or follow-up. Moreover, when we consider social factors like caste and religion, we see that there are still significant barriers to access and persistent social norms. The lower odds for Muslim and Christian women compared to the reference group indicate a pressing need for culturally sensitive engagement, community intermediaries, and inclusive healthcare environments. This variety in experiences highlights the importance of customizing strategies at the subnational level, including bolstering supply in underperforming areas and working on trust-building and norm-shifting initiatives within specific communities.

To improve the quality of antenatal care (ANC), we need to shift our focus from just making contact to ensuring that essential components of care are completed. This means closely monitoring and encouraging the completion of key ANC elements like blood pressure checks, haemoglobin and urine tests, ultrasounds when necessary, adherence to iron and folic acid (IFA) supplements, and structured counselling on warning signs and preparing for birth. Conducting readiness audits at both facility and outreach levels, providing supportive supervision, and engaging in micro-planning can help fill the gaps for those who are already attending appointments. Next, we should tackle economic and informational barriers by offering cashless diagnostic services and ensuring a steady supply of IFA, paired with targeted health literacy campaigns and digital reminders, particularly for women who are less affluent or less educated. Additionally, we can implement interventions that empower women like support groups, couple counselling, and assistance with transportation but these should be combined with financial and logistical support, as wealth significantly influences the

completion of ANC. Furthermore, we need to create culturally sensitive strategies that collaborate with community and religious leaders, utilize materials that are linguistically appropriate, and promote respectful care practices to foster trust among groups that are less likely to complete their ANC. Lastly, we should use district-level dashboards to monitor both empowerment initiatives and the completion of ANC components, allowing for adaptive management.

5.3 Conclusion:

The overall level of ANC coverage in India is quite promising, with most women receiving vital clinical services like abdominal exams, blood pressure checks, and lab tests during their pregnancies. The statistics show impressive rates of blood pressure monitoring (96.7%), urine testing (93.8%), and blood sampling (94.5%). Additionally, there's a significant uptake of iron–folic acid supplements (87.2%) and ultrasound tests (82.4%). These numbers indicate that many critical services are accessible, showcasing considerable progress in reaching pregnant women in both urban and rural settings, as well as across various socio-economic backgrounds. However, there are still gaps, especially in the consistent delivery and adherence to the complete ANC package, which includes counselling and diagnostic services.

This highlights the need for strengthening the health system. When we analyse disparities based on women’s autonomy, we uncover complex relationships between agency, socio-demographic factors, and ANC usage. Here, autonomy is defined by decision-making power and freedom of movement, and it’s closely linked to age, education (both personal and parental), and living in urban areas. Interestingly, it doesn’t show a significant connection to household wealth in adjusted models. This suggests that empowerment is more influenced by social and educational factors, as well as life stages, rather than just economic status. On the other hand, complete ANC utilization is strongly tied to wealth, education, urban living, and religion, indicating that financial and informational resources play a crucial role in the likelihood of receiving comprehensive care. These insights reveal an important duality: while empowerment is essential, it alone isn’t enough to ensure full ANC coverage without also addressing economic barriers and improving health literacy. Therefore, effective interventions need to combine agency-building with financial protection, reliable supply chains, and demand generation that reflects the realities of diverse communities.

5.4 Recommendations of the study:

To tackle the inequalities and gaps pointed out in this research, we can suggest a few key recommendations. Health systems need to prioritize the reliable availability of essential antenatal care (ANC) services and supplies, focusing on improving infrastructure and supply chains in areas that are falling behind. It's crucial that efforts to empower women go hand in hand with economic support and health education, rather than standing alone; engaging the community, especially local leaders and peer groups, can really boost women's agency and their willingness to seek health care. Investing more in education for both girls and adult women will yield long-term benefits for ANC uptake and overall maternal health. We also need to address caste and religious disparities by implementing culturally sensitive and inclusive outreach and service models, ensuring that care is provided in a non-discriminatory and respectful manner. Finally, monitoring and evaluation systems should evolve from merely counting service contacts to assessing the completeness and quality of ANC services, with regular, detailed reporting to enable targeted interventions. Future research should incorporate qualitative methods and longitudinal studies to better understand the factors influencing ANC utilization and women's empowerment over time.

5.6 Limitations of the study:

When interpreting the findings of this study, it's important to keep in mind a few general limitations. First off, the research relies on cross-sectional survey data, which means we can't really draw any causal conclusions; the relationships we see between socio-demographic factors, women's autonomy, caste, and antenatal care usage might be influenced by factors we didn't measure. Secondly, all the key variables—like ANC attendance, autonomy, and health behaviours—were self-reported, which opens the door to potential recall bias and social desirability bias, especially in sensitive areas. Thirdly, complex ideas like "empowerment" and "complete ANC" were defined using the available questionnaire items, but these might not fully capture their multifaceted nature; important elements like quality of care, psychological autonomy, and informal influences are left out. Additionally, the analysis doesn't take into account crucial contextual factors such as facility quality, service readiness, and community practices, which could significantly affect ANC coverage and disparities. Lastly, while quantitative methods are useful, they might miss out on the rich contextual, cultural, and experiential details that qualitative research could uncover, and variations at the district level might get lost in state-level analyses.

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Appendices

Appendix: Plagiarism Report

Saloni Singh D report

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