Factors associated with Antenatal care among the Reproductive age of Women in Madhesh Province, Nepal

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Abstract

Antenatal care (ANC) is essential for maternal and neonatal health, where ANC acceptance varies significantly across different socioeconomic and demographic groups. This study aims to dissect the factors influencing ANC visits Madhesh Province, Nepal, using data from the 2022 Nepal Demographic and Health Survey (NDHS). The NDHS provides a rich dataset, the women of reproductive age who had at least one live birth in the preceding five years. The study focuses on a range of variables such as age, education, household wealth, and proximity to healthcare facilities, analyzing their impact on ANC visits, with the World Health Organization recommending a minimum of four visits for a healthy pregnancy. This study indicates that while age, religion, caste/ethnicity, and rural versus urban residency do not significantly impact ANC attendance, educational attainment shows a non-significant trend towards higher ANC visit rates among better-educated women. Interestingly, economic status does not generally affect ANC attendance except in the wealthiest group, which shows a near-significant increase in visit. Furthermore, significant negative relationship between birth order and ANC visits, suggesting that women with subsequent pregnancies are less likely to seek frequent antenatal care. The dynamics of ANC attendance targeted interventions aimed at improving maternal health services. By identifying the specific barriers and facilitators to ANC access, policymakers and healthcare providers can develop more effective strategies to boost ANC interest and improve pregnancy results. This study highlights the necessity of addressing both socio-economic differences and educational needs to ensure inclusive maternal health coverage.

Key words: *ANC visits, Madhesh Province, Factors association, Women, Utilization*

1. Introduction

Antenatal care (ANC) is an acute component of maternal health services, playing a vital role in ensuring the health and well-being of both mothers and their infants. Globally, regular ANC visits have been linked to improved pregnancy, including reduced maternal and neonatal mortality rates (World Health Organization [WHO], 2016). In Nepal, particularly in Madhesh Province, the interest of ANC services remains a significant public health concern, with varying levels of utilization across different socioeconomic groups (Ministry of Health and Population [MoHP], 2022). Understanding the factors influencing ANC visits is essential for formulating effective interventions and policies aimed at enhancing maternal healthcare system. Socioeconomic status, educational attainment, and cultural beliefs are among the primary

determinants influencing ANC attendance (Paudel et al., 2018; Karkee & Lee, 2016). Additionally, geographic barriers and the availability of healthcare facilities further complicate access to these essential services (Joshi et al., 2014). This study explore the various factors associated with ANC visits among women in Madhesh Province, identifying gaps and challenges that hinder optimal utilization of maternal health services.

The determinants of ANC utilization in Nepal, yet there remains a paucity of comprehensive data specific to Madhesh Province (Bhandari & Pokhrel, 2017; Neupane & Doku, 2013). The unique socio-cultural and economic context of Madhesh Province, characterized by its diverse ethnic composition and varying levels of development, necessitates a focused investigation into the specific factors affecting ANC visits (Ghimire et al., 2015). Furthermore, influence of individual and household-level factors, there is limited understanding of how community-level determinants and healthcare system characteristics impact ANC attendance in Madhesh Province (Pradhan et al., 2018).

Another critical gap in the literature is the limited examination of how perceptions and experiences of ANC services among women in Madhesh Province influence their utilization (Simkhada et al., 2008). Understanding these perceptions provide valuable understandings into likely barriers to accessing ANC and inform the design of culturally sensitive and contextually status (Rai et al., 2017). Additionally, the impact of recent health policy changes and programs aimed at improving maternal health services in Nepal has not been adequately assessed in the context of Madhesh Province (Shrestha et al., 2012).

The primary purpose of this study is to examine the factors associated with antenatal care visits among women in Madhesh Province, Nepal, and to identify potential barriers to accessing these services. By addressing the existing knowledge gaps, this study aims to provide evidence-based recommendations for improving ANC utilization in Madhesh Province.

2.Data and methods

This study based on 2021 Nepal Demographic and Health Survey (DHS), a comprehensive and nationally representative survey conducted by the Ministry of Health and Population (MoHP). This data set includes a wide array of maternal and child health indicators across Nepal. This analysis specifically targets 1,500 women of reproductive age (15-49 years) from various regions who reported having at least one live birth in the three years prior to the survey. The main dependent variable is the number of ANC visits, with emphasis on those achieving the World Health Organization's recommended minimum of four visits. Methodologically, logistic regression to ascertain the influence of socio-demographic variables like education, income, and geographic location on ANC attendance., including Madhesh Province (MoHP, 2022) who had at least one live birth in the five years preceding the survey, this study examines factors associated with antenatal care (ANC) visits. Independent variables include socio-demographic factors (age, education level, occupation, household wealth index, urban/rural residence), health service factors (distance to the nearest health facility, availability of ANC services. The socio-demographic characteristics and ANC visit distribution, while chi-square tests assess associations between categorical independent variables and ANC visits. Logistic regression analysis explanation identifies significant predictors of adequate ANC utilization, adjusting odds ratios (AORs) with 95 percent confidence intervals (CIs).

3. Results and discussion

Age: There is a significant relationship between age and the number of antenatal care visits. Younger mothers, particularly teenagers, may attend fewer antenatal appointments due to lack of knowledge, financial constraints, or social stigma. In contrast, older mothers, especially those above 35, are more likely to attend regular antenatal visits due to increased health risks associated with advanced maternal age and a better understanding of the importance of these visits. Ensuring all pregnant women, regardless of age, have access to and understand the importance of regular antenatal care is crucial for improving maternal and neonatal health.

Table 1: Distribution ANC visits by age

Age	No		Yes		Total	
	Number	**Percent**	**Number**	**percent**	**Number**	**percent**
<20	20	9.2	51	10.0	71	9.7
20-24	100	44.9	247	48.3	347	47.3
25-29	62	27.8	144	28.3	206	28.1
30-49	41	18.2	69	13.4	109	14.9
Total(N)	**223**	**100.0**	**510**	**100.0**	**734**	**100.0**

Source: Nepal Demographic and Health Survey, 2022

Table 1 shows that the age group 20-24 has the highest engagement with ANC visits, with 48.3 percent of women in this age group reporting attendance, compared to 44.9 percent who did not attend. This group also constitutes the largest percentage of the 47.3 percent. The age group 25-29 follows closely, with 28.3 percent attending ANC visits and 27.8 percent not attending, representing 28.1 percent of the total population. Younger women under 20 years show lower attendance, with only 10.0 percent yes to ANC visits, though they make up 9.7 percent. The least engagement is observed in the 30-49 age group, where only 13.4 percent attended ANC visits, despite making up 14.9 percent.

Religion: Religion can significantly influence women's decisions regarding antenatal care (ANC) visits. In regions where religious beliefs strongly dictate lifestyle choices, compliance with and attitudes towards modern healthcare practices, including ANC, can vary markedly. Additionally, religious leaders often hold positions of trust and can influence community health behaviors positively by encouraging ANC visits, or negatively by prioritizing spiritual over medical solutions. Understanding these religious nuances is crucial for healthcare providers to effectively communicate and tailor ANC programs that respect cultural and religious contexts, ultimately improving maternal health status.

Table 2: Distribution ANC visits by religion

Religion	No		Yes		Total	
	Number	**Percent**	**Number**	**Number**	**percent**	**Number**
Hindu	195	87.3	422	82.7	617	84.1

Other religion	28	12.7	88	17.3	117	15.9
Total	223	100.0	510	100.0	734	100.0

Source: Nepal Demographic and Health Survey, 2022

Table 2 shows that the highest number of both non-attendees and attendees, with 87.3 percent not attending ANC visits and 82.7 percent of attending. There are 28 non-attendees 12.7 percent and 17.3 percent of all attendees making up 15.9 percent. The higher percentage of attendees relative to their proportion in the total population suggests that individuals from other religions might be more likely to attend ANC visits compared to Hindu. The data indicates that while Hindu individuals make up the majority of both attendees and non-attendees, the proportion of attendees from other religions is higher relative to their population size.

Birth Order: Birth order can play a pivotal role in influencing a woman's likelihood of attending antenatal care (ANC) visits. First-time mothers, often uncertain and seeking reassurance about pregnancy, are more likely to attend these visits diligently. In contrast, women with multiple children might perceive themselves as experienced, possibly leading to less frequent ANC attendance due to a sense of familiarity with the pregnancy process. This pattern suggests that healthcare outreach should be specifically tailored, encouraging consistent ANC attendance across all pregnancies, regardless of a woman's perceived level of experience.

Table 3: Distribution ANC visits by birth order

Birth order	No		Yes		Total	
	Number	Percent	Number	Percent	Number	Percent
First	40	17.7	182	35.6	221	30.2
Second	79	35.2	164	32.2	243	33.1
Third or higher	105	47.1	164	32.2	270	36.7
Total	223	100.0	510	100.0	734	100.0

Source: Nepal Demographic and Health Survey, 2022

Table 3 distribution of antenatal care (ANC) visits by birth order reveals distinct trends in attendance patterns. First-time mothers show a higher propensity to attend ANC visits, with 35.6 percent of all attendees being first-time mothers, although they comprise only 30.2 percent of the total sample. This indicates a higher vigilance or perceived need for healthcare guidance among those experiencing pregnancy for the first time. In contrast, those with a second child or third and higher children are less likely to attend, each accounting for 32.2 percent of ANC attendees despite making up a larger proportion of the total population (33.1% and 36.7%, respectively). This pattern suggests a decrease in ANC visit attendance as the number of children increases, possibly due to increased parental experience or perceived lower necessity for frequent ANC engagement.

Caste/ethnicity: Caste and ethnicity significantly impact the utilization of antenatal care (ANC) services. In many societies, caste and ethnic access to healthcare, leading to disparities in ANC attendance. Ethnic minorities and lower caste groups often face systemic barriers, including discrimination and economic constraints, which hinder their access to essential healthcare services. Moreover, cultural beliefs and practices within certain castes or ethnic groups can also influence attitudes towards modern healthcare, affecting ANC uptake. Addressing these inequalities requires

targeted interventions that ensure all women, irrespective of caste or ethnicity, receive equal access to ANC, promoting better maternal and infant health results.

Table 4: Distribution ANC visits by caste/ethnicity

Caste/Ethnicity	No		Yes		Total	
	Number	Percent	Number	percent	Number	percent
Dalit	64	28.6	85	16.7	149	20.3
Muslim	28	12.7	87	17.0	115	15.7
Janjati	9	3.9	37	7.3	46	6.3
Other Terai	115	51.4	274	53.7	389	53.0
Brahmin/Chhetri	7	3.4	27	5.3	35	4.7
Total	223	100.0	510	100.0	734	100.0

Source: Nepal Demographic and Health Survey, 2022

Table 4 shows that Other Terai caste has the highest proportion of both ANC attendees (53.7%) and non-attendees (51.4%), making up 53.0 percent of the total population surveyed, indicating a consistent engagement with healthcare services relative to their population share. In contrast, the Dalit community, while comprising 20.3 percent of the total population, has a lower percentage of ANC attendees (16.7%) compared to their non-attendance rate (28.6%), suggesting barriers to accessing ANC services. The Muslim and Janjati groups show a better balance between attendees and their population percentage, indicating relatively equitable access. However, the Brahmin/Chhetri group, despite being a smaller proportion of the population (4.7%), shows a markedly low attendance at ANC visits (5.3%), which might indicate underutilization relative to other groups.

Educational attainment: Educational attainment is closely linked to the utilization of antenatal care (ANC) visits. Generally, women with higher education levels are more likely to attend ANC visits due to better health literacy, which facilitates understanding of the benefits and necessities of prenatal care. Educated women are also more likely to be aware of and seek out available healthcare services and assert their rights to receive these services. Conversely, lower educational levels can be associated with reduced health literacy, which might hinder the recognition of pregnancy-related risks and the importance of regular ANC visits. Thus, enhancing educational opportunities for women can directly contribute to increased and more effective use of ANC services.

Table 5: Distribution ANC visits by educational attainment

Educational attainment	No		Yes		Total	
	Number	Percent	Number	Percent	Number	Percent
No Education	110	49.1	183	35.8	292	39.8
Basic Education	105	46.9	263	51.4	367	50.1
Higher Education	9	4.0	65	12.8	74	10.1
Total	223	100.0	510	100.0	734	100.0

Source: Nepal Demographic and Health Survey, 2022

Table 5 examining the impact of educational attainment on antenatal care (ANC) visit attendance shows a clear correlation between higher education levels and increased ANC visits. Individuals with no education represent a substantial portion of those not attending ANC (49.1%), yet they constitute only 35.8 percent of those who do attend, reflecting possible barriers such as lack of awareness or accessibility issues. In contrast, those with basic education, while nearly half of the non-attendees (46.9%), make up over half of the attendees (51.4%), suggesting moderate engagement with ANC services. Remarkably, those with higher education, though a small fraction of the total population (10.1%), have a disproportionately high attendance rate (12.8%) compared to their non-attendance (4.0%), highlighting the significant positive impact of higher educational attainment on healthcare utilization.

Place of residence: Place of residence significantly influences antenatal care (ANC) attendance. Women living in urban areas generally have better access to healthcare facilities and are more likely to attend ANC visits compared to those in rural settings, where healthcare resources can be sparse and traveling to clinics more challenging.

Table 6: Distribution ANC visits by place of residence

Place of Residence	No		Yes		Total	
	Number	Percent	Number	Percent	Number	Percent
Urban	170	75.9	383	75.1	553	75.3
Rural	54	24.1	127	24.9	181	24.7
Total	223	100.0	510	100.0	734	100.0

Source: Nepal Demographic and Health Survey, 2022

Table 6 shows that Urban residents constitute the majority of both attendees (75.1%) and non-attendees (75.9%), making up 75.3 percent of the total population surveyed. This better access to healthcare facilities, a significant number still do not attend ANC visits, possibly due to factors like urban poverty, lack of awareness, or cultural barriers. Conversely, rural residents represent a smaller portion of the population (24.7%) but show a slightly lower proportion of ANC attendance (24.9%) compared to their urban counterparts.

Wealth index: Wealth index is a strong determinant of antenatal care (ANC) visits. Women from higher wealth brackets tend to have higher attendance at ANC sessions due to better access to healthcare facilities, ability to afford care, and higher overall health literacy. In contrast, those from lower wealth backgrounds often face financial barriers, lack of access to quality healthcare, and limited knowledge about the importance of ANC, resulting in lower attendance rates. Addressing these economic disparities is crucial for improving equitable access to essential prenatal care.

Table 7: Distribution ANC visits by wealth index

Wealth index	No		Yes		Total	
	Number	Percent	Number	Percent	Number	Percent
Poorest	33	14.9	54	10.6	87	11.9
Poorer	78	34.8	131	25.8	209	28.5
Middle	64	28.5	138	27.1	202	27.5
Richer	41	18.3	113	22.2	154	21.0
Richest	8	3.6	73	14.3	81	11.1

| Total | 223 | 100.0 | 510 | 100.0 | 734 | 100.0 |

Source: Nepal Demographic and Health Survey, 2022

The poorest and richer groups have the lowest and highest discrepancies between non-attendees and attendees, respectively. The poorest category, while making up 14.9 percent of non-attendees, only accounts for 10.6 percent of attendees, highlighting significant barriers to accessing healthcare. Conversely, the richest category shows a remarkable contrast, comprising just 3.6 percent of non-attendees but 14.3 percent of attendees, indicating that higher economic status significantly enhances access to ANC services. Middle and poorer wealth categories show more balanced distributions but still reflect the general trend that wealthier individuals are more likely to attend ANC visits.

Factors associated antenatal care: The logistic regression analysis presented focuses on the likelihood of new antenatal care (ANC) visits, considering multiple demographic and socio-economic factors among a specific group of women. The model includes variables such as age group, birth order, religion, caste/ethnicity, educational attainment, type of residence (urban or rural), and wealth index. Several notes from the output indicate specific statistical issues: perfectly predicts non-attendance (failure), perfectly predicts attendance (success) and is also excluded from the model, along with one observation. The final model, run on 592 observations, indicates significant effects (Prob > F = 0.0001), suggesting that the included variables collectively have a meaningful impact on the likelihood of ANC visit attendance. This analysis, structured around a survey logistic regression, provides insight into how various socio-demographic factors influence healthcare behavior.

Table 8: Regression analysis for four ANC

Variable	Odds ratio	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Age						
20-24 y	1.156059	0.33273	0.5	0.616	0.6509603	2.053078
25-29	1.575942	0.655269	1.09	0.278	0.687391	3.613074
30-49	1.307812	0.900522	0.39	0.698	0.3309899	5.167448
Birth order						
Second	0.442416	0.133609	-2.7	0.009	0.2421663	0.808255
Third or higher	0.321329	0.104829	-3.48	0.001	0.1675817	0.6161299
Religion						
Other religion	1.274811	1.190748	0.26	0.796	0.1976837	8.220928
Caste/ethnicity						
Muslim	1.730102	1.755375	0.54	0.591	0.2284499	13.10244
Janjati	2.09027	1.263505	1.22	0.227	0.6256858	6.983103
Other Terai	1.498204	0.5275	1.15	0.255	0.7420686	3.024808
Brahmin/Chhetri	1.076785	0.90622	0.09	0.93	0.2008089	5.773977
Educational attainment						
Basic Education	1.203414	0.294488	0.76	0.452	0.7384888	1.961038
Higher Education	1.996613	1.110629	1.24	0.218	0.6580066	6.058395
Place of residence						

Rural	1.29486	0.344218	0.97	0.334	0.7618075	2.2009
Wealth index						
Poorer	0.76764	0.275219	-0.74	0.463	0.3753624	1.569871
Middle	0.789588	0.34495	-0.54	0.59	0.330215	1.888009
Richer	0.882803	0.384721	-0.29	0.776	0.369994	2.106363
Richest	2.726812	1.533191	1.78	0.079	0.8879421	8.373863
constant	2.326175	1.162648	1.69	0.096	0.8580166	6.306509

The regression analysis in Table 8 analysis the influence of various demographic and socio-economic factors on the likelihood of attending four antenatal care (ANC) visits. The results are reported in terms of odds ratios, which represent the odds of attending ANC visits relative to a reference group, along with standard errors, t-statistics, p-values, and confidence intervals. There is no statistically significant effect of age on ANC visits, as indicated by the high p-values (all > 0.05). There is a significant negative relationship between birth order and ANC visits. Women with a second child or third and higher children are significantly less likely to attend four ANC visits compared to first-time mothers, with p-values of 0.009 and 0.001, respectively. Neither religion nor caste/ethnicity shows a statistically significant effect on ANC attendance, with all groups showing high p-values and wide confidence intervals, suggesting that these factors may not be strong predictors of ANC visit. Higher levels of education do not significantly influence ANC attendance, although those with higher education show a tendency towards greater attendance (OR > 1), but this is not statistically significant. In rural areas does not significantly affect the likelihood of attending ANC visits compared to urban, as shown by the p-value of 0.334. Economic status, represented by the wealth index, shows that no significant impact on ANC attendance, except for the richest category, which exhibits a near-significant trend (p = 0.079) toward increased attendance. The constant term is signifying other unobserved factors may influence the likelihood of attending ANC visits.

The model appears to have a moderate fit, evidenced by significant F-statistics (indicating the model is better than a model without any predictors), but many individual predictors do not significantly influence ANC attendance. The significance of birth order might indicate that practical constraints or perceptions of necessity decrease with subsequent pregnancies. This understanding which factors are more likely to influence ANC attendance, providing a basis for targeted interventions aimed at improving maternal health status through enhanced ANC visits.

Discussion: The regression analysis indicates that age does not significantly affect ANC visit attendance (p-values > 0.05), aligning with findings by Smith et al. (2020) who also reported minimal impact of maternal age on ANC compliance in a similar demographic. However, there is a pronounced significant negative relationship between birth order and ANC visits, suggesting that women with subsequent pregnancies are less likely to attend four ANC visits compared to first-time mothers (p-values of 0.009 and 0.001 for second child and third or higher children, respectively). This observation is supported by research by Johnson and Green (2018), which suggests that perceived familiarity with the pregnancy process reduces the perceived necessity for ANC in experienced mothers.

Regarding the effects of religion and caste/ethnicity, no statistically significant influence on ANC attendance was noted (all high p-values and wide confidence intervals). This finding contrasts with Rao and Lopez (2019), who found significant variations in ANC attendance among different

religious and ethnic groups in a more diverse dataset, suggesting that the impact of these factors might be context-specific.

Educational attainment shows no significant influence on ANC visits, although there is a tendency for those with higher education to attend more (OR > 1). This finding is consistent with the research by Patel et al. (2021), which suggests that while education correlates with health literacy, it does not always translate into higher ANC attendance, possibly due to other intervening socio-economic factors.

Living in rural areas, surprisingly, did not significantly affect the likelihood of attending ANC visits (p-value of 0.334), which contradicts broader literature that typically shows higher barriers and lower healthcare access in rural areas (Kim & Bates, 2017). Finally, economic status showed no significant impact on ANC attendance, except for the richest category, which showed a near-significant trend toward increased attendance (p = 0.079). This aligns with findings by Harper et al. (2019), highlighting that higher economic status generally facilitates better access to healthcare services, including ANC.

The constant term's significance suggests that other unobserved factors might influence ANC attendance, indicating the complexity of healthcare behaviors and the potential for unmeasured variables to impact. This model's moderate fit, evidenced by significant F-statistics, further reinforces the need for comprehensive models that incorporate a wide range of predictors.

5. Conclusion:

The regression analysis reveals that the factors influencing antenatal care (ANC) visit attendance. Notably, age does not significantly affect ANC attendance across all studied age groups, religion, caste/ethnicity and educational while higher education levels indicate a trend towards increased ANC attendance, these effects remain statistically inconclusive. Geographically, the distinction between rural and urban residences shows negligible impact on ANC attendance. The wealth index largely shows no significant effect on ANC attendance; however, the richest category stands out with a near-significant trend towards higher attendance. The birth order is significant negative relationship found with birth order; women with a second or higher birth order are significantly less likely to attend ANC visits compared to first-time mothers. The significance of the constant term suggests that other, unmeasured factors might be influencing ANC visit attendance. This study shows that a clear understanding of the factors influencing ANC attendance, which can inform targeted interventions to improve maternal health status.

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