

Exploring Antenatal Health Care Service Utilization in Nepal: A Comprehensive Analysis

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Abstract

The utilization of maternal health care is one of the important factors in reducing the incidence of maternal mortality. Studies in Nepal and in developing countries shows that various demographic, socio-economic and economic factors are associated with ANC service utilization. The main objective of this study is to identify and examine socio-demographic and economic factors affecting antenatal healthcare service utilization in Nepal. This study used data from the Nepal Demographic and Health Survey 2016 and analyzed the data using logistic regression analysis. This research analyzes ANC (antenatal care) concerning dependent variables: age, birth order, religion, ethnicity, educational attainment, province, residence, and wealth indices. Maternal health has been receiving increased attention in the global health, development, and human rights agenda, representing a priority area for accelerating progress on the SDGs and sustaining the gains of the MDGs. Bivariate analysis was conducted for all variables, and some of them were statistically significant at the 5 percent significance level (since $p < 0.05$). The dichotomous use of modern maternal healthcare utilization, namely whether a woman utilized maternal health care or not, employed dichotomous logistic regression to determine which factors best explain and predict the outcome of maternal health care utilization during pregnancy. A positive estimated value indicates that the odds favor the event and the event is likely to occur, while a negative value indicates that the event is not likely to occur. ANC visits of women decrease with birth order. Based on empirical results, the major factors for ANC services were income, awareness, access to health care services, and birth order attended. The level of awareness among women about the utilization of maternal healthcare in the study area was low. Maternal healthcare service utilization differed across various components of maternity. It would be better to increase awareness about the utilization of modern maternal healthcare for mothers and improve access to healthcare services in their villages to minimize transportation costs and waiting times from the government's side, thus increasing the utilization of maternal health care services in Nepal.

Introduction

Antenatal health care service utilization is a critical component of maternal health and plays a

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pivotal role in reducing maternal and neonatal morbidity and mortality worldwide (WHO, 2020). Ensuring that expectant mothers receive adequate antenatal care is essential for monitoring the health of both the mother and the developing fetus, identifying potential complications early, and providing necessary interventions. While progress has been made in improving antenatal care utilization globally, significant disparities persist, particularly in low and middle-income countries (WHO, 2020).

World Health Organization (WHO) estimates that 99 percent of 600,000 women deaths as a result of pregnancy and child birth each year occurs in developing countries. Risk of maternal mortality and morbidity can be reduced through regular and proper ANC check-up, delivery under safe and hygienic conditions (Rahman et al., 2008).

Under the health goal, SDG 3.1 has set the target for maternal mortality reduction: “by 2030 reduce the global maternal mortality ratio to less than 70 per 100,000 live births specific maternal health indicator”. To reach the Ending Preventable Maternal Mortality (EPMM) goal of a global average target of 70 deaths per 100,000 live births, each country will need to contribute a two-thirds reduction in its maternal mortality ratio (MMR) by 2030, regardless of their MMR at baseline. To eliminate the wide inequity in MMRs between countries, a secondary goal is that by 2030, no country should have an MMR that is more than 140, or twice the targeted global average MMR. For countries with very high baseline MMR (greater than 420), a steeper decline will be therefore necessary. In addition to reducing their national average MMR, all countries are called upon to focus on equity and eliminate disparities in maternal mortality among sub-populations (UN, 2015).

For normal pregnancy, minimum of four antenatal visiting (at least 20 minutes duration for each) is needed to accomplish the essential level of ANC (WHO, 2004). Antenatal care can play an important role in improving maternal health, not by itself but through encouraging women to use other services such as institutional delivery and advice on pregnancy or delivery complications (WHO, 2010). ANC motivates pregnant women facing any pregnancy complication to seek advice for her problems. The level of ANC use does make a difference to the chances of delivering in an institution.

The Sustainable Development Goals (SDGs) framework has given a high level of priority assigned to health, including maternal, newborn, and child health, recognizing the critical importance for millions of women and their families (WHO, 2020). A study on rural Uttar Pradesh, India shows the likelihood of women with high ANC use delivering in an institution three times higher than for women with no ANC use (Aalok, 2005). Antenatal care, use of key maternal health services that can significantly reduce maternal mortality as available literatures suggest that the high rates of maternal and neonatal mortality are associated with inadequate and

poor-quality maternal health care, including ANC.

In the context of Nepal, a country nestled in the heart of South Asia, antenatal health care service utilization has been a subject of growing concern. Nepal, with its diverse topography, faces unique challenges in delivering accessible and equitable healthcare services to all its citizens. Despite substantial efforts by the government and various non-governmental organizations to improve maternal and child health outcomes, the utilization of antenatal care services in Nepal remains a subject of interest for researchers and policymakers alike.

This comprehensive analysis seeks to shed light on the current status of antenatal health care service utilization in Nepal. It aims to address existing gaps in the literature by providing a thorough examination of the factors influencing the utilization of antenatal care services in this specific context. While some studies have explored aspects of maternal health care utilization in Nepal, there is still a need for a consolidated and up-to-date assessment of the situation to inform evidence-based interventions.

Existing literature in Nepal often focuses on maternal health care utilization in general, without delving deeply into the unique socio-economic factors that may impact antenatal care utilization. There is a need for research that specifically identifies how income, education, and urban-rural disparities influence the utilization of antenatal services. While it is recognized that Nepal's diverse geography poses challenges for healthcare accessibility, a comprehensive analysis is needed to understand the specific geographical barriers that hinder antenatal care utilization. This includes studying the impact of remoteness, difficult terrain, and inadequate infrastructure on maternal health service access. While the utilization of antenatal care services is crucial, the quality of care received during these visits is equally important.

Few studies in Nepal have thoroughly examined the quality of antenatal care services, including the provision of essential tests, counseling, and the overall patient experience. Cultural practices and societal norms can significantly influence a woman's decision to seek antenatal care. Further research is needed to explore how these cultural and social factors interact with healthcare-seeking behavior in Nepal. Understanding the perspectives and challenges faced by healthcare providers in delivering antenatal care services can provide valuable insights into the healthcare system's capacity and effectiveness. Few studies have delved into the experiences of healthcare professionals involved in antenatal care (Sharma, 2002).

Methods and Methodology

The analysis in this study draws upon data from the Nepal Demographic and Health Survey 2016 (NDHS 2016), which is a nationally representative cross-sectional survey. NDHS 2016 is the ninth iteration of a series of population and health surveys conducted at the national level in Nepal. It is also the fifth comprehensive survey of its kind conducted as part of the global Demographic

and Health Survey (DHS) program.

The study's target population comprises women in Nepal aged 15 to 49 years who have given birth to at least one live child within the five years leading up to the survey. The dataset for this analysis consists of information collected from 3,998 women in this demographic group. The research methodology employed a combination of descriptive statistics and analytical techniques, including bivariate and multivariate regression analysis, to explore and elucidate key patterns and relationships within the NDHS 2016 dataset.

The dependent variable in this context is antenatal care (ANC) utilization, while the independent variables include age, birth order, religion, ethnicity, educational attainment, province, residence, and wealth index. These independent variables are expected to predict the dependent variable.

Specifically for antenatal care, if a woman was checked by a trained health professional (doctor, nurse, or midwife) at least once during pregnancy, it was coded as "1"; otherwise, it was coded as "0". The data were extracted from the complete NDHS 2016 datasets (MoHP, 2017). The analysis utilized information from the last delivery and generated dichotomous categorical variables for all three outcome variables. Major analytical methods included descriptive distribution, bivariate, and multivariate analysis. Addressing violations of the assumption of independence of observations is crucial as these can lead to biased standard errors. The binary logistic regression model is defined as follows:

$$\text{logit}[\theta(x)] = \log \left[\frac{\theta(x)}{1-\theta(x)} \right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots + \beta_k X_k$$

Where, β_0 = the constant of the equation and β_i = the coefficient of the i^{th} predictor

Logistic regression (Sandro, 2014) is popular in part because it overcome many of the restrictive assumption of ordinal least square (OLS) regression.

Results

The quality of antenatal care can be assessed based on the type of provider, the number of ANC visits and the timing of the first visit. Antenatal care can also be monitored by evaluating the services received and the information provided to mothers during their visits. Information regarding ANC coverage was collected from women who gave birth within the five years before the survey. In the case of women with two or more live births during the five-year period, the data pertain to the most recent birth only.

Demographic and socio-economic Characteristics of Antenatal Care

The distribution of the population by sex and age is one of the most crucial demographic groupings. The study of the age and sex structure holds a significant place in demographic statistics. This information aids in interpreting findings presented later in the report and provides an indication of the survey's representativeness. The number of women distributed in the survey at the provincial level is described.

One of the most appropriate ways to measure equity in a healthcare program is to determine how many clients fall into each wealth quintile for your country. A quintile represents 20 percent of the population. For instance, if a population consists of 1,000,000 people, it can be divided into five quintiles, each containing 200,000 individuals. The wealth index assigns a score to each person in the population, reflecting their wealth based on their household's characteristics. Using this score, five 'wealth quintiles' can be created as follows: place the poorest 20 percent in quintile one, the second poorest 20 percent in quintile two, the middle 20 percent in quintile three, the second wealthiest 20 percent in quintile four, and the wealthiest 20 percent in quintile five. This has already been done for most developing countries in the Demographic and Health Surveys (MoHP, 2017).

Table 1: Distribution of Demographic and Socio-economic Characteristics

Age	Routine 4 ANC				Total	
	No		Yes		Number	Percent
	Number	Percent	Number	Percent		
<20	169	50.53	165	49.47	334	100
20-24	548	43.13	723	56.87	1271	100
25-29	591	42.84	789	57.16	1380	100
30-34	478	47.21	534	52.79	1012	100
Birth Order						
First	503	33.59	995	66.41	1498	100
Second	494	40.90	713	59.10	1207	100

third or higher	789	61.05	503	38.95	1292	100
Religion						
Hindu	1482	43.33	1938	56.67	3420	100
Other religion	304	52.67	273	47.33	577	100
Ethnicity						
Brahmin/Chhetri	358	30.90	801	69.10	1159	100
Dalit	289	53.01	256	46.99	545	100
Janjati	548	42.04	755	57.96	1303	100
Other Terai	437	60.32	287	39.68	724	100
Muslim	152	60.38	100	39.62	252	100
Others	2	14.45	12	85.55	14	100
Educational attainment						
No Education	797	63.41	459	36.59	1256	100
Basic Education	766	42.91	1020	57.09	1786	100
Higher Education	223	23.34	732	76.66	955	100
Province						
Koshi	276	40.22	410	59.78	686	100
Madhesh	634	65.91	329	34.09	963	100
Bagmati	234	33.84	457	66.16	691	100

Gandaki	127	37.62	210	62.38	337	100
Lumbini	258	35.91	461	64.09	719	100
Karnali	152	59.64	103	40.36	255	100
Sudur Paschim	105	30.20	241	69.80	346	100
Residence						
Urban	847	38.13	1376	61.87	2223	100
Rural	939	52.88	835	47.12	1774	100
Wealth index						
Poorest	451	54.85	371	45.15	822	100
Poorer	421	50.14	419	49.86	839	100
Middle	431	49.93	431	50.07	863	100
Richer	340	40.96	490	59.04	830	100
Richest	143	22.32	500	77.68	643	100
Total	1786	44.68	2211	55.32	3997	100

Source: Data files of Nepal Demographic and Health Survey 2016.

Table 1 shows that the age group less than 20 years had 169 (50.53%) with no visits, while the age group 25-29 had the highest ANC utilization at 57.16%. This indicates that as the age group increases, ANC visits also increase. ANC visits do not decrease with increasing age group.

Regarding pregnancy-related characteristics, the proportion of women having four ANC visits is highest among those not using third birth order (61.05%) and among women whose last child was their first birth (66.41%). ANC utilization for the first birth order is higher than for the second and third birth orders. As birth order increases, ANC visits decrease.

The data also reveals that 1938 (56.67%) Hindus received ANC visits, while 273 (47.33%) from other religions received ANC visits. This table indicates that Hindu religious groups have higher ANC utilization than other religious groups. Additionally, the majority of women are Hindu

(69.10%) and have received ANC visits, while the lowest percentage, 39.62%, belongs to the Muslim community. Generally, dalit, janjati, Muslim, and other castes have lower ANC utilization compared to Brahmin/Chherti. This explains why the so-called upper castes had higher ANC utilization than other castes.

The proportion of births attended by skilled providers increases with increasing maternal educational attainment, from 38 percent among mothers with no education to 85 percent among mothers with an SLC or above. ANC visits are lower among women with no education, while women with basic and higher education have higher ANC utilization.

Province is another important factor associated with the place of delivery, with a significant gap between women in the highest (39%) Sudur Paschim and those in the lowest (19%) in Koshi. All other five provinces have more than 50 percent ANC visits. Urban women (61.87%) have used more ANC visits than rural women (47.12%). ANC utilization declines with decreasing wealth, with the poorest at 25.15 percent, followed by the poorer group at 49.86 percent, the middle group at 50.07 percent, and the richest group at 77.68 percent. This indicates that the poorest and poorer populations have lower ANC utilization compared to the richer and richest groups.

Factors Affecting Utilization of Maternal Health Services

Bivariate statistical analysis examines the marginal effect of a predictor variable on the response variable without considering other predictors. It reveals the association between the outcome variable and other predictor variables through cross-tabulation of the response variables. To determine which factors best explain and predict the utilization of modern maternal healthcare during pregnancy, delivery, and post-delivery, a dichotomous logistic regression was employed. This regression model assesses whether a woman utilized maternal health care or not.

Table 2: Distribution of 4 ANC in maternal health services

ANC	Odds Ratio	Linearized Std. error	T	P> t	95% Confidence interval	
					Lower limit	Upper limit
Age group						
20-24	1.349432	.1788911	2.26	0.024	1.039772	1.751315
25-29	1.610377	.2622993	2.93	0.004	1.169034	2.21834
30-49	1.924827	.3537468	3.56	0.000	1.341042	2.762748

Birth order						
Second	.7122798	.0704875	-3.43	0.001	.5863246	.8652928
Third/hig.	.4458207	.0607837	-5.93	0.000	.3409766	.5829024
Religion						
Other religion	.7426819	.1297874	-1.70	0.090	.5266979	1.047235
Caste						
Muslim	1.091131	.3272662	0.29	0.771	.604969	1.967979
Janjati	.991721	.1493226	-0.06	0.956	.737567	1.333448
Other Terai	.8802002	.1659207	-0.68	0.499	.607574	1.275157
Brahmin/ Chhetri	1.345509	.2053839	1.94	0.053	.996617	1.81654
Educational attendance						
Basic Education	1.566394	.1598185	4.40	0.000	1.281644	1.914408
Higher Education	2.234315	.3040176	5.91	0.000	1.709788	2.919755
Province						
Madesh	.4941886	.0928553	-3.75	0.000	.3415311	.7150808
Bagmati	1.041565	.2495071	0.17	0.865	.6502941	1.668256
Gandaki	.977632	.171093	-0.13	0.897	.6929765	1.379216
Lumbini	1.236117	.2141244	1.22	0.222	.8792786	1.737772
Karnali	.5872663	.1219675	-2.56	0.011	.3903642	.883487
Sudur Paschim	1.828162	.3259707	3.38	0.001	1.287483	2.595899
Residence						
Rural	.8624732	.1018396	-1.25	0.211	.6837639	1.08789

Wealth index						
Poorer	1.25289	.1663638	1.70	0.090	.9649724	1.626713
Middle	1.573435	.2264548	3.15	0.002	1.185598	2.088142
Richer	1.769421	.2815858	3.59	0.000	1.293973	2.419565
Richest	2.395249	.4569907	4.58	0.000	1.645944	3.48567

Table 2 presents the results from a logistic model based on treatment contrasts. Each proportion is compared to the specified reference group. The initially fitted model included additive effects for age group, birth order, religion, caste, educational attendance, province, residence, and wealth index. The numbers labeled *estimate* and *S.E.* represent the parameter estimates (the natural logarithm of the odds ratio) and their standard errors, respectively. The "deviance" measures the error after fitting the model. To evaluate the overall performance of the model, the null deviance indicates how well the response is predicted by a model with nothing but the intercept. The residual has 14.6 degrees of freedom.

Significant variables were included in the reduced model based on treatment contrasts. The natural logarithm of the odds ratio was estimated from the coefficients, along with their corresponding 95 percent confidence intervals. Table 2 displays the odds ratios for each variable, along with their corresponding 95 percent confidence intervals, after adjusting for the other variables using logistic regression.

ANC visits by women increase with age group. The estimated odds ratio of ANC utilization for the age group of mothers compared to those in the 20-24 age group is 0.00. However, for age groups 20-24, 25-29, and 30-49, the odds ratios are increased by 1.34, 1.61, and 1.92 times, respectively, compared to the age group 15-19. This difference is statistically significant. ANC visits by women decrease with birth order.

In terms of education, both basic and higher education show an increase compared to no education. This difference is also statistically significant. Regarding provinces, Madhesh (0.49 times), Gandaki (0.97 times), and Karnali (0.58 times) have lower odds ratios, while Bagmati (1.04 times), Lumbini (1.23 times), and Sudur Paschim (1.82 times) have higher odds ratios compared to Koshi.

The utilization of ANC by mothers with awareness about maternal health care services is more likely to be used, with the poorest to poorer group at 1.25 times, the middle group at 1.57 times, and the richer and richest groups at 1.76 times and 2.39 times, respectively. These differences are statistically significant.

Discussion

The current study reveals that more than half of the respondents (50.53%) were pregnant at an age younger than 20, which is in line with findings from Mahesh Province in Nepal and Ethiopia (Gurmesa, 2009). However, this finding is not consistent with a study conducted in Nigeria (Iyaniwura & Yussuf, 2009). This finding highlights that many women still get married before the legal age of marriage (20 years) and give birth before attaining reproductive maturity.

The study shows that only 55 percent had completed four or more ANC (Antenatal Care) visits, which is similar to a study conducted in Lucknow where 28.4 percent had completed four or more antenatal visits. This is lower than the findings from NDHS 2011, Uganda, Ethiopia, and North Maharashtra, which reported percentages of 50 percent, 37.5 percent, 46.5 percent, and 64.76 percent, respectively (Alemayehu et al., 2010; Mumbare, 2011). This difference might be attributed to the fact that we considered visits only at the appropriate times according to the schedule provided by WHO.

A study conducted in Eastern Sudan revealed that 90 percent of women had at least one antenatal visit, 11 percent had more than four visits, while 10.0 percent had not attended any visits. This can be attributed to the hypothesis that planned pregnant mothers were more prepared for motherhood and received support from other family members for all types of care needed during pregnancy.

Conclusion

This study analyzes the marginal effect of a predictor variable on the response without considering other predictors. It demonstrates the association between outcome variables and other predictor variables obtained through cross-tabulation of the response variables: maternal healthcare, antenatal care, and the usage of other predictor variables independently. Bivariate analysis is conducted for all variables, and some of them are statistically significant at a 5 percent significance level ($p < 0.05$) for all four maternal health care aspects.

Antenatal care services, the professional ethics of health workers, place of birth, delivery care, and utilization are associated with age, birth order, caste, religion, educational level, province, place of residence, and wealth quintile. Quality of antenatal care services, place of birth, ability to deliver, and postnatal care utilization are associated with the occupation of mothers and awareness about maternal health care.

It is found that in the age group less than 20 years, 169 (50.53%) had no visits, while in the age group 25-29, the proportion was 57.16%, which had the highest ANC utilization. Concerning pregnancy-related characteristics, the proportion of those having four ANC visits was highest among those not using third birth order (61.05%) and among women whose last child was their first birth (66.41%).

Regarding religion, 1938 (56.67%) of Hindu women received ANC visits, while 273 (47.33%) of women from other religions did.

ANC visits by women decrease with increasing birth order. The utilization of maternal health care is one of the important factors in reducing the incidence of maternal mortality. Based on the empirical results, the major factors for ANC services were income, awareness, access to health services, and attended birth order.

On the other hand, for delivery care services, the major factors found to be significantly affected were attended birth order, religion, husband's occupation, quality of antenatal care, postnatal care, place of birth, professional ethics, and the ability to deliver. The level of awareness among women about the utilization of maternal health care in the study area was low. Maternal health care service utilization varied across different components of maternity.

Considering the factors that have been significantly associated with a mother's utilization of maternal health care services, it would be beneficial to raise awareness about the use of modern maternal health care among mothers and improve access to healthcare services in their villages. This can help minimize transportation costs and waiting times, ultimately leading to an increase in the utilization of maternal health care services in Nepal

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