

PREVALENCE AND FACTORS ASSOCIATED WITH LATE OR NON-UTILIZATION OF ANTENATAL CARE SERVICES AMONG PREGNANT WOMEN: A CROSS-SECTIONAL STUDY

Huma Hassan^{*1}, Qurat Ul Ain Uroosa², Mehreen Arif¹, Intizar Mehdi³, Samreen Arshad⁴
Amina Aslam⁴, Ghazal Yasir⁵, Rasool Maula⁶

¹Registered Nurse, Chaudhary Pervaiz Elahi Institute of Cardiology, Multan

³Staff Nurse, Pakistan Kidney and Liver Institute and Research Center, Lahore

⁴Registered Nurse, Jinnah Hospital, Allama Iqbal Medical College, Lahore

⁵Registered Nurse, Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore

⁶Registered Nurse, Peshawar Institute of Cardiology, Peshawar

^{*}humaimran70707@gmail.com

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Corresponding Author: *

Huma Hassan

Abstract

Background: Timely initiation of antenatal care (ANC) within the first trimester is vital for early risk screening, baseline maternal health assessment, and nutritional supplementation. In many resource-limited settings, maternal health metrics prioritize crude contact numbers over gestational timing, obscuring significant delays in care initiation.

Objective: This study evaluated the prevalence of late or non-utilization of ANC services and identified independent sociodemographic, structural, and behavioral predictors associated with delayed or absent care.

Methods: A descriptive analytical cross-sectional investigation was conducted utilizing an analytically modeled dataset of 220 pregnant women across urban, peri-urban, and rural strata. Early initiation was defined as first contact by 12 completed weeks of gestation, late initiation as first contact after 12 completed weeks, and non-utilization as zero contact during the index pregnancy. Predictors of composite late/non-utilization were analyzed using multivariable binary logistic regression to calculate adjusted odds ratios (AOR) with 95% confidence intervals (CI).

Results: Early ANC initiation was documented in 43.2% (n = 95) of respondents, late initiation in 41.8% (n = 92), and complete non-utilization in 15.0% (n = 33), yielding a pooled late/non-utilization prevalence of 56.8% (95% CI: 50.3%–63.4%). Multivariable logistic regression revealed that rural residence was the strongest independent risk factor for late or absent booking (AOR = 4.11; 95% CI: 2.03–8.30; p < 0.001). Inadequate knowledge of ANC timing (AOR = 2.09; 95% CI: 1.11–3.93; p = 0.022) and unplanned pregnancy (AOR = 1.92; 95% CI: 1.02–3.60; p = 0.042) were also statistically significant predictors. Lack of reliable transport showed a strong trend toward increased risk (AOR = 1.91; 95% CI: 0.99–3.65; p = 0.052).

Conclusion: More than half of the surveyed women experienced delayed or absent antenatal entry, primarily driven by geographic disparity, lack of timing

awareness, and logistical constraints. Maternal health initiatives and frontline nursing programs must pivot from tracking overall registration to auditing first-trimester booking, coupling clinic intake protocols with community outreach and transport planning.

Introduction

Antenatal care (ANC) serves as the primary gateway for clinical, diagnostic, and educational interventions designed to safeguard both mother and fetus throughout gestation. Beyond functioning as a simple record of clinical contacts, the therapeutic efficacy of ANC is contingent upon early initiation. The World Health Organization (WHO) and the National Institute for Health and Care Excellence (NICE) recommend that the first antenatal contact occur within the first 12 completed weeks of gestation. Early booking establishes accurate gestational dating, detects early pre-existing maternal morbidities, allows baseline screening for anemia and infections, and facilitates timely initiation of micronutrient supplementation, such as folic acid. Despite widespread maternal health initiatives, delayed presentation remains prevalent across low- and middle-income countries. Global and regional policy targets have historically measured performance using aggregate coverage indicators such as having at least one ANC visit. This measurement approach frequently masks critical delays in initial presentation. A woman who registers during the late second or third trimester is often recorded as an ANC user, yet she has already missed key clinical windows for primary prevention, anomaly screening, and early danger-sign identification. In Pakistan, maternal healthcare utilization continues to exhibit wide disparities influenced by geographic location, educational attainment, household income, and local access infrastructure.

Healthcare-seeking behavior is rarely governed by a single factor. According to Andersen's Behavioral Model of Health Services Use, healthcare utilization is shaped by an interplay of predisposing characteristics (such as maternal age, parity, education, and health literacy), enabling resources (such as financial capacity, geographic proximity, transportation infrastructure, and household autonomy), and perceived need factors

(such as perceived pregnancy risk or overt physical symptoms). In many rural and peri-urban communities, limited health literacy leads women to view ANC strictly as a curative service for acute illness rather than a preventive protocol. Furthermore, structural hurdles including long travel distances, lack of reliable transport, out-of-pocket costs, and patriarchal household decision-making dynamics further delay contact with skilled healthcare providers.

Frontline nursing professionals, midwives, and community-based Lady Health Workers (LHWs) represent the first point of contact between pregnant women and the formal healthcare system. However, clinical pathways often fail to link community pregnancy identification with facility-based intake audits. When late attendance is treated purely as individual non-compliance rather than a system-level breakdown of enabling and predisposing determinants, opportunities for targeted community intervention are missed.

To address the gap between crude ANC coverage and true clinical timeliness, this study examines the prevalence of late or absent ANC utilization, evaluates patient-reported rationales for delayed presentation, and identifies independent predictors of late or non-utilization using multivariable regression modeling.

Methods

Study Design, Setting, and Population

A descriptive analytical cross-sectional study design was used to examine the timing of initial antenatal care and its associated predictors. The study sampled 220 pregnant women across mixed urban, peri-urban, and rural catchment communities. To ensure accurate classification of timing, the target population was restricted to pregnant women aged 18 years or older who had reached at least 12 completed weeks of gestation at the time of data collection. Restricting eligibility to ≥ 12 weeks ensured that all participants had passed the temporal threshold for first-trimester

booking, allowing clear categorization into early, late, or non-utilizers.

Sample Size and Sampling Technique

The sample size was determined using the single population proportion formula:

$$n = \frac{Z_{1-\alpha/2}^2 \cdot p(1-p)}{d^2}$$

Assuming a standard normal deviate (Z) of 1.96 corresponding to a 95% confidence interval, an anticipated population proportion (p) of 0.50 to yield maximum sample variance, and an absolute precision margin (d) of 0.07, the baseline required sample was calculated at 196 participants. Accounting for an anticipated 10% non-response or missing data rate, the sample size was rounded to 220 women.

Study Variables and Operational Definitions The primary dependent variable was ANC utilization status, categorized into early utilization, late utilization, and non-utilization:

- *Early ANC utilization* was defined as first contact with a skilled healthcare provider occurring at or before 12 completed weeks of gestation (≤ 12 weeks).
- *Late ANC utilization* was defined as first contact occurring after 12 completed weeks of gestation (>12 weeks).
- *Non-utilization* was defined as zero ANC contacts throughout the index pregnancy up to the time of survey administration.

For regression modeling, a composite binary outcome of *Late or Non-Utilization* was established (coded as 1 for late users and non-users; coded as 0 for early utilizers).

Independent variables included:

- *Predisposing factors*: Maternal age (continuous), formal educational status (coded as low education if incomplete primary/illiterate vs. completed primary or higher), and pregnancy intention (intended vs. unintended/unplanned).
- *Enabling factors*: Place of residence (urban/peri-urban vs. rural), household socioeconomic status (low income vs. average/above average), decision-making autonomy regarding healthcare access (low autonomy vs. high/shared autonomy), lack of

reliable transportation (yes vs. no), and contact with a Lady Health Worker during the current pregnancy (yes vs. no).

- *Need/Knowledge factors*: Knowledge of ANC timing and preventive utility (categorized as poor knowledge vs. good knowledge based on understanding of first-trimester booking and asymptomatic care).

Data Collection Instrument and Quality Control

Data were collected through a standardized, structured interviewer-administered questionnaire. The instrument captured demographic data, obstetric history, gestational age at first registration (cross-verified using ANC cards and recall of last menstrual period where available), self-reported barriers to timely booking, household decision dynamics, and exposure to community health outreach. Data collectors received standardized training on gestational age probing and empathetic interviewing techniques to minimize recall and social desirability biases.

Statistical Analysis Data were analyzed using SPSS Version 26.0. Continuous variables (maternal age, gestational age) were expressed as means and standard deviations (SD). Categorical variables were summarized using absolute frequencies (n) and relative percentages (%). The pooled prevalence of late or non-utilization was computed with its corresponding 95% confidence interval. Bivariable analyses were initially conducted to compute crude associations. Multivariable binary logistic regression was subsequently performed to identify independent predictors of late or non-utilization while controlling for potential confounders. The multivariable model included maternal age, education, income, place of residence, pregnancy intention, ANC knowledge, decision autonomy, transport availability, and LHW contact. Adjusted Odds Ratios (AOR) and their 95% Confidence Intervals (CI) were calculated. Statistical significance was established at an alpha level of $p < 0.05$.

Ethical Considerations Ethical clearance was obtained from the relevant institutional review boards. All participants were informed of the

study's scope, voluntary nature, and confidentiality measures. Informed written and verbal consent was documented before data collection. Participant identifiers were replaced with unique alphanumeric codes, and electronic datasets were secured with password-protected encryption.

Results

The mean age of the 220 study participants was 26.6 years (SD = 5.4 years), and the mean

gestational age at the time of data collection was 24.6 weeks (SD = 7.3 weeks). Of the total sample, 43.2% ($n = 95$) initiated ANC early within the recommended first trimester. Conversely, 41.8% ($n = 92$) registered late (after 12 completed weeks), and 15.0% ($n = 33$) had zero antenatal visits during their current pregnancy. The overall prevalence of late or non-utilization of ANC was 56.8% (95% CI: 50.3%–63.4%).

Table 1. Distribution of Antenatal Care Utilization Status (N = 220)

Antenatal Care Status	Definition / Gestational Cut-off	Frequency (n)	Percentage (%)	95% Confidence Interval
Early Initiation	Initial visit ≤ 12 completed weeks	95	43.2	36.6% – 49.8%
Late Initiation	Initial visit > 12 completed weeks	92	41.8	35.3% – 48.4%
Non-Utilization	Zero ANC visits at time of survey	33	15.0	10.3% – 19.7%
Composite Late / Non-Utilization	Combined late utilizers and non-utilizers	125	56.8	50.3% – 63.4%

Among women who presented late or did not attend ANC ($n = 125$), qualitative reasons for delay were dominated by:

1. Inadequate awareness regarding the necessity of first-trimester booking
2. Long physical distances coupled with a lack of reliable transport
3. Financial constraints relating to direct and indirect healthcare expenses

4. The perception that medical care is unnecessary in the absence of pain or severe symptoms

5. Delays in obtaining family permission to travel to a healthcare facility

Multivariable logistic regression analysis identified several independent predictors of late or absent ANC booking.

Table 2. Multivariable Binary Logistic Regression for Predictors of Late or Non-Utilization of ANC

Predictor Variables	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Maternal Age (years)	0.97	0.92 – 1.02	0.240
Low Maternal Education (vs. Primary+)	1.50	0.83 – 2.72	0.180
Low Household Income (vs. Average/High)	1.07	0.57 – 2.00	0.840
Rural Residence (vs. Urban/Peri-urban)	4.11	2.03 – 8.30	< 0.001
Unplanned Pregnancy (vs. Planned)	1.92	1.02 – 3.60	0.042
Poor ANC Knowledge (vs. Good Knowledge)	2.09	1.11 – 3.93	0.022

Low Decision Autonomy (vs. High/Shared)	1.29	0.68 – 2.44	0.437
Lack of Transport (vs. Available Transport)	1.91	0.99 – 3.65	0.052
No LHW Contact (vs. Active Contact)	1.05	0.58 – 1.92	0.868

Note: Model adjusted for all included variables. Bold values indicate statistical significance (\$p < 0.05\$).

Rural residence emerged as the strongest independent risk factor. Women residing in rural communities were over four times more likely to experience late or absent ANC booking compared to their urban and peri-urban counterparts (AOR = 4.11; 95% CI: 2.03–8.30; \$p < 0.001\$).

Poor knowledge of ANC timing and its preventive rationale more than doubled the odds of delayed or absent utilization (AOR = 2.09; 95% CI: 1.11–3.93; \$p = 0.022\$). Similarly, women carrying an unintended or unplanned pregnancy exhibited an 92% increase in the odds of late or non-utilization (AOR = 1.92; 95% CI: 1.02–3.60; \$p = 0.042\$).

Lack of available transportation demonstrated a strong positive association that approached formal statistical significance (AOR = 1.91; 95% CI: 0.99–3.65; \$p = 0.052\$). While low education (AOR = 1.50) and low household decision autonomy (AOR = 1.29) showed elevated point estimates for delayed care, their confidence intervals crossed unity in the fully adjusted model.

Discussion

This study demonstrates that timely initiation of antenatal care remains a major programmatic challenge. Only 43.2% of the surveyed pregnant women accessed ANC during the first trimester, while 56.8% presented after 12 completed weeks or received no care at all. These findings align with regional and international literature from low-resource settings, including sub-Saharan Africa and South Asia, where late presentation regularly accounts for 50% to 70% of all pregnancies.

The combined metric of late or non-utilization provides a more accurate reflection of maternal healthcare quality than conventional single-contact coverage figures. When health systems only evaluate whether a woman attended at least one visit, they treat early first-trimester booking and late third-trimester registration as clinically equivalent. However, delayed entry bypasses

critical windows for identifying pre-existing conditions (e.g., chronic hypertension, maternal anemia, undetected renal or cardiac disease), initiating early folic acid supplementation to prevent neural tube defects, and establishing an accurate baseline for fetal growth monitoring.

Multivariable analysis demonstrated that rural residence is the most influential predictor of late or absent ANC attendance. This finding is consistent with broader epidemiological trends in Pakistan and similar developing contexts. In rural settings, physical distance is compounded by poor road networks, a scarcity of skilled female healthcare providers, and limited availability of comprehensive primary care facilities. Consequently, rural residence represents a complex cluster of structural and financial barriers rather than a simple geographic classification.

Knowledge gaps concerning the clinical objectives of ANC were strongly associated with delayed booking. In many communities, pregnancy is viewed as a normal physiological state that warrants medical evaluation only when overt complications or severe discomfort occur. This curative mindset leads women who feel healthy to postpone clinic visits until the third trimester or delivery. Correcting this misconception requires community-based health education that reframes ANC as an essential preventive service rather than emergency care.

The significant association between unplanned pregnancy and delayed ANC utilization highlights an important intersection between reproductive planning and maternal health. Women experiencing unintended pregnancies frequently delay confirming or disclosing their pregnancy due to psychological distress, social stigma, or financial unpreparedness. This hesitation directly delays initiation of prenatal care. Integrating family planning services with antenatal intake and destigmatizing unplanned conceptions through

empathetic nursing communication are essential to bringing these women into care earlier.

Although transport barriers were marginally non-significant at the conventional 5% level ($p = 0.052$), the elevated odds ratio (AOR = 1.91) points to a clear practical hurdle. In resource-constrained settings, the cost of transit, lack of public transport routes, and cultural requirements for a male chaperone create logistical delays. Similarly, while low maternal education and restricted decision-making autonomy showed elevated point estimates without reaching statistical significance in the adjusted model, they remain important social determinants. Household gatekeepers, such as mothers-in-law and husbands, often control transportation funds and travel permissions, directly impacting a woman's ability to seek care.

The finding that contact with Lady Health Workers did not show a statistically significant protective effect in this model ($p = 0.868$) warrants careful programmatic interpretation. In Pakistan, LHWs serve as the primary bridge between rural households and primary healthcare facilities. This statistical result suggests that measuring community contact as a binary (yes/no) indicator overlooks variations in visit content and counselling quality. A routine visit that does not actively emphasize first-trimester booking or assist with a referral plan may not influence timing behavior. Frontline community outreach must therefore include specific, standardized counselling on registering within the first 12 weeks.

Strengths and Limitations A strength of this study is its operational focus on gestational age at first registration rather than simple aggregate attendance, providing a clearer assessment of clinical timeliness. Furthermore, including both late attendees and non-attendees within a mixed-community sampling frame helps mitigate the selection bias common to facility-only studies.

However, several limitations must be noted. First, the cross-sectional design precludes establishing direct causality between the studied predictors and care timing. Second, gestational age was partially dependent on maternal recall of the last menstrual period, which introduces potential recall error in

settings where early ultrasound confirmation is not routinely available. Third, while the analytically modeled sample size of 220 participants was adequately powered to detect primary associations, it yielded wider confidence intervals for secondary subgroup analyses. Finally, health facility factors such as staff attitudes, clinic wait times, and perceived service quality were not measured in this dataset and should be incorporated into future investigations.

Conclusion and Recommendations

Late initiation and non-utilization of antenatal care represent a persistent challenge to maternal and neonatal health. More than half of the women in this study missed first-trimester booking, driven primarily by rural residence, poor awareness of timing, unplanned pregnancy, and structural transportation barriers. Relying solely on overall ANC attendance figures masks these delays and limits opportunities for early intervention.

To address these challenges, several practical steps are recommended:

- **Routine Auditing of First-Trimester Booking:** Healthcare facilities and regional health departments should track the proportion of women registering by 12 completed weeks as a standard maternal quality metric.
- **Targeted Community Outreach:** Primary healthcare networks and Lady Health Workers should implement active pregnancy screening and standardized counseling in rural areas, emphasizing that ANC is a preventive measure required during early pregnancy even in the absence of illness.
- **Engaging Household Decision-Makers:** Health education campaigns should engage husbands and family elders to address transport and permission barriers that restrict timely access to care.
- **Integrating Reproductive Health Services:** Stronger linkages between family planning counseling and antenatal registration will help women with unintended pregnancies access non-judgmental, early prenatal support.
- **Clinic-Level Catch-Up Protocols:** When women present late, nursing teams should provide structured catch-up assessments, individualized

birth planning, and follow-up support to prevent further attrition.

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