

ANTENATAL CARE AWARENESS IN A PERI-URBAN POPULATION: AN EVIDENCE FROM A TERTIARY CARE HOSPITAL IN LAHORE, PUNJAB, PAKISTAN

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ABSTRACT

Background: Antenatal care (ANC) awareness is a key determinant of maternal and neonatal health outcomes, yet peri-urban populations in Pakistan, which combine urban and rural healthcare access patterns, remain underrepresented in the awareness literature. **Objectives:** To assess the level of ANC awareness among pregnant women attending a tertiary care public hospital in Shahdara, Lahore, and to evaluate the association between ANC awareness and socio-demographic and obstetric variables. **Methods:** An analytical, cross-sectional study was conducted among 300 pregnant women recruited by convenience sampling from the obstetrics and gynecology outpatient department. Awareness was assessed using a 20-item questionnaire (Cronbach's alpha ≥ 0.7) categorized as poor ($<50\%$), moderate ($50-75\%$), or good ($\geq 75\%$) awareness. Fisher's exact test was used as the primary test of association between awareness and socio-demographic/obstetric variables, at $\alpha=0.05$. **Results:** Of 299 women with valid data, most demonstrated good awareness (55.0%), 44.0% moderate, and 0.7% poor. Awareness was highest for exclusive breastfeeding (84.7%), environmental hygiene (80.0%), and personal hygiene (79.7%). Three variables were significantly associated with awareness i.e. ANC booking timing ($p<0.001$), socioeconomic status ($p=0.047$), and current gestational age ($p=0.034$) while age, education, occupation, and gravidity were not significant. **Conclusion:** Focused health education, early ANC booking, and community-based interventions are suggested to augment maternal knowledge and encourage safer pregnancy outcomes.

KEYWORDS: Antenatal Care; Awareness; Pregnant Women; Socio-demographic Factors.

INTRODUCTION

Antenatal care (ANC) is a cornerstone of maternal and neonatal healthcare, encompassing health education, nutritional counselling, medical examinations, and screening for high-risk conditions such as preeclampsia, anemia, and gestational diabetes (1). Globally, ANC is recognized as a fundamental approach in reducing maternal and neonatal mortality and improving pregnancy outcomes, with the World Health Organization estimating that maternal deaths could be substantially reduced through consistent, informed engagement with ANC services (2). Awareness, however, is the precondition for that engagement; a woman cannot act on care she does not know to seek, and cannot recognize a complication she has not been taught to identify.

Global evidence on ANC utilization has grown considerably, but it's yet to achieve the targets, set globally. Systematic reviews from South Asia and Sub-Saharan Africa consistently find that women who attend the WHO-recommended minimum of four ANC visits may nonetheless lack functional knowledge of pregnancy danger signs, nutritional requirements, or the purpose of routine screening tests, a gap that undermines the preventive value of attendance itself (3,4). In rural Uganda, for instance, structured assessment found that fewer than half of pregnant women could correctly identify three or more obstetric danger signs despite near-universal ANC contact (5). Comparable knowledge gaps have been documented in rural Bangladesh, where awareness of specific ANC components lagged well behind overall attendance rates (6), and in India, where maternal education was shown to be a stronger predictor of both ANC use and institutional delivery than attendance frequency alone (7).

Within Pakistan, maternal mortality remains substantially above regional and global targets, and inadequate ANC awareness is repeatedly cited as a contributing systemic factor (8). National survey data situate this burden concretely, underscoring the continued gap between Pakistan's maternal health indicators and the Sustainable Development Goal target of reducing preventable maternal mortality (9). Multiple studies converge on a similar set of structural barriers, low health literacy, socio-cultural constraints on women's mobility and healthcare decision-making, and inconsistent access to quality ANC services, particularly outside major urban centers

(10,11). Gender dynamics further shape awareness and utilization; decision-making authority over a woman's healthcare frequently rests with husbands or mothers-in-law, and interventions that engage only the pregnant woman herself may therefore have a limited reach (12). Community-based models have shown some success in bridging this gap in rural Pakistani settings (13), and telemedicine-based approaches have likewise been piloted to extend ANC education where physical access to a facility is constrained (14). Tertiary care hospitals, which increasingly serve as the point of contact for both urban and lower-income peri-urban populations seeking subsidized or free maternal services, are simultaneously a site where awareness gaps become visible and a setting where they could most feasibly be addressed (15).

Peri-urban localities present a distinct and comparatively understudied context within this broader picture. These settings combine features of both urban and rural life, rapid population growth, socioeconomic heterogeneity, and healthcare infrastructure, producing awareness patterns that do not neatly mirror either purely urban or purely rural findings (16,17). Shahdara, a peri-urban locality of Lahore, exemplifies this transitional profile. Its tertiary care public hospital offers subsidized ANC services to a socioeconomically diverse population, yet the extent to which this access translates into genuine awareness of ANC content, rather than mere attendance, has not previously been formally quantified. Existing Pakistani literature has tended to focus on either rural or fully urban populations, leaving peri-urban settings such as Shahdara without a dedicated evidence base to inform locally tailored maternal health education (18).

This gap carries direct clinical weight. The classic "three delays" framework identifies delay in the decision to seek care, as the earliest and frequently most consequential point of failure in preventing maternal death (19). A woman who cannot distinguish normal pregnancy discomfort from the warning signs of pre-eclampsia or antepartum hemorrhage may fail to mobilize family and financial resources for timely care, regardless of how accessible the nearest tertiary facility is. Understanding not merely whether pregnant women in a peri-urban tertiary care setting are attending ANC, but specifically what they know and do not know, and which socio-demographic and obstetric characteristics predict that knowledge, is therefore a necessary step toward designing maternal health education that closes this gap rather than reproducing it. This study was accordingly designed to inform an evidence base specific to this underrepresented peri-urban population.

Objectives

This study was carried out with two specific objectives:

1. To assess the level of antenatal care (ANC) awareness among pregnant women attending a tertiary care public hospital in Shahdara, Lahore.
2. To evaluate the association between socio-demographic and obstetric variables and antenatal care awareness among pregnant women in this setting.

METHODOLOGY

A quantitative, analytical, cross-sectional design was employed in the present study. The study was conducted in the outpatient obstetrics and gynecology department of a tertiary care public hospital in Shahdara, Lahore, Punjab, Pakistan. The study population comprised all pregnant women attending the department for routine ANC visits during the study period. The sample size was calculated using the WHO formula for finite populations, $n = N / [1 + N(e)^2]$, with an estimated study-period population of $N=1200$ pregnant women, a margin of error (e) of 5%, and a 95% confidence level, yielding a required sample of 300 participants. A convenience sampling technique was used to recruit participants. Eligible participants were pregnant women aged 20 years and above, in any trimester of pregnancy, who were in stable health and able to provide informed consent. Women with a severe psychiatric disorder impairing informed consent, or those experiencing active bleeding or requiring emergency obstetric care, were excluded.

Data were collected over four months using a structured, interviewer-administered questionnaire developed from the WHO's Recommendations on Antenatal Care for a Positive Pregnancy Experience and comparable validated tools in the literature (20,21). The questionnaire comprised two sections. Section I captured socio-demographic and obstetric information including age, education, occupation, socioeconomic status, gravidity, gestational age, and gestational age at first ANC booking. Section II assessed ANC awareness using 20 single-best-answer multiple-choice items. Each correct response scored 1 and each incorrect or "don't know" response scored 0, yielding a total awareness score of 0-20, converted to a percentage and categorized as poor (<50%), moderate (50-75%), or good ($\geq 75\%$) awareness (21).

Content validity was established through review by a panel of three maternal-health experts, and the questionnaire was piloted with 30 pregnant women (10% of the target sample) to assess clarity, comprehension, and administration time before full-scale data collection. Internal consistency of the scale was acceptable (Cronbach's $\alpha \geq 0.7$), and item-total statistics indicated that items on adequate diet in pregnancy, urine testing, malaria prevention, weight and height monitoring, and infant care after birth showed the strongest item-total correlations, with alpha-if-item-deleted values consistently between 0.711 and 0.720, indicating that no single item disproportionately affected scale reliability. Face and content validity were further supported through review by a panel of senior obstetricians, gynecologists, and public health experts for item appropriateness. Interviews were conducted face-to-face in a private consultation room by the principal researcher, trained in standardized interview technique, and took approximately 15 minutes per participant.

Data were analyzed using SPSS version 26. Descriptive statistics (frequencies and percentages) summarized socio-demographic characteristics and item-level awareness responses. Because the poor-awareness category comprised only 2 of 299 valid cases, cross-tabulations of awareness category against each socio-demographic and obstetric variable produced expected cell counts below 5 in 33-39% of cells across all seven variables, violating the assumptions required for a valid chi-square test of independence (22). Fisher's exact test, which does not rely on the large-sample chi-square approximation and remains valid under sparse-cell conditions, was therefore used as the primary test of association for all seven variables, applied uniformly rather than selectively. Statistical significance was set at $p < 0.05$.

RESULTS

The demographic findings (Table 1) of the present study showed that participants were relatively evenly distributed across five age groups, with the largest group aged 40 years and above (21.0%, $n=63$). From educational perspective, illiterate and primary-educated women each comprised the largest share (20.7%, $n=62$ each), while women with a bachelor's (9.7%, $n=29$) or master's degree (10.0%, $n=30$) formed the smallest groups. Most participants were housewives (59.7%, $n=179$), with the remainder employed (40.3%, $n=121$). Socioeconomic status was fairly evenly distributed across the five strata, ranging from 19.7% (upper-middle and middle class, $n=59$ each) to 20.3% (lower-middle and lower class, $n=61$ each). Most women were in their second trimester (40.0%, $n=120$) or first trimester (39.0%, $n=117$) at the time of data collection, with fewer in the third trimester (21.0%, $n=63$). The majority were primigravida (59.0%, $n=177$) rather than multigravida (41.0%, $n=123$). Regarding ANC booking, most women booked their first visit between 8 and 10 weeks of gestation (28.7%, $n=86$), while smaller proportions booked very early (2-8 weeks: 11.3%, $n=34$) or comparatively late (20-24 weeks: 19.0%, $n=57$; 24-28 weeks: 1.7%, $n=5$).

Table 1. Demographic and Obstetric Characteristics of Participants (N=300)

Variable	Category	n	%
Age (years)	20-24	59	19.7
	25-29	58	19.3
	30-34	59	19.7
	35-39	61	20.3
	40 and Above	63	21.0
Educational Status	Illiterate	62	20.7
	Primary	62	20.7
	Secondary	60	20.0
	Higher Secondary	57	19.0
	Graduate	29	9.7
	Masters	30	10.0
Occupational Status	Housewife	179	59.7
	Employed	121	40.3
Socioeconomic Status	Upper Class	60	20.0
	Upper Middle Class	59	19.7
	Middle Class	59	19.7
	Lower Middle Class	61	20.3
	Lower Class	61	20.3
Gestational Age	First Trimester	117	39.0
	Second Trimester	120	40.0
	Third Trimester	63	21.0
Gravida	Primigravida	177	59.0
	Multigravida	123	41.0

Variable	Category	n	%
ANC Booking (Gestational Age)	2-8 Weeks	34	11.3
	8-10 Weeks	86	28.7
	10-16 Weeks	59	19.7
	16-20 Weeks	59	19.7
	20-24 Weeks	57	19.0
	24-28 Weeks	5	1.7

Of the 300 enrolled participants, 299 (99.7%) provided complete awareness data. The majority demonstrated good awareness of ANC (55.0%, n=165), 44.0% (n=132) demonstrated moderate awareness, and only 0.7% (n=2) demonstrated poor awareness (Table 2). Combined, 99.3% of participants achieved at least moderate awareness, indicating that outright poor awareness was rare in this population, though a substantial minority (44.0%) fell short of the good-awareness threshold.

Table 2. Level of Antenatal Care Awareness Among Pregnant Women

Awareness Level	n	% (Valid)	% (Total, N=300)
Poor (<50%)	2	0.7	0.7
Moderate (50-75%)	132	44.1	44.0
Good (≥75%)	165	55.2	55.0
Total (Valid)	299	100.0	99.7
Missing	1	-	0.3

Item-level analysis of the 20 ANC awareness questions revealed considerable variation in knowledge across specific topics (Table 3). Awareness was highest for exclusive breastfeeding (84.7% high/very high awareness), environmental hygiene (80.0%), personal hygiene (79.7%), care of the baby after birth (73.3%), and antenatal class attendance (73.0%). In contrast, awareness was lowest for harmful practices in pregnancy (42.0% high/very high; 27.4% low/very low), danger signs in pregnancy (46.7% high/very high; 30.4% low/very low), and the importance of tetanus toxoid vaccination (56.7% high/very high; 15.3% low/very low). Moderate awareness gaps were also observed for blood pressure monitoring, weight and height monitoring, and prevention of infection in pregnancy, each with 9-11% of participants reporting low or very low awareness.

Table 3. Highest- and Lowest-Scoring Antenatal Care Awareness Items

ANC Awareness Item	High/Very High Awareness (%)	Low/Very Low Awareness (%)
Highest-scoring items		
Exclusive breastfeeding	84.7	6.3
Maintenance of environmental hygiene	80.0	2.3
Maintenance of personal hygiene	79.7	5.3
Care of the baby after birth	73.3	7.0
Antenatal schedule classes	73.0	8.6
Lowest-scoring items		
Harmful practices in pregnancy	42.0	27.4
Danger signs in pregnancy	46.7	30.4
Importance of tetanus toxoid	56.7	15.3
Prevention of infection in pregnancy	58.7	15.0
Malaria prevention in pregnancy	62.0	9.3

Because expected cell counts fell below 5 in 33-39% of cells across all seven cross-tabulations (a direct consequence of the small poor-awareness category, n=2), Fisher's exact test was used as the primary test of association between overall ANC awareness category and each socio-demographic and obstetric variable, applied uniformly across all seven variables (Table 4). Three variables were significantly associated with awareness level: timing of ANC booking (Fisher's exact p<0.001), socioeconomic status (p=0.047), and current gestational age (p=0.034). Women who booked their first ANC visit early (4-8 or 8-12 weeks) showed a markedly higher

proportion of good awareness (65.1% and 70.7% respectively) compared with those who booked later (20-24 weeks: 41.7% good; 24-28 weeks: 31.3% good), a monotonic decline consistent with progressively less awareness among later bookers. Awareness also varied by socioeconomic status, though not as a simple linear gradient: good awareness was highest among the lower class (77.8%) and middle class (59.3%), and lowest among the upper-middle (41.7%) and lower-middle (40.0%) strata, with the upper class intermediate (51.5%), a non-monotonic pattern indicating that socioeconomic position influences awareness in this population without a straightforward "higher status, higher awareness" relationship. Current gestational age showed a clearer, monotonic gradient: good awareness was highest among women in their first trimester (61.7%), intermediate in the second trimester (55.6%), and lowest in the third trimester (39.2%).

Table 4. Association Between Antenatal Care Awareness and Socio-Demographic/Obstetric Variables (Fisher's Exact Test, Primary; Chi-Square Shown for Reference)

Variable	Fisher's Exact p	χ^2 (df)	Association
Age	0.583	4.539 (6)	Not Significant
Educational Status	0.067	14.173 (10)	Not Significant
Occupational Status	0.136	3.375 (2)	Not Significant
Socioeconomic Status	0.047	13.753 (8)	Significant
Gestational Age	0.034	8.712 (4)	Significant
Gravida	0.737	1.180 (2)	Not Significant
ANC Booking (Gestational Age)	<0.001	55.135 (10)	Significant

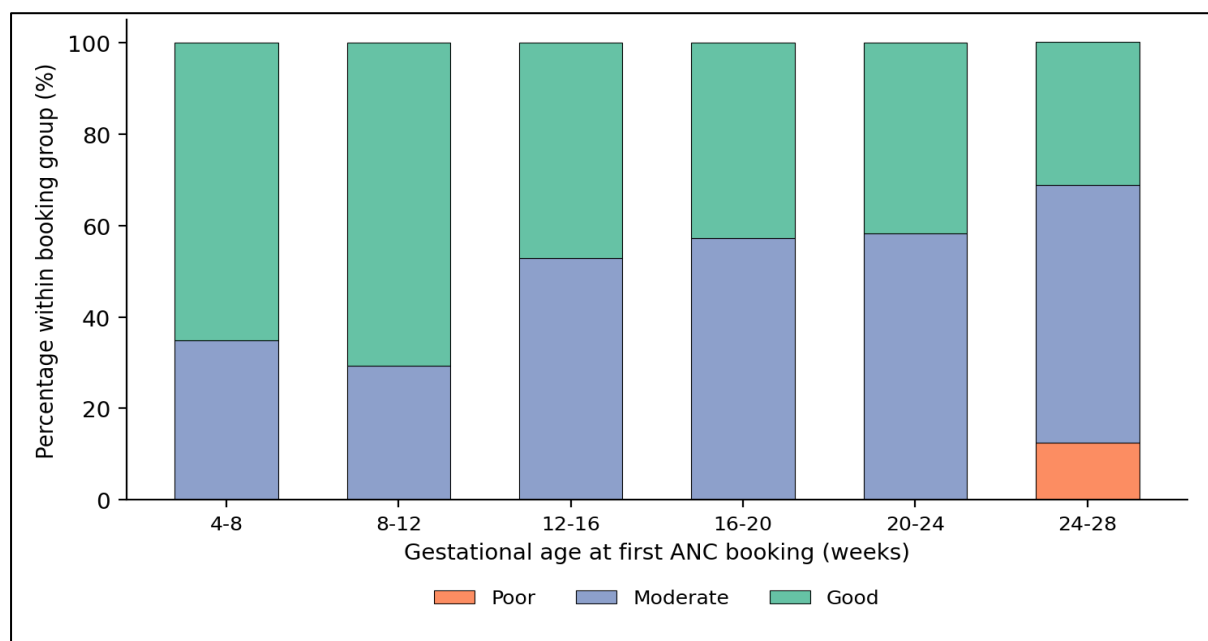


Figure 1: Good ANC Awareness by Socioeconomic Status & Gestational Age

Four variables showed no statistically significant association with awareness at the $\alpha=0.05$ threshold: age ($p=0.583$), education ($p=0.067$), occupational status ($p=0.136$), and gravidity ($p=0.737$). The age finding corrects an internal data-entry duplication identified in the underlying dataset, in which the Age row had been erroneously assigned the ANC Booking row's chi-square statistics; this was recalculated directly from the raw age-by-awareness cross-tabulation using both chi-square ($\chi^2=4.539$, $df=6$, $p=0.604$) and Fisher's exact tests, both confirming no association. Education approached but did not reach the significance threshold ($p=0.067$), representing a borderline trend rather than a confirmed association.

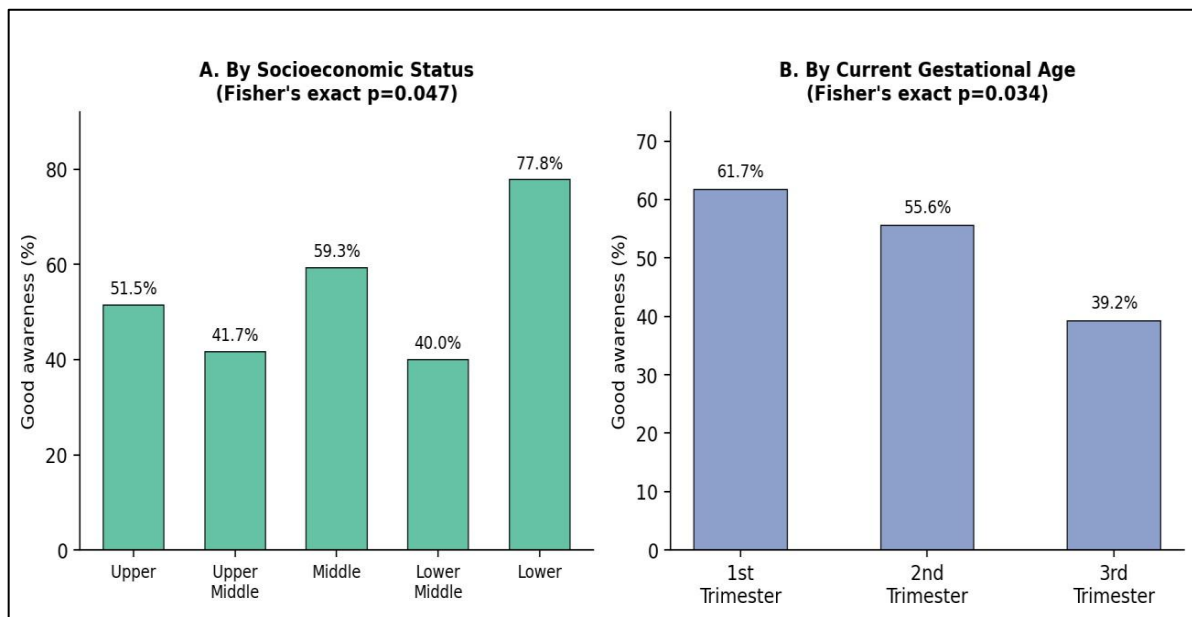


Figure 2: ANC Awareness Level by Timing of 1st ANC Booking ($\chi^2= 55.135$, $df= 10$, $p<0.001$)

In summary, four key findings emerged from this analysis. First, overall ANC awareness among this population was predominantly good to moderate, with negligible poor awareness (0.7%). Second, item-level awareness was highly uneven, with near-universal knowledge of routine care topics (breastfeeding, hygiene) but substantial deficits in danger-sign recognition and awareness of harmful practices, the two areas most directly relevant to preventing maternal mortality. Third, using Fisher's exact test as the primary, uniformly applied test of association, three variables were significantly associated with overall awareness i.e. timing of ANC booking, socioeconomic status, and current gestational age. Fourth, age, education, occupational status, and gravidity showed no statistically significant association with awareness in this sample, with education approaching but not reaching the significance threshold.

DISCUSSION

The finding of the present study i.e. 55.0% of participants demonstrated good awareness and a further 44.0% demonstrated moderate awareness, with poor awareness essentially absent (0.7%), indicates that the healthcare system serving this peri-urban population is succeeding in disseminating general ANC knowledge. This is consistent with comparable Pakistani tertiary-hospital settings, where structured ANC education has been shown to meaningfully improve maternal knowledge scores (23), and aligns with evidence from India that facility-based contact itself functions as an important vehicle for health information transfer (7).

Item-level results' pattern i.e. strong general knowledge coexisting with a specific deficit in emergency-recognition knowledge, closely mirrors findings from rural Uganda, where fewer than half of ANC-attending women could identify multiple obstetric danger signs despite near-universal facility contact (5), and from a Pakistani cohort in which women could typically name only one or two danger signs rather than demonstrating comprehensive understanding of obstetric emergencies (24). The clinical significance of this gap is substantial. Under the classic "three delays" framework, the first and often most fatal delay in maternal mortality is the delay in deciding to seek care, a delay directly driven by failure to recognize that a complication is occurring (19). A woman unable to distinguish ordinary pregnancy discomfort from the warning signs of pre-eclampsia or antepartum hemorrhage may not mobilize family or financial resources for timely care, regardless of how close or well-equipped the nearest tertiary facility is. The present findings therefore suggest that current ANC education in this setting functions well as a platform for routine health maintenance messaging but less effectively as an early-warning system, a distinction with direct implications for maternal mortality that general awareness statistics alone would obscure.

According to the present study findings, women who booked their first ANC visit early (4-12 weeks) showed substantially higher rates of good awareness (65-71%) than those who booked later (20-28 weeks: 31-42% good), a monotonic pattern consistent with a cumulative-exposure explanation; each ANC visit is an opportunity for health education, so earlier engagement affords more visits and a longer educational window before delivery. This finding is consistent with broader evidence that the timing of first contact with the health system, rather than demographic profile alone, is a primary determinant of the knowledge a woman ultimately accumulates during pregnancy (25). Practically, this makes timing of ANC booking a rare and valuable finding for intervention design;

it is the strongest of the three significant associations and, unlike socioeconomic status, is a specific, directly modifiable behavior that community-level and facility-level interventions can target.

Socioeconomic status was also significantly associated with awareness, good awareness was highest among the lower class (77.8%) and middle class (59.3%), and lowest among the upper-middle (41.7%) and lower-middle (40.0%) strata. This pattern diverges from the straightforward "higher socioeconomic status, higher awareness" relationship often assumed in the literature, and instead may reflect differential exposure to public-sector health messaging. Women from the lowest-income stratum attending a subsidized public tertiary hospital may rely more heavily on, and therefore absorb more from, facility-based counseling than lower-middle and upper-middle class women, who may divide their care-seeking between public and private providers and receive less consistent messaging from any single source (10). This pattern underscores that socioeconomic status shapes awareness through the specific care pathway a woman follows, not merely through income itself.

Current gestational age at the time of the survey showed a clearer, monotonic gradient, with good awareness highest among women surveyed in their first trimester (61.7%), intermediate in the second (55.6%), and lowest in the third (39.2%). At first inspection this appears counterintuitive, since women further along in pregnancy have had more opportunity for cumulative ANC exposure. Women who present late for their first visit are more likely to be captured in a later trimester without yet having had their awareness reinforced by repeated contact, while women booking and attending early are proportionally over-represented among first-trimester respondents. This finding should therefore be interpreted as intertwined with, rather than independent of, the booking-timing association, and is less directly actionable on its own than the booking finding itself.

Age, education, occupational status, and gravidity showed no statistically significant association with awareness. Education showed a borderline trend ($p=0.067$) that did not reach the conventional threshold, which runs counter to evidence from India, where maternal education was a strong predictor of ANC-related knowledge (7). Because this hospital already achieves high average awareness across all educational strata, education's typical explanatory power over awareness may be attenuated in this specific, already well-informed population. Age showed no association with awareness, likewise gravidity, suggests that repeated pregnancy exposure alone does not guarantee cumulative learning, reinforcing that the quality and content of each ANC encounter, not merely its repetition, drives awareness.

CONCLUSION

Taken together, these findings point to a clear set of implications for maternal health practice in this setting. First, generic ANC counseling should be supplemented with structured, repeated messaging focused specifically on emergency recognition, ideally using interactive or visual formats given the literacy variation in this population, rather than relying on verbal listing of symptoms during routine visits (23,26). Second, interventions aimed at encouraging earlier first-visit engagement, through community outreach, first-trimester incentives, or targeted messaging to newly pregnant women, represent a direct and evidence-supported lever for improving population-level awareness. Community health worker models have shown feasibility for this kind of early engagement in comparable Pakistani settings (13), and given the peri-urban, high mobile-connectivity profile of this population, mobile-based reminders and educational content may offer a scalable complementary channel for reinforcing early booking and danger-sign knowledge specifically (27). Third, the significant but non-monotonic socioeconomic pattern suggests that counseling intensity should not be assumed to scale simply with income; lower-middle and upper-middle class women, who showed the lowest good-awareness rates despite not being the most disadvantaged group, may be a specific subgroup worth targeted attention rather than assuming that only the lowest-income women require additional support.

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