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Factors associated with late antenatal care booking in selected health facilities of Zoba Maekel, Eritrea: a cross-sectional study

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Abstract

Background Antenatal care is a special care provided for pregnant women with the aim of preventing, detecting, and treating health problems in both the fetus and mother. Early antenatal care attendance promotes early detection and treatment of complications which result in proper management during delivery and puerperium. However, the majority of pregnant women in Eritrea initiate their ANC booking late. The study aims to assess factors associated with late ANC booking among pregnant mothers attending selected antenatal care services in Zoba Maekel, Eritrea.

Method A health facility based cross-sectional study was conducted from February to March 2022 among 439 pregnant women. To select the study participants, a stratified two-stage cluster sampling method was employed and a predesigned and pretested questionnaire was used to collect data regarding factors associated with late antenatal booking. Binary logistic regression analysis was used to assess the association between the outcome variable and the independent variables and a *P*-value less than 0.05 was considered statistically significant.

Result The prevalence of late antenatal care booking was 59% (95% CI 0.54–0.64). Those aged 20–34 years (AOR: 0.26; 95% CI: 0.15–0.44), 34 and above (AOR: 0.21; 95% CI: 0.11–0.33), and those who were unemployed (AOR: 0.45; 95% CI: 0.34–0.59) had decreased odds of late first ANV booking. Having family size of 4 and above (AOR: 2.25; 95% CI: 1.07–4.74), reside in rural areas (AOR = 2.20, 95%, CI: 1.38–3.50), from Muslim religion (AOR = 2.11, 95%, CI: 1.70–2.62), with gravida 2 to 4 (AOR = 2.11, 95%, CI: 1.70–2.62) and gravida 5 and above (AOR = 3.11, 95%, CI: 2.26–4.27) had higher odds of late antenatal care initiation. The odds of late ANC initiation was 1.62 among ANC visitors yet not accompanied by their husband to health center (AOR = 1.62, 95% CI 1.35–1.95).

Conclusion This study showed that most pregnant women did not start ANC booking earlier. Further, the study indicated that younger age, rural settlements, family size ≥ 4, from Muslim religion, employees, gravida 4 to 9, and those who did not get husband/family support to ANC follow-up, were highly likely to initiate ANC booking late. Hence, it is crucial to provide health education on the timing of ANC among women of reproductive age. The community's awareness of the importance of receiving early ANC also needs to be promoted.

Keywords Antenatal care, Late antenatal care booking, Pregnant women, Associated factors

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Background

Globally, pregnancy and childbirth-related complications are contributing to significant public health problems [1]. Several reports showed that despite efforts to reverse the trend, the burden is high in developing countries, accounting for 99% of the global maternal deaths in 2015, with the sub-Saharan Africa (SSA) region contributing 66% of the mortality [2]. In the sustainable development goals (SDG 3), maternal mortality reduction remains a priority agenda. Nevertheless, it continues to be a global challenge with 275,288 deaths due to pregnancy related complications in 2015. Antenatal Care (ANC) creates a good opportunity to deliver interventions for improving maternal and neonatal health [3].

Antenatal care is a key maternal service rendered for pregnant women by skilled health care professionals to ensure the best health conditions for both the unborn baby and the mother [4, 5]. According to World Health Organization (WHO) 2016 ANC model pregnant women should start their first antenatal care within 12 weeks of gestational age, with subsequent contacts taking place at 20, 26, 30, 34, 36, 38 and 40 weeks' of gestation [5, 6], but many pregnant women start their first ANC late.

Several studies have concluded that initiation of ANC at the recommended time has the benefit of early detection and treatment of complications during pregnancy [4]. According to a systematic analysis by the United Nation (UN) maternal mortality estimation inter-agency group from 1990 to 2015 [7], ANC is one of the four pillars of the initiative for safe motherhood. Provision of iron and folic acid supplementation could minimize or avoid adverse pregnancy outcomes if provided during the first 12 weeks of pregnancy [5]. Previous studies showed that pregnant women attending ANC visits receive sufficient evidence-based clinical interventions, such as emergency preparedness, tetanus toxoid immunization, iron and folic acid supplements, counseling on maternal health, and administration of antiretroviral therapy in HIV-positive women.

Women who start their ANC late have a higher rate of maternal and neonatal mortality [8, 9]. Many pregnant women who reside in SSA initiate their first antenatal care booking late, mostly in the second and third trimester [10, 11]. Hence, late antenatal care booking makes it difficult to successfully implement routine ANC strategies that improve maternal well-being and good prenatal outcomes [11–13]. According to several previous studies, there are factors associated with late ANC booking, these include previous history of home delivery; had no past history of ANC follow-up; poor knowledge about ANC; having family size of >4; maternal age >25 years; being housewife; self-employment; rural settlers; gravida; women with no education, those who did not get husband support; those who perceived the right time of booking beyond 12 weeks of pregnancy; those who didn't get information on correct time of ANC initiation; and unplanned pregnancy [4, 5, 14–16].

Early first antenatal consultation during pregnancy is important to identify women at risk of complications. However, the timing of early ANC booking in most developing countries is still a problem making the accomplishment of WHO recommendation of eight contacts before delivery difficult [17].

In Eritrea, according to the national five year Health Management Information System (HMIS) report, 2015–2020, late ANC booking coverage was reported as 79.8% (2015), 78.1 (2016), 77.3% (2017), 77.2% (2018) and 78.4% (2019). So, the report clearly shows that late ANC booking is a public health problem in Eritrea. Apart from the national HMIS annual report, no research was conducted concerning the factors associated with late ANC booking in the study area. Therefore, the study aimed to assess the magnitude and factors associated with late ANC booking. The findings of this research will be used to make valuable recommendations about how to overcome the challenges of late ANC booking. The information will further provide evidence for the identification of those factors contributing to the gaps in the implementation of ANC services and will fill the policy gaps towards improving ANC services.

Methods

Study design

Health facility based cross-sectional study design was conducted from January 01, 2022 to March 30, 2022.

Study area

The study was conducted in selected health facilities of Zoba Maekel, the largest settlement in Eritrea, with a population of around 608,120 people. In this region, 34 health facilities provide ANC services. Of these, 1 is a community hospital, 6 are health centers, and 27 are health stations. The expected catchment population of pregnant women, which is 4% of the total, is estimated at around 24,324.

Study population

The study population was all pregnant women who attended ANC in the selected health facilities of Zoba Maekel. All pregnant mothers who resided in the study area for a minimum of 6 months, and were willing to participate in the study were used eligibility criteria to include in the study. Those who had unknown gestational age, and who were sick were excluded from the study.

Sample

Sample size

The sample size was determined using a single population proportion formula for a cross-sectional study. The assumptions considered were as follows: Z, standardized normal distribution value for the 95% confidence interval (CI), which is 1.96; p, an estimate of the level for the population of women with late ANC booking (77% =0.77) in zoba Maekel obtained from the report by the Ministry of Health of the state of Eritrea (MoHE, 2018); and *d*, the margin of error taking as 5.0% which gave 272. After considering 1.5 design effects and adding 5% for non-respondents the sample size was taken as 428. Since there were 11 clusters and 40 respondents per cluster, the final sample size obtained was 440. Based on the previous three months' report of ANC attendance in the 34 health facilities in Zoba Maekel, a total of 3561 pregnant women received ANC service. Of these, 2492 were from urban and the rest 1069 were from rural areas. By taking the three month report of ANC visit load in health facilities, we allocated the required sample size using the proportional to sample size among the health facilities (Table 1).

Sampling procedure

A stratified two-stage cluster sampling method was used during the selection of health facilities. First, Zoba Maekel was stratified into two strata, rural and urban. Two-stage sampling techniques were used, in the first stage; the cluster-sampling technique was used. The sampling was done with proportionate allocation of size to the study populations in the health facilities located in rural and urban areas. Clusters were selected from the sampling frame, which consisted of the health facilities from which the sample was selected. Out of the seventeen health facilities from the urban areas known as clusters, 7 health facilities (Edaga Hamus Community Hospital, Edget Health Center, Maitemenay Health Station, Godaif Health Station, Godaif Community Hospital, Addis Alem Health Center and Akriya Health Station) were selected using a systematic random sampling technique. Due to the high number of ANC attendance a total of 80 participants were selected from Edaga Hamus Community Hospital which was as double as the total participants selected from every health facility. Moreover, out of the seventeen health facilities or clusters from the rural areas, 3 health facilities (Tsaeda Krstian Health Center, Adi Gaedad Health Center and Emba Derho Health Station) were selected using a systematic random sampling technique in the first stage. In the second stage, 40 pregnant women were selected from each of the selected health facilities using a convenient sampling technique (Fig. 1).

Data collection

Data was collected using an interviewer-administered structured questionnaire. The questionnaire contains closed-ended questions, and the questions were organized under the main research objective for this study. The questionnaire used in the data collection was derived from related questions used in similar studies [5].

Research variables

Dependent variables

In this study, the outcome variable "late initiation of ANC" was constructed by the women's self-reported answers. Participants who attended their first ANC in less than or equal to 12 weeks of gestation were coded as "0" and were considered early for ANC booking. Whereas, those who attended their first ANC >12 weeks were coded as "1" and were considered late for ANC booking.

Independent variables

In the present study, the explanatory variables used were selected based on the existing literature in similar studies about late initiation of ANC booking [1, 4, 5]. These were broadly grouped in to three groups namely: Socio-demographic characteristics of the respondents, obstetric-related factors, as well as women's empowerment and knowledge factors.

Socio-demographic factors of the participants included: age (< 20, 20–34, and >34 years); residence

Table 1 Sample allocation of pregnant women in the health facilities

Stratified in to urban and rural areas	Total No of ANC clients seen Jan, Feb, Mar 2021	Proportional allocation of size	Number of health facilities selected
Urban	2492	2492/3561 = 0.6998 0.6998 * 428(sample size) = 300	Given 40 participants to be included: 40/428 = 10.7 ≈ 11 health facilities were selected from the total 34 health facilities that is 8 health facilities from Urban areas and 3 health facilities from Rural areas
Rural	1069	1069/3561 = 0.3002 0.3002 * 428(sample size) = 128	
Total	3561	428	10

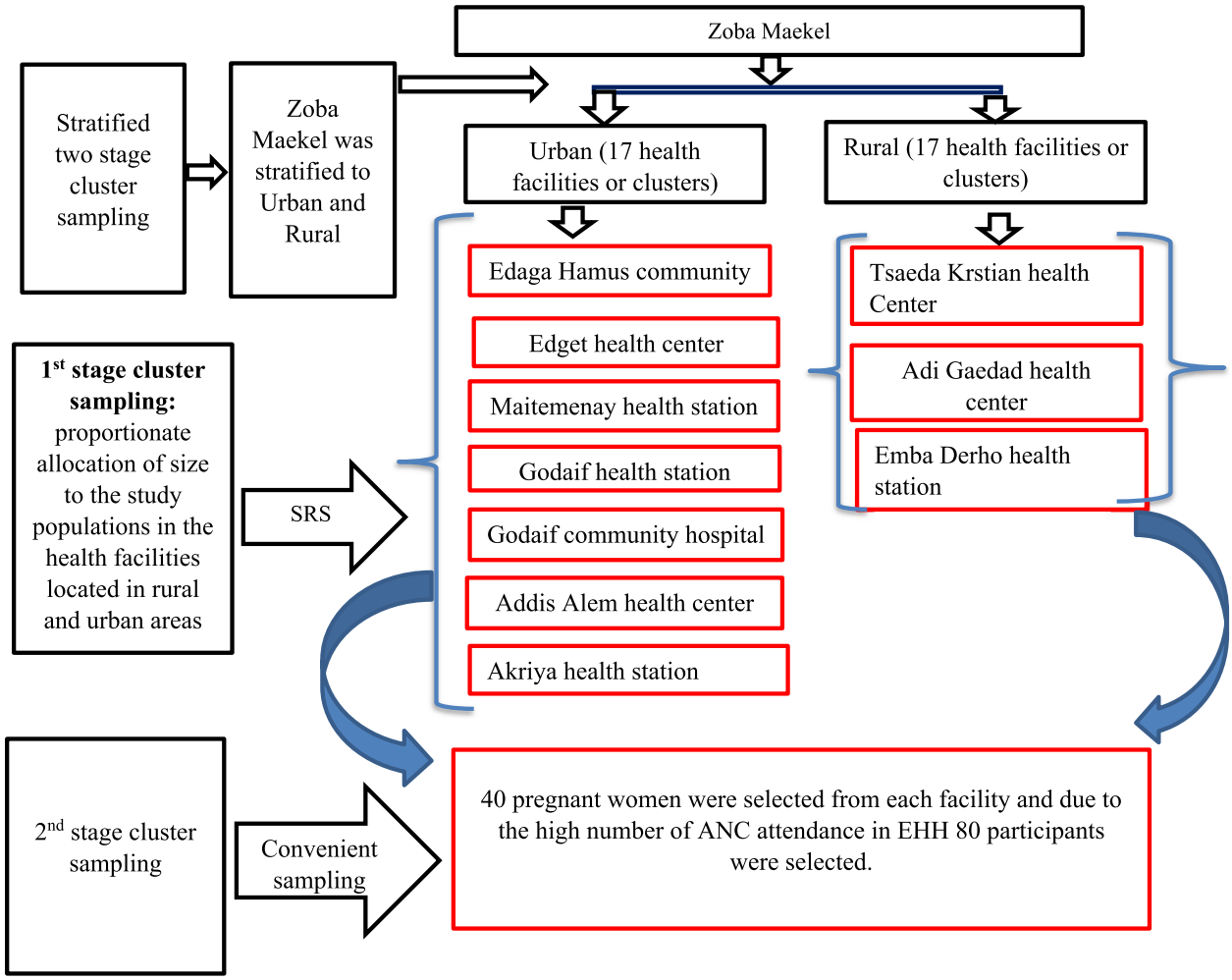

Fig. 1 The schematic presentation of sampling procedures. SRS = Simple Random Sampling

(urban and rural); marital status (married, and unmarried); religion (re-categorized in to Christian, and Muslim); ethnicity (re-grouped as "Tigrigna" and "others"); occupation (Housewife, private employee, and government employee); and educational level (grouped as primary, junior, secondary, and tertiary). We also assessed the proximity of the home from the health facility (< 30 min and ≥ 30 min) and family size (≤ 3 and ≥ 4). Additionally, partners' characteristics were assessed using two measures: partners' educational level (re-categorized ≤ 8 th grade, 9 th- 12 th grade, > 12 th grade) and partners' occupation (re-grouped in to private employee, government employee, soldier, and others).

In this study, obstetrical-related information was also included (for instance, number of pregnancies, planned pregnancy, information on when to start ANC, and accompany by husband or relatives). Factors linked to women's empowerment were ascertained by educational level, occupation, and decision-making power on general health and ANC follow-ups. The decision-making power was categorized in to three groups (respondent alone, husband alone, and jointly woman and her husband).

Pretest

Questionnaire pre-testing was conducted on randomly selected 20 pregnant women (5% of the total sample size) in November 2021 at one health facility that was not included in the study, for comprehensiveness and validity. The questionnaire was then assessed for its clarity and completeness. Some skip-patterns were corrected, questions difficult to ask were rephrased, and the consent form was modified.

Data processing & analysis

After each questionnaire was checked for its completeness and consistency, data was coded and entered into SPSS version 26 for further analysis. Descriptive statistics was used to show the frequency distribution of the

study population and the prevalence estimates of the late initiation of ANC. Bivariable logistic regression analysis was made using OR and 95% CI to assess the association of the independent variable with the outcome separately. Variables that were significant in the Bivariable logistic regression analysis at *p*-value < 0.05 were included in a multivariable logistic regression analysis to see the association of independent variables with late antenatal care booking after controlling confounders. Multicollinearity of the variables was tested using tolerance and the variance inflation factor (VIF). The test results indicate that none of the variables in the model had a tolerance threshold of less than 0.10, or a VIF of 10; actually, all VIF values were below 2. Goodness of fit of the model was assessed by using the Hosmer and Lemeshow goodness of fit test. The Independent variables that were significantly associated at *p*-value < 0.05 with late ANC booking in the multivariable logistic regression analysis were declared as significantly associated. The measure of association was calculated using an adjusted odds ratio (AOR) with a 95% confidence interval. A *P*-value less than 0.05 was taken as a significant level at the multivariable logistic regression analysis.

Results

Socio-demographic Characteristics

The sociodemographic characteristics of 439 pregnant women are presented in Table 2. Of the total research participants, most women were aged 20–34 years (83.6%), resided in urban areas (72.9%), Christian followers (86.6%), and from Tigrigna ethnic group (93.4%). With regard to marital status, and occupation, majority (96.1%, 76.5%) of the pregnant women were married, and unemployed, respectively. Educational level was re-categorized in to four groups: primary, junior, secondary, and tertiary. Most (60.2%) of them had a secondary

Table 2 Socio demographic characteristics of pregnant women who were attending ANC at selected health facilities of Zoba Maekel, January to March 2022 ($n = 439$)

Variables	Category	Total N (%)	Time of ANC booking	
			Early n (%)	Late n (%)
Age	< 20 years old	14 (3.2)	4 (2.2)	10 (3.9)
	20–34 years old	367 (83.6)	160 (88.9)	207 (79.9)
	> 34 years old	58 (13.2)	16 (8.9)	42 (16.2)
Residence	Urban	320(72.9)	149(82.8)	171(66)
	Rural	119(27.1)	31(17.2)	88(34)
Marital Status	Married	422 (96.1)	175 (97.2)	247 (95.4)
	Unmarried	17 (3.9)	5(2.8)	12 (4.6)
Religion	Christian	380 (86.6)	160 (88.9)	220 (84.9)
	Muslim	59 (13.4)	20(11.1)	39 (15.1)
Ethnicity	Others	29 (6.6)	11 (6.1)	18(6.9)
	Tigrigna	410 (93.4)	169(93.9)	241 (93.1)
Occupation	Unemployed	336(76.5)	128(71.1)	208(80.3)
	Employed	103(23.5)	52(28.9)	51(19.7)
Respondents Educational level	Primary	21 (4.8)	6 (3.3)	15 (5.8)
	Junior	99 (22.6)	37(20.6)	62 (23.9)
	Secondary	246(56.0)	90 (50.0)	156 (60.2)
	Tertiary	73 (16.6)	47(26.1)	26 (10.0)
Proximity of home from health facility	< 30 min	314 (71.5)	132 (73.3)	182 (70.3)
	≥ 30 min	125 (28.5)	48(26.7)	77(29.7)
Family size	≤ 3	235 (53.5)	122 (67.8)	113 (43.6)
	≥ 4	204 (46.5)	58(32.2)	146(56.4)
Husband Occupation	Private employee	172 (40.8)	68(38.9)	104 (42.1)
	Government Employee	106 (25.1)	52(29.7)	54 (21.9)
	Soldier	123 (29.1)	43 (24.6)	80(32.4)
	Others	21 (5.0)	12(6.9)	9 (3.6)
Husband Education	≤ 8th grade	75(17.8)	27 (15.4)	48 (19.4)
	9 th – 12th grade	249(59.0)	101(57.7)	148(59.9)
	> 12 th grade	98 (23.2)	47(26.9)	51 (20.6)

educational level, while a small fraction (4.8) of them had a primary educational level. More than half (53.5%) of the research participants had a family size less or equal to three.

Obstetrics characteristics of the study population

Of the total respondents, (68.1%) were multigravida and (31.9%) were primigravida. More than half (53.5%) of them were para 2 or less and the rest (46.5) were para 3 or more. Among the respondents who had a history of pregnancy before were asked for their ANC experience and (98.7%) reported that they had previous ANC follow up. Besides, (28.8%) had history of previous pregnancy complications. Out of those who had history of giving birth, (6.7%) had a history of stillbirth and (25.8%) had a history of abortion. Regarding the current pregnancy, (87.2%) of the study participant's pregnancy were planned and (12.8%) were not planned. Regarding information about when to start ANC and the source of the information, majority of the respondents (81.3%) had information and their main source of information was health workers. When the pregnant women were asked about the appropriate time to start ANC booking, majority (72.4%) of them answered correctly that the appropriate time of ANC booking is less than 12 weeks of gestation. Concerning decision-making on respondents' general health, the majority (80.9) replied jointly (their husband and themselves), while the least (5%) said that decision is made only by their husband. Additionally, most (69.7%) of the respondents were not accompanied by their partners or relatives in the current visit. The prevalence of late ANC booking at first visit were 59.0% (95%, CI: 0.54–0.64) (Table 3).

Percent of respondents by reason for late ANC booking (*n* = 259)

Figure 2 illustrates the reason mentioned by the respondents for late ANC booking. The reasons that they mentioned were: "misunderstanding of the right time of antenatal care booking and its purpose" 3.5%, "don't know that they were pregnant" 8.5%, "negligence" 37.4%, and "thought the right time" 50.6%.

Factors associated with the late first ANC visit

On bivariate analysis, socio-demographic factors found to be significantly associated with the late ANC booking at first ANC visit were age, residence, religion, education, occupation, family size, husband's occupation. Besides, obstetric factors: gravidity and husband/relative accompany her to the health facility for ANC follow up were significantly associated in bi-variable analysis (Table 4).

On multivariable analysis, age, residence, religion, employment and educational level of the respondent as well as family size and husband's occupation were significantly associated with the late booking of the first ANC visit. Women aged 20–34 years and those aged 34 and above had decreased odds (AOR: 0.26; 95% CI: 0.15–0.44 and AOR: 0.21; 95% CI: 0.11–0.33) of late first ANC visit as compared to the women aged less than 20 years. Those respondents living within a family size of four and above had 1.42 (AOR: 1.42; 95% CI: 1.15–1.77) times higher odds of late first ANC visit as compared to those who were living within three and less family size. Pregnant women who reside in rural areas were 2.2 times more likely to be late booking than women who reside in urban areas (AOR = 2.20, 95%, CI: 1.38–3.50). Moreover, pregnant women who were gravida 2 to 4 were 2.11 times higher to be late booking than the reference group, primigravida (AOR = 2.11, 95%, CI: 1.70–2.62). Likewise, respondents with gravida 5 and above were more likely to be late booking (AOR = 3.11, 95%, CI: 2.26–4.27). The odds of late ANC initiation was 1.62 among ANC visitors yet not accompanied by their husband to health center as compared to their counter parts (AOR = 1.62, 95% CI 1.35–1.95) (Table 5).

Discussion

In this study, almost all (98.7%) of the respondents had ANC follow-up in their past pregnancies. But, more than half 259(59%) of them start their first ANC booking beyond the recommended time, which is consistent with similar studies elsewhere [4, 6, 16, 18]. However, a higher prevalence was observed in other cross-sectional studies [1, 5, 14, 19, 20]. Besides, contrasted to the current study, a lower prevalence of late ANC booking was reported in Ghana 43%, and Cameron [21, 22]. This difference could be attributable to the socioeconomic status of women, access to ANC provision in these countries, methodological complexities of the studies, and timing differences between the studies as suggested in studies elsewhere [16, 21, 23]. Overall, the results of the current study suggest that the total ANC attendance is not encouraging with only 41% of the respondents initiate ANC early. This calls that there is still a room for improvement through population health campaigns for childbearing age women addressing the need for early ANC booking.

The finding of the current study is congruent with the study conducted in Tanzania that the majority (72.4%) of the participants knew the right time to start their first ANC, but only 41% booked early [24]. The reason for this could be that pregnant women might have less knowledge about the benefits of early booking and this suggests that theory does not always necessarily translate into practice. A study conducted in Niger Delta, Nigeria showed that although 73.3% of the research participants knew the right time to start ANC booking, no women

Table 3 Obstetric history of pregnant women who were attending ANC at selected health facilities of Zoba Maekel, Eritrea, January to March 2022 ($n = 439$)

Variables	Category	Total N (%)	Time of ANC Initiation	
			Early n (%)	Late n (%)
Gravida	One	140 (31.9)	82(45.6)	58(22.4)
	2–4	199(45.3)	72(40.0)	127(49.0)
	5–9	100(22.8)	26(14.4)	74(28.6)
Parity	≤ 2	160 (53.5)	60(61.2)	100 (49.8)
	≥ 3	139 (46.5)	38(38.8)	101 (50.2)
Had Still Birth	Yes	20 (6.7)	7 (7.1)	13 (6.5)
	No	279(93.3)	91(92.9)	188 (93.5)
Had abortion	Yes	77 (25.8)	28(28.6)	49 (24.4)
	No	222 (74.2)	70(71.4)	152 (75.6)
Had ANC follow up past pregnancy	Yes	295 (98.7)	95(96.9)	200 (99.5)
	No	4 (1.3)	3(3.1)	1(0.5)
Complication last pregnancy or delivery	Yes	86 (28.8)	30(30.6)	56 (27.9)
	No	213(71.2)	68(69.4)	145(72.1)
Means of recognizing current pregnancy	Missed menses	94(21.4)	39(21.7)	55(21.7)
	Urine Test	345(78.6)	141(78.3)	204(78.8)
Panned pregnancy	Yes	383(87.2)	163(90.6)	220(84.9)
	No	56(12.8)	17(9.4)	39(15.1)
Informed when to start ANC	Yes	357(81.3)	141(78.3)	216(83.4)
	No	82(18.7)	39(21.7)	43(16.6)
Source of information	Health worker	286(80.1)	108(76.6)	178(82.4)
	Friends/relatives	44(12.3)	20(14.2)	24(11.1)
	Mass Media	27(7.6)	13(9.2)	14(6.5)
When do think is the appropriate time for ANC Initiation	≤ 12 weeks of gestation	318(72.4)	170(94.4)	148(57.1)
	> 12 weeks of gestation	121(27.6)	10(5.6)	111(42.9)
Ambulance service	Yes	220(50.1)	96(53.3)	124(47.9)
	No	219(49.9)	84(46.7)	135(52.1)
Decision maker on general health and ANC follow ups	Respondent alone	62(14.1)	28(15.6)	34(13.1)
	Husband alone	22(5.0)	10(5.6)	12(4.6)
	Jointly	355(80.9)	142(78.9)	213(82.2)
Today Does your husband or relative accompany you	Yes	133(30.3)	70(38.9)	63(24.3)
	No	306(69.7)	110(61.1)	196(75.7)
Time of ANC initiation	-	439(100)	180(41.0)	259(59.0)

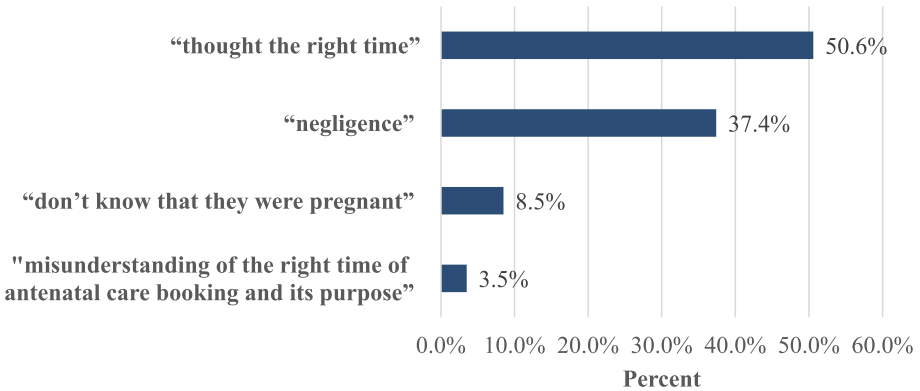

Fig. 2 Percent of respondents by reason for late booking

Table 4 Univariate analysis on socio-demographic and obstetric related factors associated with late ANC booking at first visit

Variables	Category	COR (95% CI)	*P*-Value
Age	< 20	1	
	20–34	**0.25(0.15–0.44)**	**< 0.001***
	> 34	**0.2(0.11–0.38)**	**< 0.001***
Residence	Urban	1	
	Rural	**2.17(1.78–2.65**)	**< 0.001***
Religion	Christian	1	
	Muslim	**1.51(1.18–1.92)**	**0.001***
Occupation	Unemployed	1	
	Employed	**0.46(0.35–0.6**)	**< 0.001***
Educational level	Primary	1	
	Junior	0.91(0.6–1.38)	0.66
	Secondary	1.3(0.87–1.95)	0.203
	Tertiary	**0.49(0.29–0.81)**	**0.006***
Family size	≤ 3	1	
	≥ 4	**1.43(1.15–1.78)**	**0.001***
Husband occupation	Private employee	1	
	Government employee	0.9(0.71–1.12)	0.342
	Soldier	**1.28(1.05–1.56)**	**0.014***
	Other	**0.59(0.41–0.84)**	**0.004***
Husband Education	≤ 8th grade	1	
	9 th- 12 th grade	1.06(0.78–1.46)	0.696
	> 12 th grade	1.05(0.81–1.36)	0.7
Gravida	One	1	
	2–4	**2.06(1.65–2.58)**	**< 0.001***
	5–9	**3.01(2.18–4.17)**	**< 0.001***
Planned pregnancy	Yes	1	
	No	1.17(0.9–1.51)	0.243
Informed when to start ANC follow ups	Yes	1	
	No	0.97(0.77–1.21)	0.758
Does your Husband/Family member accompany you today	Yes	1	
	No	**1.62(1.35–1.95)**	**< 0.001***

Result values are weighted

COR Crude odds ratio

* *P*-value < 0.25

had actually started their first ANC within the first 12 weeks of gestation [25].

In this study, the most common reason mentioned for late ANC booking was "perceived the right time" followed by negligence. Whereas, "misunderstanding of the right time of antenatal care booking and its purpose" was the least reported reason. In agreement with studies from Ethiopia and Tanzania [16, 24], the finding of the present study revealed that the highest (50.6%) reported reason for late ANC booking was that they thought it was the right time. However, contrasted to these studies, Matyukira and Roos [26] revealed that the majority (41.2%) were late for ANC visits mentioning that they were not aware of pregnancy followed by 31.4% who mentioned they were not aware of when to start ANC booking and the least 5.9% mentioned that it was not necessary and were lazy to attend. A study by Roberts et.al., from Malawi reported that pregnant women do not attend antenatal care early due to the fact that nurses were always shouting and yelling at clients [27]. Sakala M indicated in his study that 40% of respondents booked late because they were told that they were still early in the pregnancy [28].

In this study, women aged 20 years and above had lower odds of late first ANC visit than women aged less than 20 years. In line to this findings, Nyambe et.al, argued that teenagers (aged 15–19 years) are more likely to be unmarried and also may not understand the clinical

Table 5 Multivariable analysis on socio-demographic and obstetric related factors associated with late ANC booking at first visit

Variables	Category	AOR (95% CI)	*P*-Value
Age	< 20	**1**	
	20–34	**0.26(0.15–0.44)**	**< 0.001***
	> 34	**0.21(0.11–0.38)**	**< 0.001***
Residence	Urban	1	
	Rural	**2.18(1.80–2.65)**	**< 0.001***
Religion	Christian	1	
	Muslim	**1.52(1.19–1.93)**	**0.001***
Respondent Employment	Employed	1	
	Unemployed	**0.45(0.34–059)**	**< 0.001***
Educational level	Primary	1	
	Junior	0.90(0.60–1.36)	0.617
	Secondary	1.27(0.86–1.90)	0.235
	Tertiary	**0.48(0.29–0.77)**	**0.003**
Family Size	≤ 3	1	
	≥ 4	**1.42(1.15–1.77)**	**0.001***
Husband Occupation	Private employee	1	
	Government employee	0.89(0.72–1.09)	0.258
	Soldier	**1.28(1.05–1.55)**	**0.016**
	Other	**0.58(0.4–0.83)**	**0.003**
Gravida	One	**1**	
	2–4	**2.11(1.70–2.62)**	**< 0.001***
	5–9	**3.11(2.26–4.27)**	**< 0.001***
Does your Husband/Family member accompany you today to the ANC	Yes	1	
	No	**1.62(1.35–1.95)**	**< 0.001***

Result values are weighted

AOR Adjusted odds ratios

* *P*-value < 0.05

significance of early booking [14]. Emelumadu et.al, also noted that those older than 19 years were more likely to be married and feel anxious about the safety of their babies, hence, they started ANC booking early [29]. Contrary to the current findings, several studies elsewhere [1, 16, 30] found out that older respondents were more likely to be late for ANC booking than young women. Eyasu and his colleagues [1] stated that, since older mothers' confidence level increases after previous experience of pregnancy and childbirth, it is possible for older women to feel that early initiation of ANC is not necessary.

In this study, pregnant women residing in rural areas had higher odds of being late than those living in urban areas at multivariable logistic regression analysis. The reason for this could be that women residing in rural areas might not get transportation access and lack of road-blocks hinders their access to ANC. Moreover, since they are expected to travel long distance to reach the health facilities, they may wait until they get money for transportation. This finding is consistent with what was reported in a study done in Somalia whereby rural residents were 3 times more likely to start ANC late compared to those living in urban areas [31]. A study from Bangladesh also showed that rural settlers had lower utilization of early ANC than urban settlers did [32].

The better income that educated women has, empowered them to overcome transportation challenges and other indirect costs. Moreover, they can better understand the information given about ANC and its importance to their child and themselves. The current study showed that pregnant women with tertiary educational levels had lower odds to be late for ANC booking than the reference group, illiterate. Congruent to the current study, studies conducted in Uganda, and Ethiopia [19, 20, 33, 34] found that lack of education was a barrier to early initiation of ANC booking. In this study, unemployed mothers had decreased odds of late ANC booking than the reference group, employed. The possible reason could be that, busy work schedules and lack of enough time to go to the health facility were attributable to the employed pregnant women to start ANC late.

The present study demonstrated that pregnant women with a family size greater than or equal to four were 1.4 times more likely to initiate ANC lately than women with a family size 3 and lower. Similar findings from different parts of Ethiopia and Rwanda [15, 16, 35, 36] support the current findings. The possible reason for this could be explained by the financial constraints, which are more challenging with increasing family size. Additionally, the lengthy time that women spend caring for their children and the greater family size as a whole, and other household work might affect them to seek medical help at the right time.

The findings of the present study revealed that the strength of association increases with increase in the number of pregnancy that pregnant women with gravida 2–4 were 2.11 times more likely to be late booking than the reference group, primigravida. Similarly, respondents with gravida 5 and above were 3.11 times more likely to be late booking. In line to the current study, a study from South Africa revealed that mothers who were pregnant for the first time (AOR =0.56; 95% CI 0.34–0.94) were less likely to initiate ANC late [37]. The possible reason for these findings as explained by Isaac Banda et.al., could be that it is possible for multigravida women to feel more confident and comfortable with previous experience and feel that starting ANC booking early is not necessary [32].

Provision of proper information particularly by health professionals improves the timing of ANC attendance [16]. In this study, getting information on when to start ANC was not significantly associated with late initiation of ANC. In contrary to the current study, research done in Gondar north west-Ethiopia [16] showed that mothers who did not get information when to start ANC were nearly two times more likely to book late than those who got information. The findings of their study are supported by studies elsewhere [30, 38]. The results of this study revealed insignificant association between planning pregnancy and late ANC booking in the multivariable logistic regression analysis. However, several authors argued that women with unplanned pregnancies might deny the pregnancy [39] and try to terminate the pregnancy [40] both of which may delay presentation for ANC services before 12 weeks of pregnancy and could affect their health-seeking behavior. Studies elsewhere [4, 21, 37, 32] also showed that women who had unplanned pregnancies had increased odds of being late for ANC booking compared to mothers with planned pregnancy. The results of this study also revealed that pregnant women who were not accompanied by their husband during ANC follow up were more likely to start first ANC late compared to their counter parts. This finding is in vein with similar studies from Ethiopian [35, 41] and Tanzania [42]. The reason could be that in Eritrea men are more economically empowered, and more influential than their counterparts. The late booking for ANC, therefore, is likely to be attributed to the lack of encouragement and financial support that they are supposed to get from their partners, which could ultimately discourage pregnant women from seeking early ANC services.

Limitation of the study

This study found crucial factors for late initiation of ANC among pregnant women. However, we identified some limitations in the current study. Firstly, the cross-sectional nature of the study limits the temporal relationship between variables. Secondly, the study was a facility-based cross-sectional study whose findings are not generalized to the general population. Besides, the exclusion of pregnant women who attended antenatal care at private health facilities could lead to a lack of generalization. Thirdly, studies use different cutoff points to categorize women as late for ANC booking or early, making it difficult to compare our findings with other studies.

Conclusion

A majority of mothers in this study practiced late booking at ANC. It also indicated that, younger age, religion, rural settlements, family size of 4 and above, 2 or more pregnancies, and not accompanied by husband/family to the ANC follow-up, were statistically significant factors for late booking at ANC. Hence, the Ministry of Health and district health care providers should strengthen the health education provision on the importance of timely accessing ANC services through the media and community sensitization meetings. Future qualitative studies be conducted exploring the factors associated with late antenatal care booking in other public health facilities of Zoba Maekel. We also suggest further investigation of health system- related factors associated with late initiation of ANC among pregnant women.

Abbreviations

ANC	Antenatal Care
COR	Crude odds ratio
AOR	Adjusted odds ratio
WHO	World Health Organization

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Authors' contributions

TME, EET, FAM, IGT, MAT and GG conceived the research. TME edited, cleaned, analyzed, andinterpreted the data. TME, EET, FAM, IGT, MAT, and GG edited the data and then wrote the final report. KTS, TME, and GG edited the drafted article and the final version of the manuscript. All authors approved the final research.

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Data availability
Data used for analysis are available from the corresponding author upon reasonable, written request.

Declarations

Ethics approval and consent to participate
In accordance with the Declaration of Helsinki, the Orotta College of Medicine and Health Sciences (OCMH) and the Ministry of Health (MoH) research ethics and protocol review committee approved the study. Study participants were also informed about the objective of the study and written informed consent was obtained from each respondent.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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