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Original research

Delayed initiation of antenatal care and its associated factors among pregnant women visiting Hawassa City, South Ethiopia

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ABSTRACT

Background: *One of the primary measures for reducing maternal mortality in developing countries is the utilization of focused antenatal care. This study study assessed magnitude of delayed antenatal care initiation and factors associated among pregnant women visiting public health facilities in Hawassa, Southern Ethiopia.*

Method: *A cross-sectional study was conducted from 15 June to 15 August 2019. Three hundred ninthy two pregnant women were selected using a systematic random sampling. Data collection employed interviewer-administered, semi-structured questionnaires. It was entered into EpiData v3.1, and analyzed in SPSS v24. All variables that demonstrated a p-value below 0.25 during bivariable analysis were incorporated into the multivariable logistic regression. Statistical associations were interpreted as significant when the p-value was under 0.05.*

Results*: The magnitude of delayed antenatal care initiation was 57.7% (95% CI: 52.74-62.57%). Factors independently associated with late initiation included maternal age 31-35 years (AOR = 4.93, 95% CI: 1.70-14.27), lower husband education (AOR = 2.88, 95% CI: 1.17-7.31), no previous ANC attendance (AOR = 2.03, 95% CI: 1.20-3.43), presence of obstetric complications (AOR = 4.05, 95% CI: 2.06-7.96), unplanned pregnancy (AOR = 2.40, 95% CI: 1.23-4.68), lack of partner support (AOR = 2.47, 95% CI: 1.16–5.26), and decision-making by others rather than the woman herself (AOR = 0.40, 95% CI: 0.18-0.87).*

Conclusion*: Late initiation of antenatal care was high in the study area. Factors significantly associated with delayed ANC included maternal age, husband's education, lack of previous ANC experience, history of obstetric complications, unplanned pregnancy, limited maternal decision-making autonomy, and insufficient partner support. City health offices should encourage timely ANC attendance, increase public awareness about the importance of starting ANC early, and strengthen health education on pregnancy danger signs and their potential consequences.*

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INTRODUCTION

Due to several physiological changes that take place during pregnancy, both the woman and her unborn child face possibly life-threatening conditions (1). Numerous maternal health care services have been implemented in place to either avoid or lessen these issues. Focused antenatal care (FANC), which prioritizes individualized, timely, and women-centered care throughout pregnancy, is one of the main tactics intended to minimize maternal mortality in developing nations (2, 3).

Since every pregnant woman is thought to be at risk for potential complication under the FANC model, early ANC visits during the first trimester of pregnancy are suggested to guarantee the best possible care and enhance the health of both the mother and her unborn child (4, 5). In order to properly manage preterm labor, early visits aid in the precise assessment of gestational age (GA), which supports timely diagnosis and management of preterm labor. Additionally, they allow for early identification and treatment of iron deficiency anemia (IDA) and sexually transmitted infections (STIs), screening for genetic and congenital diseases, and starting folic acid supplementation to lower the risk of neural tube defects (NTD).

Additionally, early ANC offers a chance to counsel women on modifiable lifestyle risks like smoking, alcohol consumption, drug abuse, obesity, malnutrition, and occupational exposure, as well as to identify and manage modifiable existing health problems like heart disease, diabetes mellitus, hypertensive disorders, and HIV/AIDS (6-8). In addition, it is a great moment to counsel women about the advantages of child spacing, encourage them to seek postpartum care for themselves and their newborn, and highlight the advantages of skilled attendance during birth (9).

However, An estimated 10.7 million preventable maternal deaths occurred worldwide from 1990 to 2015. Developing nations account for around 99% (302,000) of all maternal deaths worldwide. About 66% (201,000) of maternal deaths occur in Sub-Saharan Africa (SSA) alone, with Ethiopia ranking among the top ten nations with high maternal mortality, accounting for nearly 58% of all maternal deaths worldwide (10).

Ethiopia's MMR decreased from 990 per 100,000 live births in 2000 to 420 per 100,000 live births in 2013 (18,19). The Federal Ministry of Health (FMOH) has introduced a number of measures, including ANC service, to further improve maternal, neonatal, and child health outcomes (11). Just 20% of women plan their first ANC initiation before 16 weeks of pregnancy, despite the fact that the percentage of women receiving ANC from a certified physician increased from 27% in 2000 to 62% in 2016 (12). Most women begin ANC in the second or third

trimester, and late ANC inititiation continues to be widely reported across different regions of the country (12-14).

Delayed initiation of antenatal care increases the likelihood of adverse pregnancy outcomes, including maternal and neonatal death (15). It can hinder or prevent the timely identification of serious maternal and fetal conditions, including hypertension, diabetes, anemia, antepartum hemorrhage, preterm labor, and intrauterine fetal death. Furthermore, women who begin ANC late may miss the opportunity to receive to receive folic acid supplementation during the first trimester, increasing the risk of a congenital neural tube defect and associated mortality. Additionally, pregnant women who are not screened ealry for infection such as syphilis and HIV may unknowingly transmit these diseases to the fetus, resulting in adverse fetal outcomes (16, 17).

Evidence regarding timing pregnant women in Hawassa City begin antenatal care is scarce; hence, this study sought to assess the magnitude and associated factors of delayed ANC initiation among women utilizing public health services in the city.

MATERIAL AND METHODS

Study setting and period

The study was conducted at public health facilities in Hawassa City from 15 June to 15 August 2019. Hawassa is the administrative capital of the Southern Nations, Nationalities and Peoples Regional State and lies approximately 275 kilometres south of Ethiopia's capital, Addis Ababa. There is one rural sub-city with eleven kebeles and seven urban sub-cities with twenty-one kebeles.

The estimated total population of Hawassa is 359,358, with a 1:1.06 male-to-female ratio. There are three public hospitals, 11 health centers, and 17 health posts in the city, and around 19,058 pregnant women are expected to receive antenatal care there each year.

Study design and population

A cross-sectional study was conducted within selected public health facilities in Hawassa City among pregnant women initiating antenatal care. The study population comprised all women who attended their first ANC visit at those institutions during the study period.

Pregnant women who were having their first ANC visit, had a known last normal menstrual period (LNMP), volunteered to participate, had lived in the study area for at least six months, and were able to participate in an interview both physically and intellectually were included. Women who were seriously ill during the data collection period or who visited the designated health facility for referral purposes were excluded.

Sample size determination and sampling procedure

The required sample size was calculated using the single population proportion

formula, applying a 95% confidence level, a 5% margin of error, and an expected prevalence of late ANC initiation of 61.2%. After adjusting for a 10% non-response rate, the final sample size was 402 (Figure 1). This study included all Hawassa city public health facilities that offered ANC services and categorised them into hospitals and health centres. Based on client flow, the computed sample size was then distributed proportionately among these facilities.

Tools and methods for data collection

Data collection employed a structured, pretested questionnaire derived from earlier studies. It was written in English, translated into Amharic, and pretested on five percent of the Adare Health Center. Questions that were confusing were clarified.

Seven BSc Degree midwives who were fluent in the local languages (Sidamagna and Amharic) employed an interviewer-administered questionnaire to gather data.

Continuous supervision was conducted at each health facility to ensure proper data collection and all completed questionnaire were checked to ensure they were complete. Throughout the procedure, data collectors received feedback to ensure the quality of the data.

Data management and analysis

Data were entered in EpiData 3.1 and exported to SPSS 24 for analysis. For continuous variables, mean ± SD was used. The multivariable logistic regression model contained variables that had a bivariable logistic regression $p < 0.25$. Effect estimates were presented as adjusted odds ratios with 95% confidence intervals, and statistical significance was considered at a p-value below 0.05. Model adequacy was assessed using the Omnibus test and the Hosmer–Lemeshow goodness-of-fit test. Results are displayed in tables, figures, and accompanying narrative.

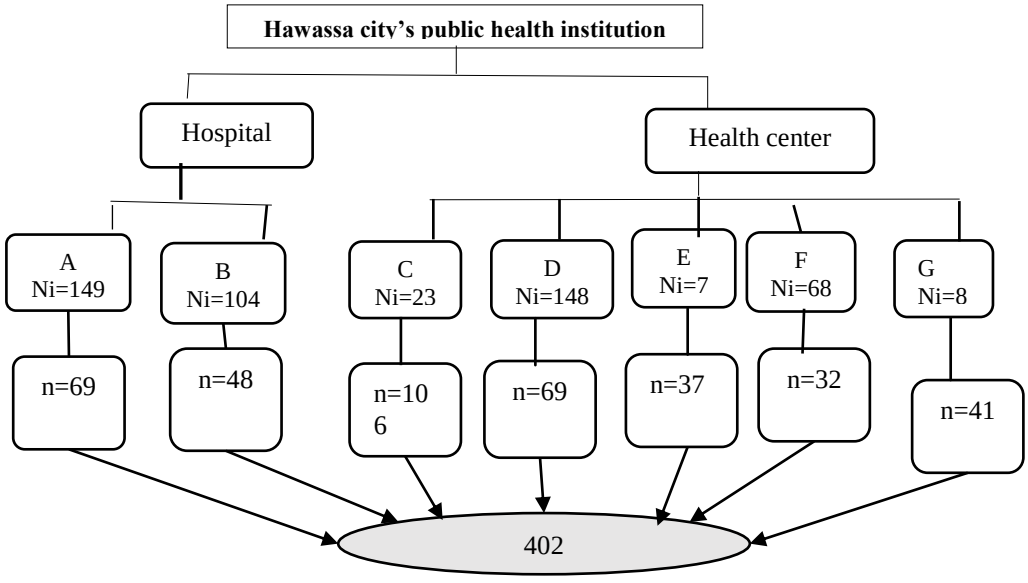

Figure 1: Schematic represenation of sampling procedure, 2019

RESULTS

Sociodemographic characteristics of the participants

Of the 392 pregnant women who took part (97.5% response rate), 202 (51.5%) were 25 years or younger with a mean age of 25.8 years (SD = 5.4).

Most were married 364 (92.9%) and 257 (65.6%) reside in urban areas. The average monthly income was 2174.5 ETB (SD = 1843.0), with the majority (64.5%) reporting a monthly income of ≤2000 ETB (Table 1**).**

Table 1. Participants' sociodemographic details, Southern Ethiopia, 2019 (n=392).

Variable	Characteristics	Frequency	Percent
Age in years	16-20	83	21.2
	21-25	119	30.4
	26-30	128	32.7
	31-35	36	9.2
	>35	26	6.6
Marital status	In Marriage	364	92.9
	Out of marriage*	28	7.1
Maternal	Unable to read and write	68	17.3
educational	Grade 1-8	155	39.5
	Grade 9-10	119	30.4
	Above grade 10	50	12.8
Husband	Unable to read and write	36	9.2
Educational	Grade 1-8	87	22.2
	Grade 9-10	123	31.4
	Above grade 10	146	37.2
Religion	Orthodox	99	25.3
	Protestant	193	49.2
	Muslim	97	24.5
	Others**	3	0.8
Occupation	Government employee	50	12.8
	Work in Private	44	11.2
	Housewife	253	64.5
	Student	39	9.9
	Others***	6	1.5
Family Size	≤4	278	70.9
	4-6	68	17.3
	>6	46	11.7
Monthly income	≤400	72	18.4
	400-1000	104	26.5
	1000-2000	77	19.6
	>2000	139	35.5
Monthly income	Urban	257	65.6
	Rural	135	34.4

=Single, Divorced and Widowed **= Catholic, * Merchant*

Obstetric and gynecologic history of the respondents

Of the total participants, 253 (64.5%) were multigravida. Of them, 171 (67.6%) had visited the ANC at least once and 173 (68.4%) had given birth at health facility. Previous pregnancy, labor, or delivery complications were reported by 69 (27.3%), while, Inhistory of child loss and still birth

was reported by 17 (6.7%) and 16 (6.3%) respectively (Table 2).

Table 2: Study participants' obstetric and gynaecologic characteristics, Southern Ethiopia, 2019, n=392

Variable	Characteristics	Frequency	Percent
Gravidity	Primigravida	139	35.5
	Multi-gravida (1-4)	179	45.7
	Grand multigravida (≥5)	74	18.9
Parity	≤3	192	75.9
	≥4	61	24.1
Number of alive children	No alive child	19	7.5
	≤4	176	69.6
	>4	58	22.8
History of Stillbirth	Yes	16	6.3
	No	237	93.7
History of Child loss	Yes	17	6.7
	No	236	93.3
History of abortion	Yes	55	21.7
	No	198	78.3
Type of previous abortion (n=55)	Spontaneous	28	50.9
	Induced	27	49.1
History of previous ANC follow up	Yes	171	67.6
	No	81	32.6
Previous ANC initiation time (GA) (n=171)	≤16	82	48.0
	>16	89	52.0
Current GA at ANC initiation among previous utilizer (n=171)	≤16	96	55.6
	>16	75	44.4
Number of ANC visit for previous pregnancy (n=171)	<4	103	61.2
	≥4	68	39.8
Previous history of institutional delivery	Yes	173	68.4
	No	80	32.6
Previous complications history	Yes	69	27.3
	No	184	72.7

Antenatal care Knowledge

Of the responders, 336 (85.7%) were aware of ANC. ANC visits were deemed crucial for both the mother and the foetus by 260 (66.3%) of them. Furthermore, 158 (40.3%) thought that each pregnancy required at least four ANC visits. Additionally, 243 (62.0%) knew when ANC should be started.

More than half (57.3%) of the respondents with the past ANC follow-up had visited a health centre during their previous pregnancy. Ninety-six percentdid not pay for ANC services.

Furthermore, 269 (80.0%) thought that pregnant women who seemed healthy should attend ANC. Furthermore, 270 (68.8%) thought of ANC as a way to prevent disease and promote health. The mean score for knowledge was 5.16 (SD = 2.78). In addition, 227 respondents (57.9%) showed a good of antenatal care knowledge (Table 3).

Healthcare-related problem

In addition 119 (69.7%) reported waiting for less than two hours. Only 58 participants (14.8%) paid more than 20 ETB for transportation to ANC services (Table 4).

Table 3. Obstetric and gynecologic characteristics of participants, Southern Ethiopia, 2019 (n=392).

Variable	Characteristics	Frequency	Percent
Know about ANC	Yes	336	85.7
	No	56	14.3
ANC used both for the mother and fetus	Yes	260	66.3
	No	132	33.7
Health looking-pregnant women needs	Yes	269	80.0
ANC Visit	No	123	20.0
An appropriate time to begin ANC within	Yes	243	62.0
4 months of gestation	No	149	38.0
A woman needs at least 4 times ANC	Yes	158	40.3
visit per pregnancy	No	234	59.7
ANC used for birth preparedness	Yes	285	72.7
	No	107	23.3
ANC used for health promotion and	Yes	270	68.8
disease prevention	No	122	31.1
Awareness of obstetric danger sign	Yes	204	52.0
danger	No	188	48.0

Table 4: Study participants' health care-related characteristics, South Ethiopia, 2019 (n=392)

Variable	Characteristics	Frequency	Percent
Facility type for previous ANC	Government hospital	59	34.5
(n=171)	Private hospital/clinic	14	8.2
	Health center	98	57.3
Reason to select the health facility	Cost-free	43	13.0
	Less cost	6	1.8
	Get better care	62	18.7
	Good attitudes of staff	48	14.5
	Short waiting time	68	20.5
	Short distance	104	31.4
Any payment asked	Yes	6	3.5
	No	165	96.5
Waiting time (in hours)	≤ 2hr	119	69.7
	>2hr	52	30.4
Perceived waiting time as problem	Yes	107	62.6
	No	64	37.4
Paid for transportation	Yes	263	67.1
	No	129	32.9
Transportation cost (N=392)	≤ 20ETB	334	85.2
	>20ETB	58	14.8

Current pregnancy history

Of those surveyed, 309 (78.8%) reported they had planned a pregnancy. Of these, 306 (99%) planned it jointly with their husbands. Further more, 310 (79.1%) got information from various sources, but only 162 (85.7%) were specifically told to make a reservation within 16 weeks. Additionally, 328 participants (83.7%) reported that their spouses supported their attendance at ANC (Table 5).

Magnitude of late ANC initiation

The magnitude of delayed ANC start was 57.7% (95% CI: 52.74-62.57%).Mean gestational age at ANC commencement was 18.99 weeks (SD = 6.27).

Associated factors of late antenatal care initiation

Maternal age 31–35 years (AOR=4.93, 95% CI=1.70–14.27), husbands' educational attainment of no formal education (AOR=2.88, 95% CI=1.17–7.14), primary education (AOR=3.12, 95% CI=1.63–5.99), and secondary education (AOR=1.97, 95% CI=1.14–3.43), unplanned pregnancy (AOR=2.40, 95% CI=1.23–4.68), and no history of obstetrical complications were all significantly associated with late ANC initiation (Table 6).

Table 5: Current pregnancy history among participants, Southern Ethiopia, 2019 (n=392).

Variable	Characteristics	Frequency	Percent
Pregnancy planned	Yes	309	78.8
	No	83	21.2
Plan includes husband (n=309)	Yes	306	99.0
	No	3	1.0
Unplanned but wanted by mother (n=83)	Yes	73	88.0
	No	10	12.0
Unplanned but wanted by husband (n=83)	Yes	74	89.2
	No	9	10.8
Adviced for ANC	Yes	310	79.1
	No	82	20.9
Advised to start ANC at ≤ 4 months (n=311)	Yes	162	85.7
	No	27	14.3
Decision maker for ANC service	Husband	48	12.24
	Wife	153	39.03
	Both	180	45.9
	Other	11	2.80
Partner support towards ANC service	Yes	328	83.7
	No	64	16.3

DISCUSSION

The magnitude of late ANC initiation was 57.7% (95% CI 52.74-62.57%)**.** This finding aligns with the sudies conducted in Tigray (60.5%) (13), Debre-Markos (59.4%) (14), and Myanmar (56.1%) (19). The similarities in the study design and environment, sociodemographics, accessibility to health care services, and media exposure may be the cause of this.

It is, nevertheless, slightly greater than the rates reported in Cameron (44.0%) and Malaysia (28.0%) (20, 21).

This disparity may result from differences in sample size, the definition of late beginning (12 versus 16 weeks of gestation), and socioeconomic and prior obstetrics variables. This discrepancy may also be explained by the majority of research participants' late initiation during prior pregnancies and their prior poor use of ANC services.

This finding is lower compared to finding of 2016 EDHS. The reason for the observed discrepancy might be explained by the fact that EDHS included women from rural locations where geographic access to medical facilities may be a significant predictor of ANC timing, as well as a large sample size of national representatives. Similar to findings from other parts of Ethiopia (22-24), the prevalence in this study was low, which may have been caused by temporal and sociodemographic differences. The lower prevalence may be attributable to the high proportion of women with formal education and urban residence in the sample, as well as heterogeneity in the gestational-age threshold used to classify late ANC initiation..

Table 6: Bivariable and Multivariable Logistic Regression Results for Factors Associated with Late Antenatal Care Visit, Southern Ethiopia, 2019

Variables	Characteristics	Late ANC initiation		COR (95%CI)	AOR (95%CI)
		Yes (%)	No (%)		
Maternal age (in years)	16- 20	46 (55.4)	37 (44.6)	1	1
	21-25	64 (53.8)	55 (46.2)	0.94 (0.53-1.64)	1.29 (0.68-2.44)
	26-30	69 (53.9)	59 (46.1)	0.94 (0.54-1.64)	1.78 (0.89-3.54)
	31-35	28 (77.8)	8 (22.2)	2.82 (1.15-6.90)	**4.93(1.70-14.27) ***
	>35	19 (73.1)	7 (26.9)	2.18 (0.83-5.75)	1.79 (0.56-5.73)
Level of Maternal Education	No formal	57 (83.8)	11 (16.2)	7.77 (3.30-18.34)	0.80 (0.25-2.58)
	Primary	98 (63.2)	57 (36.8)	2.58 (1.34-4.96)	1.47 (0.62-3.51)
	Secondary	51 (42.9)	68 (57.1)	1.13 (0.57-2.20)	1.07 (0.49-2.32)
	Above secondary	20 (40.0)	30 (60.0)	1	1
level of Husband Education	No formal	30 (76.9)	9 (23.1)	4.92 (2.18-11.10)	**2.88 (1.17-7.14) ***
	Primary	60 (71.4)	24 (28.6)	3.69 (2.07-6.57)	**3.12 (1.63-5.99) ***
	Secondary	77 (62.6)	46 (37.4)	2.47 (1.51-4.04)	**1.97 (1.14-3.41) ***
	Above Secondary	59 (340.4)	87 (59.6)	1	1
Average income 9monthly)	< 400	56 (77.80)	16 (22.2)	5.35(2.79-10.25)	0.83 (0.32-2.21)
	400-1000	68 (65.4)	36 (34.6)	2.89 (1.70-4.89)	1.13 (0.49-2.62)
	1000-2000	47 (61.0)	30 (39.0)	2.39 (1.35-4.23)	1.37 (0.66-2.87)
	>2000	55 (39.6)	84 (60.4)	1	1
Maternal occupation	Government employee	22 (44.0)	28 (56.0)	1	1
	Private	21 (47.7)	23 (52.3)	1.16 (0.52-2.62)	1.21 (0.35-4.18)
	Housewife	158 (62.5)	95 (37.5)	2.12 (1.15-3.91)	1.00 (0.31-3.14)
	Others	25 (55.6)	20 (44.4)	1.59 (0.71-3.58)	1.45 (0.39-5.38)
Family size	≤ 4	146 (52.5)	132 (47.5)	1	1
	4-6	40 (58.8)	28 (41.2)	1.29 (0.76-2.21)	0.72 (0.32-1.63)
	>6	40 (83.0)	6 (13.0)	6.03 (2.48-14.67)	0.59 (0.11-3.04)
Place of Residence	Urban	127 (47.5)	130 (52.5)	1	1
	Rural	99 (77.0)	36 (23.0)	2.81 (1.79-4.43)	1.46 (0.79-2.68)
Gravidity	Primigravida	83 (59.7)	56 (40.3)	1	1
	Multigravida	82 (45.8)	97 (54.2)	0.57 (0.36-0.89)	0.98 (0.43-2.27)
	Grand Multigravida	61 (82.4)	13 (17.6)	3.17 (1.59-6.30)	2.87 (0.57-14.49)
Parity	≤3	174 (52.6)	157 (47.4)	1	
	≥4	52 (85.2)	9 (14.8)	5.21 (2.49-10.92)	0.95 (0.35-2.61)
Pervious ANC	Yes	76 (44.4)	95 (55.6)	1	1
	No	150 (67.9)	71 (32.1)	2.64 (1.75-3.99)	**2.03 (1.20-3.43) ***
Previous ANC initiation	≤16weeks	26 (31.7)	56 (68.3)	1	1
	>16weeks	50 (56.2)	39 (43.8)	2.76 (1.48-5.16)	1.74 (0.86-3.54
History of Complication	Yes	17 (24.6)	52 (75.4)	1	1
	No	126 (68.5)	58 (31.5)	6.65 (3.54-12.47)	**4.05 (2.06-7.96) ***
Knowledge on ANC	Poor	118 (71.5)	47 (28.5)	2.77 (1.81-4.24)	0.74 (0.42-1.31)
	Good	108 (47.6)	119 (52.4)	1	1

Partner support	Yes	178 (54.3)	150 (45.7)	1	1
	No	48 (75.0)	16 (25.0)	2.59 (1.38-4.63)	**2.47 (1.16-5.26) ***
Advised for ANC	Yes	166 (53.5)	144 (46.5)	1	1
	No	60 (73.2)	22 (26.8)	2.37 (1.38-4.05)	1.26 (0.66-2.41)
Pregnancy type	Planned	155 (50.2)	154 (49.8)	1	1
	Unplanned	71 (85.5)	12 (14.5)	5.88 (3.07-11.27)	**2.40 (1.23-4.68) ***
Decision maker	Husband	35 (72.9)	13 (27.1)	1	1
	Mother	79 (51.6)	74 (48.4)	0.40 (0.20-0.81)	**0.40 (0.18-0.87) ***
	Both	102 (56.7)	78 (43.3)	0.49 (0.24-0.98)	0.88 (0.42-1.81)

*1= reference category *=Significant at p <0.05*

Compared to respondents aged 16-20, pregnant women aged 31-35 had 4.9 times greater odds of late ANC initiation (AOR =4.93, 95% CI=1.70-14.27). This could be because, in contrast to younger women, older women may have had previous pregnancy experience without complication and less fearful unlike younger.

In addition, younger women may benefit from higher media exposure and health literacy, enhancing awareness of ANC timing. This is consistent with research conducted in other parts of Ethiopia (14, 24, 25). Maternal age and late ANC beginning were not significantly associated in studies done in Addis Ababa and Nigeria, indicating potential methodological or environmental differences (26, 27).

According to this study, women who had never used ANC during a prior pregnancy had twice odds of starting ANC later compared to those who had (AOR = 2.03, 95% CI = 1.20-3.43).Pregnant women may benefit from prior ANC usage, linkage, and familiarity with the medical facility.They may thus have received the necessary information from counseling and health education sessions during their prior pregnancies, and they should be more aware of the benefits of early ANC visits. This explains why women who have never had an ANC visit arrive late on their first appointment.

This finding is comparable to study done in Kembata Tembaro, Ethiopia, and the central region of Tigray (22, 23). However, this is in contrast to research from Axum, which showed that late ANC attendance was not substantially correlated with prior ANC use (28)

Unintended pregnancy was independently associated with delayed ANC; women with unplanned pregnancies were about 2.4 times more likely to start ANC late (95% CI: 1.23–4.68**)**. This could be because mothers who did not intend to become pregnant may not be aware of their pregnancy in a timely manner and will be late for the first ANC start.

Even when aware of their pregnancy early, women with unplanned pregnancies may lack interest, conceal it, or deny it, leading to delayed ANC booking. Compared to planned pregnancies, they are less likely to seek timely care or engage with ANC, consistent with findings from other regions

showing higher odds of late reservations among mothers with unexpected pregnancies (29-33)

Husbands' education was an independently associated with ANC timing: women married to men with no formal or only primary/secondary education had higher odds of delayed ANC initiation compared with those whose husbands attained tertiary education. This association is consistent with prior studies from Nigeria and Uganda (26, 34), though research in Thailand reported no significant association (30).

Women without prior pregnancy, labor, or delivery complications had nearly four times higher odds of late ANC initiation compared to those with complications. This may reflect a perception of ANC as preventive rather than curative, reducing urgency among women with uncomplicated histories. The finding is consistent with studies from Malaysia and Pakistan (26, 35).

Maternal autonomy in decision-making was significantly associated with ANC initiation. Women who chose independently to begin ANC had 60% lower odds of late initiation compared to those who relied on their husbands' decision. This aligns with findings from Gondar, where lack of autonomy doubled the likelihood of late ANC bookingn (36).

Lack of partner support was a significant predictor of late ANC initiation. Women without spousal support had 2.4 times higher odds of late booking compared to those with support. This may reflect the role of partners in encouraging early ANC use or accompanying mothers to health facilities. The finding is consistent with a study conducted in western Hararge (25). However, findings from the Tigray region differed, suggesting that the impact of partner involvement may vary by context. (37).

Limitation of the study

The study has substantial drawbacks. The cross-sectional design precludes causal inference. Gestational age was calculated using women's self-reported last normal menstrual period (LNMP), which could increase measurement inaccuracy. Social desirability bias could have affected participant responses. Finally, because data were collected only from public health facilities**,** the findings may not be generalizable to women who seek care in private settings.

CONCLUSION

The magnitude of late antenatal care initiation was high (57.7%) in the study area. It was associated with maternal age, type of pregnancy, prior ANC use, history of complications, husband's educational level, partner support, and maternal decision-making autonomy.

Ethical approval

Ethical approval (Ref: IRB/204/11) and facility permissions were obtained; written consent and confidentiality were ensured

Data and materials availability

The corresponding author will provide study data upon reasonable reques

Competing interest

The authors report no competing interests.

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Authors contribution

MC conceived and designed the study, performed stastistical analysis, and drafted the manuscript.TS and HG closely supervised the overall the study activities and participated in reviewing and revisingmthe manuscript. All authors contributed to data interpretation, manuscript review, and final approval.

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