ORIGINAL RESEARCH

Factors associated with late ANC initiation among pregnant women in select public health centers of Addis Ababa, Ethiopia: unmatched case–control study design

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Background: Although Ethiopia has shown remarkable achievements in reducing maternal mortality in the last 10 years, the prevalence of late antenatal care (ANC) initiation is still high in the country.

Objective: The primary purpose of this study was to identify the factors related to late ANC initiation among pregnant women in selected public health centers in Addis Ababa, Ethiopia.

Subjects and methods: A total of 402 pregnant women (cases=134, controls=268) were recruited using multistage sampling. The design selected for the study was unmatched case–control. EpiData version 3.02 and SPSS version 20.0 were used for data entry and statistical analysis, respectively. Binary logistic regression model was used to model the odds of late ANC initiation.

Results: The odds of attending ANC late were significantly higher for mothers with a monthly household income of <US\$45.5 (AOR=6.67; 95% CI: 2.40, 18.60), who were educated up to eighth grade or below (AOR=2.17; 95% CI: 1.03, 4.60), who had unplanned pregnancy (AOR=2.73; 95% CI: 1.03, 7.23), who did not receive advice from health extension workers or TV/radio (AOR=5.21; 95% CI: 2.49, 10.88), who stayed for <5 years in Addis Ababa (AOR=3.93; 95% CI: 1.89, 8.12), and who was charged >\$8.50 to start the ANC service (AOR=3.04; 95% CI: 1.98, 4.67).

Conclusion: Low educational level, low income of the household, unplanned pregnancy, stay for <5 years in Addis Ababa, not getting advice from health extension workers or local TV/radio and higher cost associated with initiation of the first ANC service were the main predictors of late ANC initiation. Therefore, any intervention which would need to improve early ANC initiation should focus on economic empowerment of women, and tailored health education for migrant women should be strengthened.

Keywords: case–control, late ANC, Ethiopia

Introduction

Complications during pregnancy and childbirth are the leading causes of death and disability among women of reproductive age in developing countries.[1] Globally, 287,000 women die of pregnancy-related complications annually, with 99% of it occurring in the developing world and 1% in developed countries.[2] Ethiopia is one of the six countries that contributes to >50% of all maternal deaths globally.[3]

In the developed world, 98% of pregnant women receive antenatal care (ANC) at least once. While in the developing world, ANC use is as low as 68%. The lowest level

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of ANC use in the world is in South Asia, where only 54% of pregnant women report at least one ANC visit. In sub-Saharan Africa, generally the region with the lowest levels of health care use, 68% of women report at least one antenatal visit and wait around the second trimester.[4] A relatively substantial proportion present for ANC only in the third trimester.[5]

According to Ethiopia Demographic and Health Survey (EDHS) 2011, infant and under-five mortality has declined by 42% and 47%, respectively, compared to the finding from the 2000 EDHS survey. However, the decline in neonatal death remains insignificant between 2005 and 2011, compared to the overall burden of neonatal mortality in the country.[6,7] Infection, birth asphyxia, preterm birth, congenital conditions, and tetanus are the main determinants of neonatal heath in Ethiopia.

Research findings indicate that most causes of maternal and neonatal deaths are preventable. ANC is one of the key strategies for reducing maternal and neonatal morbidity and mortality directly through detection and treatment of pregnancy-related illnesses or indirectly through detection of women at risk of complications of delivery and ensuring that they could deliver in a suitably equipped facility.[8]

The timing of the first ANC visit as well as the total number of ANC visits also affect the quality of ANC that a pregnant woman receives, and under-attending the recommended ANC service may lead to adverse pregnancy outcomes.[9]

EDHS 2016 indicated that the percentage of ANC utilization had increased by 32% compared to the preceding EDHS survey and the national coverage was 31.8%.[10] Though good progress has been made in the total number of ANC visits, the prevalence of late ANC initiation is still high in Ethiopia. Research findings from Addis Ababa, Metekel, Hadya Zone, Ambo and Gonder show that the prevalence of late ANC service booking was 59.8%, 55.1%, 68.2%, 86.8% and 64.9%, respectively.[11–15] Therefore, this study identified the sociodemographic, obstetric and other health utilization factors that are related to late initiation of ANC service in the context of the study area and will serve as an important reference in providing information for policy makers and for any possible program/s intervention/s that improve early ANC initiation and thereby reduce the maternal death. In addition to this, the study findings will contribute positively to the existing body of knowledge in the area of maternal, neonatal and child health.

Subjects and methods
Study area
This study was carried out in Addis Ababa from 1 to 30 February 2017. Addis Ababa is the capital city of Ethiopia and the seat for the African Union, and the Federal Government and the Addis Ababa City Administration Government are located in the city. The city administration has 10 subcities and 116 districts. According to the Central Statistical Agency population projection, the estimated population of Addis Ababa is 3,194,999, with an annual growth rate of 21%. Out of the total population, 1,679,998 are females.[16]

Currently, Ethiopia provides a three-tiered health care system. The health care delivery system is characterized by a first level of district health system comprising a primary hospital (with a population coverage of 60,000–100,000 people), health centers (1/15,000–25,000 population) and their satellite health posts (1/3,000–5,000 population) that are connected to each other by a referral system. A primary hospital, health center and health posts form a primary health care unit, with each health center having five satellite health posts. The second level in the tier is a general hospital with a population coverage of 1–1.5 million people, and the third is a specialized hospital that covers a population of 5 million. The primary health care unit being the closest to the population has health posts, health centers and primary hospitals.[17]

Health care system in Ethiopia comprises public, nongovernmental organization and private health care facilities. Private hospitals are expensive and serve for those who can afford the services.

Health financing comes from a variety of sources. The government and other public enterprises provide 31% of the financing, donors and non-governmental organizations 37%, households 31% and other private employers and funds about 2%.[18] The direct costs for antenatal, delivery, postnatal services were free at all selected health centers, though there were indirect costs for those services.

Study design and population
One to two ratio of unmatched case–control study design was used to investigate factors associated with late initiation of ANC in Addis Ababa. Pregnant women who attended ANC after 12 weeks of their gestational age were considers as cases (i.e., late initiators of ANC) and those who attended ANC service before or at 12 weeks of their gestational age were considered as controls (i.e., early initiators of ANC). The target population consisted of all pregnant women in Addis Ababa who could potentially come to health centers for checkup and book their first ANC at the ANC units of health centers. The source population for this study was all pregnant women in Addis Ababa who visited the government-owned health institutions during the study period. The study participants were sample of pregnant women in their first visit,

who were selected from the ANC unit of government-owned health centers and considered to participate in the study.

Sample size and sampling procedure

Pregnant women who recognized their pregnancy and booked ANC before or at 12 weeks, planned pregnancy (main exposure variable, AOR=1.87), 80% power, 95% CI, 1:2 case to control ratio, proportion of controls exposed=40.2 and 2% nonresponse rate were considered for sample size calculation.[11] Under the above conditions, and considering the continuity correction assumption, OpenEpi version 3 was used to calculate the sample size and the total sample size for the study was found to be 402 (cases=134 and controls=268).

Multistage sampling technique was used to select the final sample of the respondents. At the first stage, three subcities are selected from the total number of subcities using simple random sampling without replacement technique. At the second stage, a total of 10 health centers were selected proportionally to the number of health centers in each of the selected subcity. At the third stage, the tertiary units (the respondents) selected taken proportionally according the monthly client flow in the selected health facilities using proportional allocation formula.

Data collection tools and procedures of data collection

The questions in the instrument were extracted from EDHS and other related literatures. The questionnaire had three parts. Part one of the questionnaire addressed the sociodemographic characteristics, part two contained obstetric characteristics and the third part covered questions related to ANC knowledge and utilization. Originally, the questionnaire was prepared in English and then translated into the national language of the country (Amharic) for ease of communication with the study groups.

Seventeen female midwives and three nurses who had data collection experience were recruited from the selected centers. Moreover; three female midwifes who had coordination and supervision experience were recruited to supervise the data collection process. These data collectors, supervisors and coordinators were trained for 1 day on data collection process and quality assurance techniques. The data were collected through face-to-face interview using structured and pretested questionnaire. Data collection days were within a week from Monday to Friday and on these days, it was from 9:00 to 12:00 am in the morning and from 2:00 to 5:30 pm in the afternoon.

Data quality assurance procedures

The questionnaire was pretested at 5% of the total sample size outside the study health centers. Two data collectors holding at least a diploma were recruited for data collection during the pretesting. Suggestions and feedbacks were obtained from midwives, nurses and health officers, and their comments were incorporated in the final version of the instrument.

The administrators of respective health centers, enumerators and the supervisors took half day training on the data collection tools and procedures with respect to this particular study. The overall data collection process was supervised by the principal investigator.

The collected data were carefully checked for completeness, validity and consistency of questions.

Data management and analysis

The collected data were cleaned and coded; their consistency and validity were checked using EpiData version 3.02. The coded data were exported and analyzed with SPSS version 20.0.

Bivariate binary logistic regression method was employed to compare which variables were relatively strong among the considered possible factors. Variables with p value ≤ 0.25 in bivariate logistic regression were selected and included in the final logistic regression model to identify the predictors of the outcome variable at 5% level of significance.

Ethical consideration

Ethical clearance was obtained from the Addis Continental Institute of Public Health and the Addis Ababa Health Bureau Public Health Research and Management Core Process of Ethical Review Committee.

The objective of the study, the importance and disadvantages of being part of the study were explained to the participants, and informed consent was obtained from each respondent before the interviews were conducted. Furthermore, all information that was obtained from the respondents was kept confidential. The data will not be provided to a third party. No names were included on the questionnaire. Identification of each participant was done through numerical coding.

Participants were informed that they had the right to refuse participating in this research and they also had the full right to withdraw from the interview at any time they wished.

Results
Sociodemographic characteristics of the respondents

Out of the 402 pregnant women who were interviewed, 300 (74.6%), 65 (16.2%), 35 (8.5) and 2 (0.5) were Orthodox, Muslims, protestants and followers of other religions, respectively. The ethnicity of the respondents

was as follows: 196 (48.6%) Amhara, 95 (23.6%) Oromo, 75 (18%) Gurage, 25 (6.2) Tigray and 11 (3%) were from other ethnicities.

One hundred and nineteen (29.8%) had monthly income of ≤$45.5; 53 (19.9%) of them started ANC service early and 66 (49.6%) of them started late. One hundred and fifty-one respondents had a monthly income between $45.5 and $90; 110 (41.4%) of them started ANC service early and 41 (30.8%) of them started after 12 weeks of their pregnancy. One hundred and twenty-nine respondents had a monthly income >$90; of these, 103 (38.7%) started ANC early and 26 (19.5%) started ANC late.

Three hundred and nine (76.9%) respondents had their first delivery at age <24 years. In connection with this, 203 (75.7%) of those mothers who had their first baby at age <24 years started ANC early and the rest of the women (106 [79.1%]) started it late. On the other hand, 65 (24.3%) and 28 (20.9%) mothers who were >25 years old booked ANC early and late, respectively.

Level of education of the respondents in this study was categorized as those who were educated grade eight and below and those who were educated grade nine and above. Accordingly, 131 (32.8%) of the respondents were had education up to grade eight and the rest of the women (269 [67.2%]) had attended grade nine or above. Out of 131 respondents who had completed grade eight and below, 64 (24.1%) started ANC service early and the rest at this level of education started the service late. Two hundred and two (75.9%) of those who completed either grade nine or above started the service early and others in this educational level category started the service late (Table 1).

Obstetric characteristics of the respondents

Among all the pregnant mothers who participated in the study, 54 (13.4%) had unintended pregnancy; of these, 22 (8.2%) started ANC service within the recommended time, while the remaining 32 (23.9%) started the service late. Of the mothers who had intended pregnancy, 102 (76.1%) started ANC late and the rest, that is, 246 (91.8%), booked ANC early.

Two hundred and nine (52.0%) study participants started ANC service at their first delivery; 81 (60.4%) of them were cases and 128 (47.8%) were controls. Forty-eight (35.8%) cases and 122 (45.5) controls were primiparous and the rest, that is, 86 (64.2%) cases and 146 (54.5%) controls, were multiparous women. Thirty-four (25.4%) cases and 83 (31.0%) controls were primigravida, while 185 (69.0%) controls and 100 (74.6%) cases were multigravida (Table 2).

Table 1 Sociodemographic variables of pregnant women in selected public health centers of Addis Ababa, April 2017

Characteristics	ANC initiation	
	Late (cases=134) Number (%)	Early (controls=268) Number (%)
Religion		
Orthodox Christian	91 (68.4)	209 (78.0)
Muslim	28 (21.1)	36 (13.4)
Protestant	13 (9.8)	22 (8.2)
Others	1 (0.8)	1 (0.4)
Ethnicity		
Amhara	57 (42.5)	138 (51.5)
Oromo	37 (27.6)	58 (21.6)
Tigray	8 (6.0)	17 (6.3)
Gurage	29 (21.6)	46 (17.2)
Others	3 (2.2)	9 (3.4)
Place of birth		
Born and grown up outside Addis Ababa	45 (33.6)	100 (37.3)
Born and grown up in Addis Ababa	89 (66.4)	168 (62.7)
Occupation		
Merchant	18 (13.5)	42 (16.1)
Government employee	11 (8.3)	64 (24.5)
Housewife	62 (46.6)	69 (26.4)
Private employee	36 (27.1)	78 (29.9)
Others	6 (4.5)	8 (3.1)
Length of study (in years) in Addis Ababa		
At the most 5 years	56 (62.2)	42 (25.3)
More than 5 years	34 (37.8)	124 (74.7)
Monthly income (in US dollars)		
At least $45.5	66 (49.6)	53 (19.9)
($45.5–$90.0)	41 (30.8)	110 (41.4)
More than $90.0	26 (19.5)	103 (38.7)
Age in years		
17–24	43 (32.1)	85 (31.7)
25–29	50 (37.3)	126 (40.0)
≥30	41 (30.6)	57 (21.3)
Age at first delivery in years		
≤24	106 (79.1)	203 (75.7)
≥25	28 (20.9)	65 (24.3)
Education level		
≤8th grade	67 (50)	64 (24.1)
≥9th grade	52 (50)	202 (75.9)
Current marital status		
Married (living together)	113 (85.6)	250 (94.0)
Others (either separated, divorced or widowed)	19 (14.4)	16 (6.0)
Associated costs with first ANC attendance (in Birr)		
≤184 (average payment)	55 (41.0)	182 (67.9)
>184 (average payment)	79 (59.0)	86 (32.1)

Abbreviation: ANC, antenatal care.

Predictors associated with late ANC initiation

Associations between late ANC initiation and marital status, age at pregnancy, number of pregnancies, ANC initiation

Table 2 Obstetric characteristics of pregnant women in selected public health centers of Addis Ababa, April 2017

Variables	ANC initiation time	
	Late (n=134)	Early (n=268)
Gravidity		
Primigravida	48 (35.8)	122 (45.5)
Multigravida	86 (64.2)	146 (54.5)
Parity		
Primiparous	34 (25.4)	83 (31.0)
Multiparous	100 (74.6)	185 (69.0)
If the current pregnancy was intended		
Not planned	32 (23.9)	22 (8.2)
Planned	102 (76.1)	246 (91.8)
Time between births (in years)		
Birth interval ≤2	24 (46.2)	37 (44.6)
Birth interval ≥4	27 (53.8)	46 (55.4)
ANC initiation at first birth		
No	53 (39.6)	140 (52.2)
Yes	81 (60.4)	128 (47.8)
History of spontaneous abortion		
No	111 (82.8)	229 (85.4)
Yes	23 (17.2)	39 (14.6)
History of induced abortion		
No	114 (85.1)	246 (91.8)
Yes	20 (14.9)	22 (8.2)

Abbreviation: ANC, antenatal care.

at first delivery, source of advice to initiate ANC service, monthly income, educational level, associated costs to start the first ANC, knowledge about ANC, years stayed in Addis Ababa and number of births were investigated using bivariate and multivariate binary logistic analyses.

Bivariate analysis showed that monthly income of the household, educational level, ANC associated costs, years stayed in Addis Ababa and advices from health extension workers and from TV/radio were significantly associated with late ANC initiation. Women who were educated up to eighth grade or below were more likely to start ANC late, compared to those who had completed ninth grade or above (crude odds ratio [COR]=3.16; 95% CI: 2.03, 4.90). Participants who stayed >5 years in Addis Ababa and with unintended pregnancy were more likely to start the ANC service compared to their counter parts (COR=4.86; 95% CI: 2.8, 8.44 and COR=3.51; 95% CI: 1.95, 6.33, respectively).

The final multivariate binary logistic regression analysis indicated that mothers with monthly household income up to $45.5, who completed eighth grade or below, who had unplanned pregnancy, who did not received advice from health extension workers or TV/radio, who stayed in Addis for <5 years and who paid >$8.50 to start ANC service were more likely to book ANC late, compared to mothers with monthly income >$90 (AOR=6.67; 95% CI: 2.40, 18.60),

who completed ninth grade or above (AOR=2.17; 95% CI: 1.03, 4.60), who had planned pregnancy (AOR=2.73; 95% CI: 1.03, 7.23), who got advice from health extension workers or local TV/radio (AOR=5.21; 95% CI: 2.49, 10.88), who stayed >5 years in Addis (AOR=3.93; 95% CI: 1.89, 8.12) and who paid <$8.50 (AOR=3.04; 95% CI: 1.98, 4.67), respectively (Table 3).

Discussion

This study indicated that late ANC initiation was associated with low educational level, low income of the household, unplanned pregnancy, stay for <5 years in Addis Ababa, not getting advice from health extension workers or local TV/radio and higher associated costs to initiate the first ANC.

The average associated cost with first ANC visit was $8.5 and was negatively associated with ANC visit. Women who paid more than the average associated costs start ANC visit late compared to their counterparts (AOR=3.04; 95% CI: 1.98, 4.6). This is consistent with the results of a previous study.[19] By far, most of these costs have been paid for laboratory and ultrasound services.

The study found that higher level of education of the mothers was positively associated with late ANC initiation. This is possibly because education gives an opportunity for mothers to develop greater confidence, to make better choices and to make decisions regarding their own health as well as their children. It is also more likely that educated women demand higher quality service and pay more attention to their health in order to ensure better health for themselves.[20] This is in line with the findings of studies conducted in Metekel, Ambo, Gonder and Tigray in Ethiopia[12,14,21,22] and in Auckland, New Zealand.[23]

Low monthly household income was another variable that was significantly and positively associated with late ANC attendance. Women with high household income were more likely to be able to afford the cost related to the health services and their associated costs such as transportation costs. This is consistent with the results of studies done in Kenya, Nepal,[1] and Ethiopia.[14,21]

Mothers with unplanned pregnancy were most likely to start the ANC service, as opposed to women who planned their pregnancy; women who fell pregnant intentionally were more likely to start ANC early. This is similar to the findings from Zambia[8] and Ethiopia.[24] It is believed that planned pregnancies are more cared for by the pregnant women themselves and their spouses; this enables women to book for timely ANC.

Women who stayed <5 years in Addis Ababa prior to the study were found to be strongly associated with late ANC

Table 3 Factors associated with late booking of ANC service in selected public health centers of Addis Ababa, April 2017

Predictors	ANC initiation	Odds ratio	
	Late, early (n)	COR (95% CI)	AOR (95% CI)
Marital status			
Married (living with husband)	113, 250	Reference	Reference
Others (separated, divorced or widowed)	19, 16	2.63 (1.30, 5.30)[a]	1.43 (0.89, 5.20)
Parity			
Multiparous	34, 83	1.32 (0.83, 2.11)	2.59 (0.96, 6.98)
Primiparous	100, 185	Reference	Reference
First ANC attendance			
No	53, 140	Reference	Reference
Yes	81, 128	1.67 (1.10, 2.55)[a]	0.45 (0.15, 1.36)
Age at pregnancy, years			
≥25	28, 65	Reference	Reference
≤24	106, 203	1.2 (0.73, 2.00)	1.02 (0.40, 2.62)
Intended pregnancy			
No	32, 22	3.51 (1.95, 6.32)[b]	2.73 (1.03, 7.23)[b]
Planned	102, 246	Reference	Reference
Monthly income (in US dollars)			
≤$45.50	66, 53	4.93 (2.81, 8.65)[b]	6.67 (2.40, 18.60)[a]
$45.5–$90	41, 110	1.84 (0.84, 2.59)	1.74 (0.65, 4.63)[a]
>$90	26, 103	Reference	Reference
Advice from HEW and TV/radio			
No	109, 64	13.76 (8.20, 23.09)[b]	5.21 (2.49, 10.88)[b]
Yes	25, 202	Reference	Reference
Number of years of stay in Addis			
≤5	56, 42	4.86 (2.8, 8.44)[b]	3.93 (1.89, 8.12)[b]
>5	34, 124	Reference	Reference
Educational level			
≤8th grade	67, 64	3.16 (2.03, 4.90)[a]	2.17 (1.03, 4.60)[a]
≥9th grade	67, 204	Reference	Reference

Note: [a]p-value <0.05, [b]p-value <0.000.
Abbreviations: ANC, antenatal care; HEW, health extension worker.

utilization (this paper is the first of its kind in Addis Ababa, which analyzes the impact of inner migration on timing of ANC initiation). The possible explanations for this might be as follows: women who migrated to the city may take some time to reach the same level of understanding, as compared to those who lived longer in Addis Ababa; there are more health facility services and health promotion and education in Addis Ababa as compared to rural areas and other cities of the country where migrants are coming from; as the women are engaged in various hard and time-consuming activities to lead their lives, they may not get time to go the health facilities; they may have different perceptions toward ANC utilization; and their poor ability to communicate with skilled health professionals clearly (communication barrier) could be another reason to start late. Studies from Amsterdam and Ambo, Ethiopia showed similar findings. Another study conducted in Mumbai, India reported low utilization of ANC services and high proportion of home deliveries among the migrant women despite the availability of health facilities for providing ANC care and to conduct deliveries in urban areas.[25]

Source of information was strongly associated with timely ANC initiation. Participants who got advice from health extension workers were likely to start ANC service early, as compared to those who got advice from other sources. This might be because they were provided the right information on when to start ANC with detailed explanations and the trustfulness of the participants toward the health extension workers.

Contrary to the findings from Wales, England and Auckland, New Zealand, parity was statistically insignificantly related to late ANC initiation. Similarly, maternal age, gestational age, women who had previous birth experience, long waiting time at their visit of ANC and marital status gave inconclusive results about the late ANC attendance of the participants in the study area.

Conclusion

Mothers' educational level, household income, intended pregnancies, stay in Addis Ababa for <5 years, cost associated with first ANC visit and source of information (advice) were found to have a significant and positive relationship with late

initiation of ANC in the target area. To improve early ANC initiation, the following are recommended: availing laboratory and ultrasound equipments, strengthening urban health extension workers, and health education promotion and communication, especially in areas where most women stayed <5 years in Addis Ababa. Furthermore, it is recommended that further studies should be conducted to find out why women who stayed <5 years in the study area started ANC late.

Limitation

The study was conducted in Addis Ababa public health centers in spite of the fact that pregnant women in the city can start the ANC service at private health facilities as well. This might have compromised the generalizability of the findings to some degree. The data collectors were from the ANC unit of the health facilities. This might have introduced some degree of response bias in the study.

Acknowledgments

Author contributions

KG initiated the project idea, drafted data collection tool, study design and methodology, and participated in data collection analysis and manuscript write up. AW supervised the overall research and critically edited and reviewed the manuscript based on reviewers' comments. Both authors contributed toward data analysis, drafting and critically revising the paper and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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