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Assessment of Antenatal Clinic Booking Using the Ecological Model for Health Promotion in Mpwapwa-Tanzania

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Abstract

Objective: Assessment of antenatal clinic booking using the ecological model for health promotion in Mpwapwa, Tanzania.

Methods: A cross-sectional study design was done between May and June 2017 at Mpwapwa District in Tanzania. Data were analyzed using Statistical Package for Social Sciences version 21. The analysis involved descriptive statistics to describe the sample population and relevant proportions, in frequency table and cross tabulations between independent and dependent variables; and chi-square test for showing association between study variables during statistical analysis. A P-value of < 0.05 was considered statistically significant.

Results: The majority of respondents (69.9%) registered at ANC after the recommended three months of pregnancy. Almost all of the respondents (96.3%) had high knowledge of antenatal clinic booking. More than half (59%) of respondents illustrated that it was necessary to get permission from their partners before they started ANC, and more than three-quarters (86%) said that they depended on financial support from their partners. Late booking was significantly high (83.7%, $P<0.001$) among the respondents who did not get support from their partners.

Conclusion: Overall, all levels of the ecological model appear to influence ANC booking among pregnant women. Although the participants indicated high knowledge and positive attitude towards ANC, the subordination of pregnant women in decision-making concerning ANC booking, and dependence on partners for financial support and transportation to ANC might have contributed to late ANC booking.

Keywords: Antenatal clinic booking, Ecological model for Health promotion, Late booking, Mpwapwa, Pregnant women, Tanzania.

Background

An Antenatal Clinic (ANC) is a clinic that a woman attends during pregnancy through a series of consultations with trained healthcare providers such as midwives or doctors with the specialty of pregnancy and birth [1]. The purpose of this specialized form of clinic is to ensure that every pregnancy ends in the birth of a healthy baby with no impairment in the mother's health [2- 3]. The ANC attendance is usually grouped into booking and follow-up visits. The booking visit allows the midwife/clinician to

assess the expectant mother's and unborn baby's health status. Early detection of disorders that predate the pregnancy or could be aggravated by the pregnancy is crucial to preventive, therapeutic, and counseling services [4 - 11]. Fetal assessment, gestational age estimation, blood screening for human immune virus (HIV) infections, blood screening for hemoglobin level, blood sugar level, rapid syphilis test, blood type, and rhesus status, urine test for protein, blood pressure examination, maternal weight, and height are usually carried out in the booking visit. This also allows expectant mothers to assess the services available in the health care facility and help them decide whether or not to utilize those services [12 - 16].

Several literatures show that the first 12 weeks of pregnancy are generally the recommended period for the booking visit [17 - 19]. Tanzania's antenatal clinic services policy adopted the latest WHO approach to promote safe pregnancies, recommending at least eight ANC contacts for women without complications and more than eight contacts for women with complicated pregnancies. The first contact should occur within 12 weeks of pregnancy; two contact schedules in the second trimester at 20 and 26 weeks of pregnancy; and five contact schedules in the third trimester at 30, 34, 36, 38, and 40 weeks [20]. Since the popularity of pregnancies progresses smoothly, very few need frequent visits and referrals. Moreover, the approach alerts health service providers and families in all pregnancies for potential complications that may occur at any time [21 - 23].

ANC contacts have benefits for proper information sharing of pregnancy information, pregnancy monitoring, early detection and treatment of pregnancy complications, and ensuring proper management at delivery and post-delivery [24 - 25]. Some of the preventive services offered at ANC are iron supplements, blood pressure measurement, urine tests for protein, sulfadoxine-pyrimethamine (SP) for prophylaxis of malaria, and also information on signs of pregnancy complications. Throughout the ANC follow-up, efforts are made to recognize pregnant mothers not at risk and those at-risk groups based on their earlier pregnancy or at present historical or medical factors, and actions are taken to decrease adverse pregnancy outcomes [26 - 29]. Eight contacts are mandatory to achieve the full life-saving potential that ANC promises for pregnant mothers [30]. Even though the ANC services are free and highly accessible in Tanzania, data from the Mpwapwa District Health Information System shows that 87% of pregnant women made their ANC booking after the recommended 12 weeks of pregnancy, and only 13% of all pregnant women initiate the ANC services within recommended 12 weeks of pregnancy. The reasons for low ANC booking in Mpwapwa district are not well known since no published study reveals the contributing factors.

This study was designed to assess ANC booking at Mpwapwa using the ecological model for health promotion. The ecological model for health promotion focuses on both population-level and individual-level determinants of health and interventions [31]. The application of the ecological model in this study allowed the authors to assess factors that may influence ANC booking among pregnant women at Mpwapwa.

The ecological model for health promotion consists of factors that are associated with ANC booking, namely: intrapersonal factors (knowledge, attitudes, behavior, self-concept, skill, developmental history); interpersonal factors (formal and informal social networks and social support systems, including family, work groups and friendship networks); institutional (social institutions and organization characteristics and formal and informal) rules and regulations for operations; community factors (relationships among organization, institutions and informal networks with defined boundaries); and public policy factors (local, state and national laws and policies [32].

Previous studies documented that interpersonal and other factors do influence antenatal clinic (ANC)

booking either positively or negatively [33 - 35]. Partners, customs or traditions, family members of pregnant women, distance to antenatal clinic, availability of transport, health facility rules and regulations, local policies, knowledge, and attitudes have been reported to influence antenatal clinic booking [36 - 39]. The ecological model for health promotion has been modified to suit the needs of the current study. This modified ecological model included intrapersonal, interpersonal, institutional, community, and public policy factors. At the intrapersonal factors, we assessed the knowledge and attitudes of participants towards ANC; at interpersonal factors, we evaluated the influence of partners, and family on ANC; at the institutional factors, were religion and cultural beliefs, health facility rules and regulations; at community factors, were transportation to ANC and at public policy we assessed local policies regarding ANC.

Materials and Methods

Design and setting

Data collection took place between May and June 2017. This was a cross-sectional study design conducted at Mpwapwa district council, one of the eight Councils in the Dodoma Region. The district covers a total area of 7,379 square Kilometers, which is about 18.1% of the total area of the Dodoma Region. The total population in the district is 305,046.

Population

The study population comprised all pregnant women obtaining ANC services at Mpwapwa District Hospital.

Sample size and sampling procedure

The sample size was 352 pregnant women. This sample size was determined by the prevalence of 29% of pregnant women who commenced ANC attendance within the first four months of pregnancy in a study done in Tanzania on the timing of antenatal care for adolescent and adult pregnant women in southern-eastern Tanzania). A simple random sampling method using a rotary method was used to recruit pregnant women who were present at Mpwapwa ANC during data collection. Participants were required to select a piece of paper inside the box. Those who selected a piece of paper written YES were included in the study and those who selected NO were not included. Participation was voluntary. Respondents who decided to participate in the study were requested to get in a special room for questionnaire filling. The sampling process took place between May and June 2017. All pregnant women who attended Mpwapwa ANC during the study period were included and Unwell (sick) pregnant women were excluded from the study.

Data collection instruments

A semi-structured questionnaire was used to collect data. Information was given on how to fill out the questionnaire and clear clarification on important issues concerning filling out the questionnaire was provided. Data were collected during laboratory results waiting time and when the mothers had already received all services. This was a self-administered questionnaire, but for those who were not able to read and write the main author or a research assistant assisted. This questionnaire was adapted from other studies. All questionnaires were stored in a locked cabinet to maintain confidentiality. Only the main author had access to the questionnaires. The questionnaire was reviewed by a midwife specialist, obstetrician, and statistician experts to check for the content validity of the tool. The experts were asked to review each question to measure if it was answering the research questions. The feedback from each expert was analyzed and compared to determine the degree of content validity from each question. The modifications suggested were considered before pre-testing and data collection.

The data collection tool was pre-tested at Kibakwe Health Center with a small number of pregnant women

(10% of the sample size which was 35 pregnant women). For easy understanding of pregnant women, Swahili version questionnaires were used in pre-testing and during data collection. The purpose of pre-testing was to verify the adequate collection of desired information as well as ensure the consistency of the questions. In the pre-testing process, minor corrections were made before conducting the study.

Data analysis

Statistical Package for Social Science (SPSS) version 21 was used for data analysis. The analysis involved descriptive statistics such as frequency and cross-tabulations between the dependent and independent variables. We measured the attitude of respondents towards ANC booking using five items on a five-point Likert scale system. The response categories on each item ranged from 1 (strongly disagree) to 5 (strongly agree). A respondent was classified to agree if she agreed or strongly agreed on the itemized statement. Also, she was classified to disagree if she disagreed or strongly disagreed with the specified statement. The rest we classified as neutral. Knowledge was measured through 13 questions, the respondents who scored between 0 and 6 were considered to have low knowledge, while those who scored seven and above (7 to 13) were considered to have high knowledge. The chi-square test was used to assess the associations between variables. Continuous variables were represented by means and standard deviations and categorical data by whole numbers and percentages. Odds ratios were calculated to determine the association between selected variables. A P-value of < 0.05 was considered statistically significant. Multivariate logistic regression was used to determine the association between independent variables and antenatal clinic booking.

Results

Socio-demographic characteristic

Of the 352, more than half (55.7%) were aged less or equal to 25 years, mean age ($\pm$SD) was 25 years ($\pm$6.9). The majority of the respondents (88.6%) had attained formal education; 70.5% were unemployed; the majority (86.4%) was married; 59.1% were multigravida and more than half (57.1%) had given birth less than 2 times (Table 1).

Table 1: Socio-demographic characteristics

Variables	Responses (n, %)
Age	
Age less than or equal to 25 years	196 (55.7)
Age above or equal to 26 years	156 (44.3)
Education of respondents	
Formal education (literate)	312 (88.6)
Non-formal education (illiterate)	40 (11.4)
Occupation of respondents	
Employed	104 (29.5)
Un-employed	248 (70.5)
Marital status	
Married	304 (86.4)
Un-married	48 (13.6)
Gravidity	
Primegravida	144 (40.9)

Variable		Early booking	Late Booking	Total	%Proportion for early booking	%Proportion for late booking
Age (years)	< 25	56	140	196	28.57	71.42
	>26	50	106	156	32.05	67.94
Education	Formal education	99	213	312	31.73	68.26
	Non-formal education	7	33	40	17.5	82.5
Occupation	Employed	45	59	104	43.26	56.74
	Non employed	61	187	248	24.59	75.41
Marital status	Married Unmarried	94 12	210 36	304 48	30.92 25.00	69.08 75.00
Gravidity	Primegravida	42	102	144	29.16	70.84
	Multigravida	64	144	208	30.76	69.24
Parity	Parity < 2	69	132	201	34.33	65.67
	Parity ≥ 2	37	114	151	24.50	75.50
Overall Proportion		53	123	176	30.11	69.88
Multigravida			208 (59.1)			
Parity						
Parity < 2			201(57.1)			
Parity ≥ 2			151(42.9)			

Table 2: Proportion of ANC booking at the Mpwapwa RCH clinic.

The proportion of ANC booking at the Mpwapwa RCH clinic.

Overall, the proportion of late bookings in this study was 69.9%. Late booking was high (71.4%) among women who were below or equal to 25 years old; women who had no formal education (82.5%); not employed (75.41%); unmarried (75%); primigravida (70.84%) and parity more or equal to 2 (75.5%). (Table 2).

Intrapersonal factors.

Knowledge of respondents in ANC booking

Knowledge of respondents on the best time to start ANC and number of attendances required.

Most women (64.5%) knew that the best time to start ANC is the first trimester. The majority of women (65.1%) said that the required number of ANC attendances for pregnant women is four times or more (Table 3).

Table 3. Knowledge of respondents on the best time to start ANC and required number of attendance

Variable		Number of respondents (n, %)
Best time to start ANC	First trimester	227 (64.5)
	Second trimester	109 (31.0)
	Third trimester	16 (4.5)
Number of attendances at ANC	Two times	37 (10.5)
	Three times	86 (24.4)
	Four times and more	229 (65.1)

Knowledge of respondents on the services provided at ANC

Most respondents (96%) knew that pregnant women need to go for ANC checkups, and most (67.3%) believed that it is required to go for ANC even if there are no complications during pregnancy. On the other hand, almost all (94%) of respondents said that pregnant women need vitamin supplements during ANC visits, and the majority (89.2%) knew that it is necessary to take iron folic acid tablets during ANC visits (Table 4).

Table 4: Knowledge of the services provided at ANC

Variable	Responses (n, %)	
	Yes	No
Need for a pregnant woman to go to an antenatal check-up	338 (96)	14 (4)
The requirement to go for ANC even if there is no complication during pregnancy	237 (67.3)	115 (32.7)
Need of vitamin supplements during ANC visit	331 (94)	21 (6)
Is it necessary to take an iron-folic acid tablet during an ANC visit?	314 (89.2)	38 (10.8)

Knowledge of basic tests during ANC visits

Almost all respondents (96.6%) demonstrated that pregnant woman needs to undergo blood screening tests for HIV infection. Moreover, 97.4% of respondents knew that hemoglobin level should be taken and almost all (92.6%) respondents knew that blood pressure is measured during their ANC visits. The majority of respondents (88.6%) illustrated that pregnant women should test for blood sugar levels during their ANC visits (table 5).

Table 5: Knowledge of respondents on a basic test conducted during ANC visits

Variable	Responses (n,%)	
	Yes	No
Blood screening for HIV infection	340 (96.6)	12 (3.4)
Blood screening for hemoglobin level	343 (97.4)	9 (2.6)
Blood pressure examination	326 (92.6)	26 (7.4)
Blood sugar level	312 (88.6)	40 (11.4)

The influence of intrapersonal factors (Knowledge) in ANC booking

Knowledge about ANC booking was high among pregnant women aged above 26 years (75.6%); formal education (67.6%); employed (76.0%); married women (69.7%); multigravida (72.6%) and para two or more (72.8%). Only age, occupation, marital status, and gravidity of respondents achieved statistical significant of the study to influence knowledge on ANC booking. (Table 6).

Table 6: The influence of intrapersonal factors (Knowledge) in ANC booking

Variable	Category	High knowledge	Low knowledge	Odds ratio	95% CI	P – value
Age (Years)	Below 25	119 (60.7)	77 (39.3)	0.498	0.313 – 0.792	0.003
	Above 26	118 (75.6)	38(24.4)	REF		
Education	Formal education	211 (67.6)	101 (32.4)	1.125	0.563 – 2.246	0.739
	Non-formal education	26 (65.0)	14 (35.0)	REF		
Occupation	Employed	79 (76.0)	25 (24.0)	1.80	1.071 – 3.024	0.025
	Non - employed	158 (63.7)	90 (36.3)	REF		
Marital status	Married	212 (69.7)	92(30.3)	2.12	1.144 – 3.929	0.015
	Un-married	25 (52.1)	23 (47.9)	REF		
Gravidity	Primegravida	86 (59.7)	58 (40.3)	0.560	0.356 – 0.879	0.011
	Multigravida	151 (72.6)	57 (27.4)	REF		
Parity	Parity < 2	127 (63.2)	74 (36.8)	0.640	0.404 – 1.012	0.056
	Parity ≥ 2	110 (72.8)	41 (27.2)	REF		

Attitude of respondents on ANC booking

Most of the respondents (54%) agreed that early antenatal booking was good for their pregnancy. More than half (59.7%) were willing to go for antenatal booking within the first three months of their pregnancy and the majority (67.6%) believed that vitamin supplements are good for the fetus. Most of them (67.0%) said that antenatal follow-up was good for monitoring mother's and fetus' health. Moreover, the majority (67.3%) of respondents were willing to do an ultrasound scan at ANC during their pregnancy.

Furthermore, about 59.4% of respondents knew that they may face any pregnancy and delivery complications during their ANC visits (Table 7).

Table 7: Attitude of respondents on ANC booking

Variable	Response (n, %)				
	Strongly disagree	Disagree	Neutral	Agree	Strong agree
Early antenatal booking is good for my pregnancy	6 (1.7)	17 (4.8)	2 (0.6)	190 (54.0)	137 (38.9)
Will go for antenatal booking within the first three months of my pregnancy	9 (2.6)	43 (12.2)	4 (1.1)	210 (59.7)	86 (24.4)
Believe that vitamin supplement is good for the fetus	8 (2.3)	9 (2.6)	1 (0.3)	238 (67.6)	95 (27.0)
Antenatal follow up is good to monitor mother's and fetus' health	7 (2.0)	5 (1.4)	2 (0.6)	236 (67.0)	102 (29.0)
Willing to do an ultrasound scan during my pregnancy	15 (4.3)	22 (6.3)	15 (4.3)	237 (67.3)	63 (17.9)
Readiness to face any pregnancy and delivery complication	34 (9.7)	49 (13.9)	15 (4.3)	209 (59.4)	45 (12.8)

The influence of intrapersonal factors (attitudes) in ANC booking

Although there was a more positive attitude towards ANC booking among respondents aged 26 years and above, those without formal education, employed, unmarried, multigravida, and Parity more than or equal to 2, the results were not statistically significant. (Table 8).

Table 8: The influence of intrapersonal factors (attitudes) in ANC booking

Variable	Category	Positive attitude	Negative attitude	Odds ratio	95% CI	P – value
Age (Years)	Below 25	181(92.3)	15 (7.7)	0.400	0.142 – 1.125	0.073
	Above 26	151 (96.8)	5(3.2)	REF		
Education	Formal education	294 (94.2)	18 (5.8)	0.860	0.192 – 3.850	0.843
	Non-formal education	38 (95.0)	2 (5.0)	REF		
Occupation	Employed	101 (97.1)	3 (2.9)	2.478	0. 710– 8.643	0.142
	Non - employed	231 (93.1)	17 (6.9)	REF		

Marital status	Married	286(94.1)	18(5.9)	0.691	0.155– 3.077	0.626
	Un-married	46 (95.8)	2 (4.2)	REF		
Gravidity	Primegravida	132 (91.7)	12 (8.3)	0.440	0.175 – 1.105	0.074
	Multigravida	200 (96.2)	8(3.8)	REF		
Parity	Parity < 2	188(93.5)	13 (6.5)	0.703	0.273 – 1.807	0.462
	Parity ≥ 2	144(95.4)	7 (4.6)	REF		

Interpersonal factors (Partner, family and customs or traditions) in ANC booking

Majority (56%) of respondents reported that they were not accompanied by someone to ANC. Most of them (63%) demonstrated that they were getting support during pregnancy. About 58.8% of respondents illustrated that it was necessary to get permission from their partners before they started ANC, and all respondents claimed that there were no any customs or traditions which were hindering them from attending ANC (Table 9).

Table 9: Interpersonal factors (Partner, family, and customs or traditions) in ANC booking

Variable	Responses	
	Yes	No
Somebody accompanying the pregnant woman to the clinic	155 (44.0)	197 (56.0)
Getting support during pregnancy	222 (63)	130 (37)
Getting permission from someone to start the ANC	207 (58.8)	145 (41.2)
Having customs or traditions that hinder pregnant women from attending ANC	0 (0)	352 (100)

Support from other members of the family

More than half of respondents (53.7%) said that they were not accompanied by anybody to the clinic. Most of the respondents (42.0%) reported that they were supporting themselves during pregnancy in terms of daily activities. Furthermore, the majority of respondents (85.5%) said that their partners gave them support during pregnancy in terms of money, and most of the respondents (65.6%) said that they needed permission from their partner to attend ANC (Table 10).

Table 10: Support from other members of the family

Variable	Responses (n, %)					
	Partner	Mother	Parents	Father-in-law	Yourself	Others
Accompanying pregnant women to clinic	119 (33.8)	15 (4.3)	18 (5.1)	9 (2.6)	189 (53.7)	2 (0.6)

Supporting pregnant women in term of daily activities	96 (27.3)	39 (11.1)	33 (9.4)	25 (7.1)	148 (42.0)	11 (3.1)
Supporting pregnant women in terms of money	301 (85.5)	5 (1.4)	25 (7.1)	17 (4.8)	2 (0.6)	2 (0.6)
Mostly asking for permission to attend ANC	231 (65.6)	11 (3.1)	15 (4.3)	6 (1.7)	87 (24.7)	2 (0.6)

The influence of Interpersonal factors (Partner, family, and customs or traditions) in ANC booking

Despite the influence of interpersonal factors, ANC booking was high among pregnant women aged 25 years and below (65.3%); formal education (63.5%); employed (76.9%); married (63.8%); Primegravida (70.8%); those with parity less than 2 (70.1%), only occupation, gravidity, and parity were statistically significant (Table 11).

Table 11. The influence of Interpersonal factors (Partner, family, and customs or traditions) in ANC booking

Variable	Category	Influence of interpersonal factors	Not influenced by interpersonal factors	Odds ratio	95% CI	P – value
Age (Years)	Below 25	128 (65.3)	68 (34.7)	1.209	0.782 – 1.869	0.394
	Above 26	95 (60.9)	61(39.1)	REF		
Education	Formal education	198 (63.5)	114 (36.5)	1.042	0.528 – 2.058	0.905
	Non-formal education	25 (62.5)	15 (37.5)	REF		
Occupation	Employed	80 (76.9)	24 (23.1)	2.448	1.454 – 4.121	0.001
	Non - employed	143 (57.7)	105 (42.3)	REF		
Marital status	Married	194 (63.8)	110(36.2)	1.155	0.619 – 2.159	0.650
	Not married	29 (60.4)	19 (39.5)	REF		
Gravidity	Primegravida	102 (70.8)	42 (29.2)	1.746	1.110 – 2.746	0.015
	Multigravida	121 (58.2)	87 (41.8)	REF		
Parity	Parity < 2	141 (70.1)	60 (29.9)	1.977	1.273 – 3.071	0.002
	Parity ≥ 2	223 (63.4)	129 (36.6)	REF		

Institutional factors

Health Facility rules and regulations on ANC booking

More than two-thirds of respondents (66.5%) said that they were waiting for a long time (more than 30 minutes) to get ANC services and only (33.5%) reported that they were waiting for not more than 30 minutes (recommended time) to get ANC services (Figure 1).

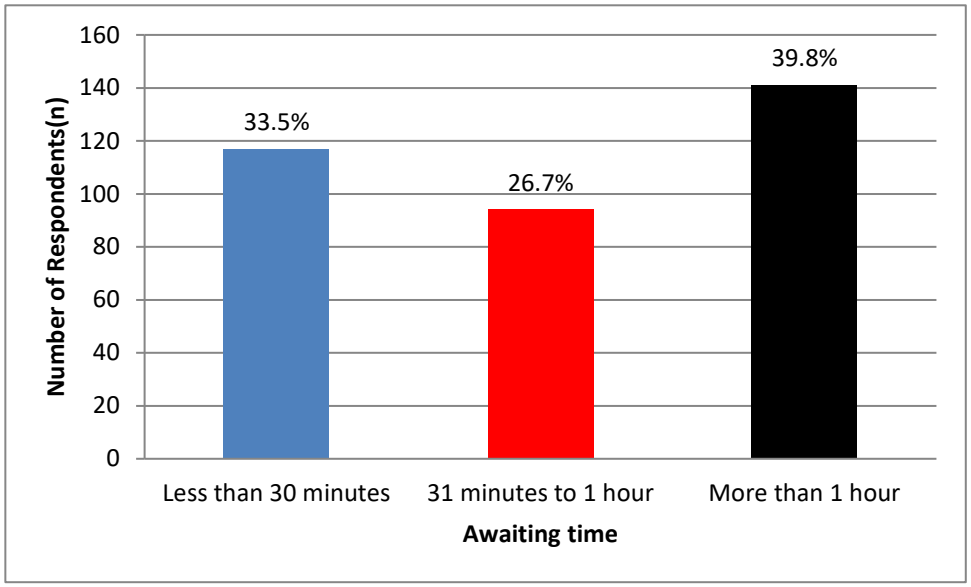

Figure 1. ANC waiting time

Community factors

Transportations to ANC booking

Most (65.1%) of the respondents were walking within 0 to 5 kilometers to reach the ANC clinic. The rest 34.9% were walking more than five kilometers from home to ANC. The majority (89.5%) were walking on foot to reach the ANC clinic. The rest, (9.1%) by motorcycle; 4.3% by public transport; 1.7% by private transport; 0.9% by bicycle; and 0.6% by Tricycle/bajaji. Most of the respondents (75.6%) who booked at ANC after 3 months (late) were living in a distance of more than five kilometers.

Public policy level

The influence of policies in ANC booking

All respondents reported that they were not paying for ANC booking and clinic cards. At the intrapersonal level (knowledge of ANC booking), late booking was high (92.3%) among the respondents who had low knowledge. At the interpersonal level (Partner support), late booking was high (83.7%) among respondents who missed support such as money for different uses from their partner. At an institutional level (Waiting for a long time to get ANC services), late booking was high (72%) amongst respondents who experienced waiting for a long time to get ANC services. At the Community level (Distance of walking to ANC), walking for more than 5 kilometers to ANC had more contribution (75.6%) to late bookings (75.6). Although all selected components of the ecological model for health promotion contributed to late booking, only the interpersonal factor (Partner support) was statistically significant.

Table 12. Factors associated with late booking per selected components of the ecological model for health promotion

Variable	Category	Total	Late booking (n, %)	P – value
Intrapersonal level (Knowledge of ANC booking)				0.059

	High knowledge Low knowledge	339 13	234 (69) 12(92.3)	
Interpersonal level (Partner support)	Yes No	223 129	138 (61.9) 108 (83.7)	0.000
Institutional factors (Waiting for long time to get ANC services)	Yes No	164 188	118 (72) 128 (68.1)	0.251
Community factors (Distance of walking to ANC)	0 to 5 Kilometer More than 5 Kilometers	229 123	153 (66.8) 93 (75.6)	0.055

Discussion

The ecological model for health promotions loosely guided the discussion.

The results showed that more than two-thirds of the respondents commenced ANC after the first trimester. That was possibly because most of the respondents were living in a distance of more than five kilometers. The distance of more than five kilometers to ANC was not favorable for pregnant women; on the other hand, most of them were using foot as a means of transport. In addition, these results implied that most respondents had a poor understanding of the importance of early ANC booking. The current result was in agreement with a study conducted in Rural and Urban Communities of the Copperbelt Province of Zambia [40], Central Ethiopia [41], Rufiji, Kilombero, and Ulanga districts in Tanzania [42], Ethiopia [43], Sibu Sire District, East Wollega Zone, Ethiopia [44], Indonesia [45], Empangeni sub-district of Uthungulu, in KwaZulu-Natal province, South Africa [46], in Kalomo, Zambia [47], Kombolcha District, Eastern Hararghe Zone, Oromia Regional State, Eastern Ethiopia [48] and was a little bit low compared to the study done in Arba Minch Town and Arba Minch District, Gamo Gofa Zone, South Ethiopia since it was more than three-quarters of participants booked ANC late. This variation may be due to the source of information. About multiple logistic regression of the study done in South Ethiopia, most of the participants justified that they were informed the commencement of ANC is from 16 weeks and more [49] but was not in line with the study done in Ghanaian Government Hospital, Ekiti State Primary Health Centers, Nigeria in which more than three-quarters of participants commenced ANC within the first trimester (early) [50] [51]. The reasons for this difference may also be linked to the fact that services rendered by Suntreso government hospital in Ghana included home visits to educate and encourage pregnant women to attend ANC earlier for skilled attendance, early diagnosis, and prevention of complications, as well as tracing defaulters.

The study showed that most women knew the best time to start ANC is the first trimester and the required number of ANC attendance throughout the pregnancy is eight times. This high knowledge of the best time to start ANC and the necessary number of attending ANC is because most respondents had formal education. This study is in line with the study done in rural women in Bangladesh [52]

Regarding the required number of attending at ANC, a previous study showed that, the mother should attend at ANC eight times or more during the pregnancy. The findings of the current study corresponded with the study done in Ambo town health facilities, in Central Ethiopia [53], Sakubva and Dangamvura polyclinics in Mutare, Zimbabwe [54], in Ile-Ife, South-West, Nigeria [55] but is not similar to the result of the study done in Mbombela Municipality of Mpumalanga province, South Africa, and South East Nigeria in which most of the participants demonstrated poor knowledge of the concept and timing of initiating and subsequent ANC services [56 - 59]

Iron supplements were given to pregnant women worldwide during ANC visits to reduce the high incidence of iron deficiency anemia. Approximately 25% of women and children are affected due to iron deficiency anemia. Current best estimates are that 38% of pregnant women worldwide are anemic with the majority attributable to iron deficiency [60]. The results of this study demonstrated that most respondents knew that pregnant women need to go for ANC checkups and that iron folic acid tablets are necessary during ANC visits to provide good hemoglobin levels in their bodies. The findings of this study revealed that many respondents had good knowledge of the importance of taking iron supplements during pregnancy. The finding of the study corresponds with the study done at a Tertiary Care Hospital of Pune, Maharashtra [61**],** Comprehensive Health Centre, Umunya [62] compared to the respondents who participated in a survey conducted in Dodoma municipal where a few respondents had good knowledge of the importance of taking iron supplements during pregnancy [29].

Furthermore, nearly all respondents demonstrated that pregnant women need to undergo blood screening tests for HIV infection and the majority illustrated that pregnant women should test for blood sugar levels during ANC visits. These findings evidence the successful awareness and willingness concerning the understanding of prevention of mother-to-child transmission of HIV/AIDS. The findings corresponds with the study done in Mozambique [63], in adolescent Girls in Some Selected Secondary Schools in Malawi [64**],** in Mbulu and Mkuranga Districts in Tanzania [65], at the State Specialist Hospital, Akure, Ondo State [66] though the participants were afraid of stigmatization. The findings of this study were high compared to other findings [29] hence a few respondents agreed to be screened during their antenatal clinic visits.

Respondents in this study demonstrated that a positive attitude towards ANC booking was gained through multi-attendance at ANC. This was evidenced by nearly all multigravida attitudes towards ANC booking was positive. It is in line with the study conducted in an urban area of India [67] but differs from the study conducted in South West Ethiopia and in Kham District, Xiengkhouang Province, LAO PDR respectively whereby almost one-third of all the respondents had a negative attitude toward ANC booking [68 - 69].

Moreover, the study illustrated that low socio-economic status influenced late ANC booking. This is evidenced by the fact that most respondents were unemployed. This finding was in agreement with [36]. which had shown that the respondents who were of low socio-economic status negatively affected ANC booking.

Most of the respondents demonstrated that they were getting financial support from their partner during pregnancy and more than half of respondents said that it was necessary to get permission from their partners and significant others before they started ANC. The study findings indicated that the problems of depending on financial support and permission from their partners facilitated them to attend ANC late. The observation was similar to the study done in Ntchisi District in Malawi [70], in Tanzania [71], and in Nigeria [72].

In addition, findings showed that more than half of respondents were not accompanied by anybody to the clinic. This lack of company to clinic influenced negatively ANC booking. The findings of this study were not in agreement with the study done in Upcountry areas of Uganda, Ile-Ife, Osun state, South-West, Nigeria, and Netherlands, respectively because partners, parents, and in-laws were in the role of accompanying pregnant women to ANC and also were supporting in daily activities such as fetching water, washing clothes, and cooking [73 - 75].

A total of 66.5% of respondents reported that they were waiting for more than half an hour to get ANC services. This long waiting time was due to inadequate staff which was observed during data collection; only one trained nurse was allocated to provide services to 40 to 50 pregnant women per day. This finding was similar to a study in a Zimbabwean Peri-Urban District and in Selected Rural and Urban Communities of the Copperbelt Province of Zambia respectively [76 - 77] whereby pregnant women were waiting for a long time due to a shortage of staff, insufficient rooms for providing antenatal services, and poor clinical data recording for the numbers of pregnant women in attendance but it was not similar to the study done at local government area of Victoria, Australia, in which most of pregnant women were frustrated due to long waiting time. Some were waiting for 4 hours despite their emergency care required for a moment [78].

The commonest means of transport to ANC in this study was on foot. Since the majority of respondents were walking to reach the antenatal clinic, so the means of transport were not favorable to them and made them to attend ANC late or not attend at all. These findings differ from the study done in Ife Central Lga, Osun State Nigeria [79**]** whereby the commonest means of transport was public transport.

All respondents reported that they were not paying for ANC booking and clinic cards. This indicated that the national exemption policy for pregnant women was adhered to. The results of this study were not in agreement with the study done in Papua New Guinea which revealed that they were paying for ANC services [80]. Although ANC services were free at the public health facilities in Malawi, in the Southern District of Mzimba there were still some additional costs including purchasing medical record books, transportation during referral for buying fuel, and the cost of obstetric laboratory tests like urine-protein tests, which impeded some pregnant women with lower income initiating their ANC timely [81]. The study conducted in Ghana, Kenya and Malawi also revealed that, there was direct and indirect cost of ANC services such as for ANC card, obstetric investigations [82], in Malindi and Magarini sub-counties of Kilificounty, Kenya [83], also Cameroon were paid for ANC services [84**]**

Conclusions

In conclusion, the overall proportion of late bookings in this study was high. All levels of the ecological model appear to influence ANC booking. Although the respondents expressed high knowledge and positive attitude towards ANC, the subordination of pregnant women in decision-making concerning ANC booking, dependence on sexual partners for financial support, and transport issues might have contributed to late ANC booking. Interventions geared towards early recommended ANC bookings should reflect all levels of the ecological model. In the long run, women's empowerment through education and income-generating activities as well as involvement of sexual partners in ANC, education, and communication may promote early recommended booking.

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