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Abstract This study aimed to investigate factors that influence antenatal care utilization and their association with adverse pregnancy outcomes (defined as low birth weight, stillbirth, preterm delivery or small for gestational age) among pregnant women in Kumasi. A quantitative cross-sectional study was conducted of 643 women aged 19–48 years who presented for delivery at selected public hospitals and private traditional birth attendants from July–November 2011. Participants' information and factors influencing antenatal attendance were collected using a structured questionnaire and antenatal records. Associations between these factors and adverse pregnancy outcomes were assessed using chi-square and logistic regression.

Nineteen percent of the women experienced an adverse pregnancy outcome. For 49% of the women, cost influenced their antenatal attendance. Cost was associated with increased likelihood of a woman experiencing an adverse outcome (adjusted OR = 2.15; 95% CI = 1.16–3.99; p = 0.016). Also, women with >5 births had an increased likelihood of an adverse outcome compared with women with single deliveries (adjusted OR = 3.77; 95% CI = 1.50–9.53; p = 0.005). The prevalence of adverse outcomes was lower than previously reported (44.6 versus 19%). Cost and distance were associated with adverse outcomes after adjusting for confound-

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1. Introduction

There is wide recognition that one of the major factors contributing to the high rate of adverse birth outcomes is the low use of prenatal and maternal health services [1,2]. Antenatal care (ANC) remains one of the Safe Motherhood interventions that if properly implemented has the potential to significantly reduce maternal and perinatal mortalities [3]. The antenatal period presents opportunities for reaching pregnant women with interventions to maximize maternal and neonatal health [4,5]. Regular ANC visits provide health personnel with an opportunity to manage the pregnancy. It is a period during which a variety of services such as treatment of pregnancy-induced hypertension, tetanus immunization [6—8], prophylaxis and micronutrient supplementation are provided [5,9]. These measures have been shown to be effective in improving pregnancy and neonatal outcomes [10].

A 44.6% prevalence of adverse pregnancy outcome has been reported among pregnant women in Kumasi, Ghana [11]. This high prevalence could be a result of barriers associated with accessing ANC services. To address some of these barriers, the government of Ghana established the National Health Insurance Scheme (NHIS) in 2003 to replace the previous ''cash-and-carry'' system. The goal was to provide essential health services without out-of-pocket payment at the point of service. In this scheme, the 'core poor', defined as being unemployed, with no visible source of income and no fixed residence, were exempt from paying insurance premiums. People who were not living in a household with someone who was employed and had a fixed residence were also exempt [12]. While the insurance scheme was intended to achieve universal coverage, only a small percentage of eligible women, especially pregnant women, were enrolled in the program. To address this inequality, pregnant women were exempted from paying the insurance premiums beginning in 2008 [13]. Under the free maternal care policy, maternal and prenatal care are covered [14].

While ANC in developed countries is characterized by a high number of antenatal visits and early attendance, it is the opposite in developing countries with fewer, late or no antenatal visits [3]. A

study in Kenya indicated that 52.5% of women in rural areas and 49.2% in urban settings attended ANC once prior to delivery and the first ANC visit was after 28 weeks of pregnancy [15]. In Ghana 85% attended at least one antenatal visit with a skilled provider before delivery. Seventy-three percent of pregnant women in urban areas and 55% in rural areas were more likely to attend 4 or more antenatal visits [6,16]. Though it has been reported that up to 40% of pregnant women in developing countries receive no ANC [17], a study in Ghana reported that 14% of women did not attend ANC at all [6].

Different factors influence the healthcare-seeking behavior of pregnant women [18]. These factors could be organizational, such as the availability of services, or socio-demographics [9,19]. Socio-demographic characteristics, such as education, occupation and number of children, were related to the use of ANC services in Vietnam [20,21]. In Punjab, Pakistan, family finances and the woman's level of education were important determinants of ANC use [22]. In Nigeria, perceived quality of care was one of the factors responsible for the low utilization rate of ANC services in tertiary institutions in the Southwest part of the country [3].

The reasons why some women in sub-Saharan countries including Ghana do not seek or get adequate ANC are not obvious. In order to improve the planning and provision of ANC services, it is important to understand perceived or apparent barriers to ANC services. This will enable the formulation and implementation of interventions that will sustain ANC utilization [3,9]. The objective of this study was to investigate the factors that influence the utilization of ANC services among pregnant women in Kumasi and determine if these factors are associated with adverse pregnancy outcomes.

2. Material and methods

2.1. Study setting

A quantitative cross-sectional study was conducted to investigate factors that influence participation in ANC services and their association with adverse pregnancy outcomes in Kumasi. The

study was conducted in two health facilities: the Komfo Anokye Teaching Hospital (KATH) and Manhyia District Hospital (a tertiary and a secondary hospital, respectively). Kumasi is the capital of the Ashanti Region. It has an estimated population of about 1.7 million people (Kumasi Health Profile, unpublished, Joana Tawia Burgesson). KATH is a referral hospital that provides most of the ANC, labor and delivery services. It serves the entire Ashanti Region as well as the bordering Regions. Manhyia District Hospital covers Manhyia North and South and caters to 34.6% of the Kumasi population (Kumasi Health Profile, unpublished, Joana Tawia Burgesson). Additionally, 16 Traditional Birth Attendants (TBAs) trained in caring for pregnant women, delivering babies, and recognizing danger signs necessitating hospital referral were included in this study. TBAs who lived and practiced within the Asokwa health sub-metro participated in this study.

2.2. Participants

Eligible participants were pregnant women, 19 years and older, who resided in Kumasi at the time of conception or moved to Kumasi within 1—2 months following conception and presented to the study hospitals or TBAs for delivery. Women with singleton, spontaneous, vaginal deliveries occurring without complications between July and November 2011 were eligible for enrollment in this study. Women with pregnancy-induced hypertension or pre-eclampsia were excluded because this condition would cause them to attend more than the required number of ANC visits.

Potential participants who presented for delivery at the study health facilities were informed of the study by the attending midwives during their admission to the labor ward while the TBAs informed their clients. Informed consent was obtained from all participants who participated in the study. Data from 643 of the 647 women were used for this study. Trained study personnel administered questionnaires to the participants 1-2 hrs following their delivery. Participants were questioned in a private area, no identifying information was recorded and confidentiality was assured. Questionnaires were reviewed for completeness.

The Institutional Review Board of the University of Alabama at Birmingham, USA, and the Committee on Human Research, Publications and Ethics, School of Medical Sciences, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, approved the study protocol.

2.3. Data collection

A 92-item structured questionnaire was used to ascertain information on: (1) socio-demographics, (2) obstetric and reproductive history, (3) occupation and lifestyle factors, (4) ANC services and treatment received, and (5) perception of quality of ANC services received and level of satisfaction. The socio-demographic section was adapted from the Malaria Monitoring and Evaluation Group [23]. It included questions about health insurance and duration of the insurance.

Prior to the commencement of the study, the entire questionnaire was reviewed by six senior midwives for content validity and cultural sensitivity. To improve its reliability, the validated instrument was pre-tested on five pregnant women attending ANC and six new mothers. Following pre-test modifications, twelve new mothers who met the study eligibility requirements pilot tested the questionnaire. The questionnaire was modified accordingly before use.

2.3.1. Primary exposure of interest
ANC attendance was assessed using data abstracted from the maternal antenatal booklet and responses to the following questions:

1. How many times did you attend antenatal clinic?
2. Did you know you had to attend at least 8 times?
3. Did you know you had to attend a total of 13 times?

Barriers to ANC attendance were assessed by asking women whether they did not attend the expected number of antenatal clinic visits because of any of the following reasons; (*a*) I did not know I had to attend that many times; (*b*) I could not afford it; (*c*) lack of insurance; (*d*) No time to attend; (*e*) I have had other children without any problems; (*f*) I was not sick; (*g*) Hospital too far from where I live; (*h*) I do not like the attitude of the hospital staff; (*i*) Fear of knowing my HIV status; (*j*) Cultural beliefs; and (*k*) lack of confidence in the services provided.

2.3.2. Primary outcome of interest
Any adverse outcome was defined as: low birth weight (birth weight <2500 g), preterm delivery (<37 weeks of gestation), and small for gestational age (sex-specific birth weight at or below the 10th percentile for the weight-for-gestational age of an international reference population) [8]. Stillbirth was defined as death of an infant more than 12 h prior to or within 12 h of delivery. Information on low birth weight, small for gestational age and stillbirth was

ascertained from the maternity record at delivery and before discharge to the "Lying Inn Ward." Determination of preterm was based on the response to the question on duration of pregnancy.

2.4. Data analysis

The data were individually entered into a Microsoft Access 2010 database and imported to SAS. Descriptive statistics of the study participants were computed as frequency distributions (character variables), means and standard deviations (numeric variables). Association of participant characteristics and pregnancy outcomes was assessed using chi-square or Fisher's exact tests. ANC attendance was categorized as <7 or 8—13 times (Ghana's standard). Association between barriers, ANC attendance and adverse pregnancy outcomes were examined using chi-square test. Two multivariable models were used to assess the association between the identified barriers and adverse pregnancy outcomes. In the first multivariable model, all the variables in the bivariate model were included irrespective of their level of significance. In the second multivariable model, all variables with a p-value $\leqslant 0.20$ from the first multivariable model or biologically plausible were included while adjusting for age, marital status and level of education. The change-in-estimate criteria were used to select potential confounders. A variable was considered a confounder if the change in estimate from the crude and adjusted model was at least 10 percent [24]. Crude and adjusted odds ratios (ORs) with 95% confidence intervals (CI) and p-values were calculated using logistic regression. All tests were two-sided and p-values $\leqslant 0.05$ were considered statistically significant. SAS® 9.2 (SAS Institute, Cary, NC, USA) was used for analyses.

3. Results

3.1. Participants' characteristics

Participation rate was 99.7%. Three participants were recruited through the TBAs while 73.7% (474/643) and 25.8% (166/643) were recruited from KATH and Manhyia, respectively. Participant characteristics are presented in Table 1. Mean (±standard deviation [SD]) age was 28 (5.7) years and ranged from 19 to 48 years. Ten percent of the unemployed were housewives and 9.6% were students. Most of the self-employed were traders (58%) and hairdressers or seamstresses (30.3%). Thirty-eight percent of women with >5 children experienced an adverse outcome compared with women with 2—5 children (22.4%).

3.2. Obstetric history of participants

One hundred and twenty-two participants (19.0%) experienced an adverse outcome. The proportion of the various adverse outcomes is shown in Table 1. About 15% (33/226) of primiparas experienced an adverse event compared with 33.3% (139/417) for the multiparas. Sixty-one percent were multiparas (2—5 children) and 3.7% were considered grande multipara (>5 children). Women 36 years or older with a primary level of education or no formal education were more likely to experience an adverse outcome. They were also likely to be poor with a monthly income of less than GH¢500.00, or have had insurance for only 3 months prior to delivery.

3.3. Determinants of ANC attendance

Women who attended >13 ANC visits were excluded since 8—13 ANC visits are required. Data for 574 participants were used for this analysis. Approximately 1.1% (7/643) of the women did not attend ANC. Ten percent (66/643) attended 1—3 visits, 45.9% attended 4—7 times and 42.8% attended 8—13 ANC visits. A summary of the reasons for inadequate ANC visits, number of ANC attended and pregnancy outcomes is presented in Table 2. Cost, lack of insurance, being unaware of pregnancy, and not being sick were reasons that statistically influenced ANC attendance. Only cost was statistically associated with pregnancy outcomes. Distance and cultural beliefs were marginally associated with pregnancy outcomes. In a cross-tabulation of identified barriers with age and level of education, women who said cost was a factor were more likely to be younger (19—25 years) ($p = 0.003$), and have a primary school or no formal education ($p = 0.008$). For 62.5% of women 19—25 years, fear of knowing their HIV status ($p = 0.038$) was another reason for inadequate ANC attendance.

3.4. Adverse pregnancy outcomes by barriers

The association between adverse pregnancy outcomes and barriers to ANC attendance is shown in Table 3. Cost was associated with an increased likelihood of a woman experiencing an adverse outcome (OR = 1.92, 95% CI = 1.11—3.33; $p = 0.020$) (crude model). In Model 1, the association between cost and adverse outcome remained significant (adjusted OR = 2.15; 95% CI = 1.16—3.99; $p = 0.016$). Having 2 or more children was significantly associated with a woman experiencing an adverse outcome. The strength of association

Table 1 Characteristics of study participants by adverse pregnancy outcome, Kumasi 2011.

Characteristics	N = 643[a]		Adverse[b] N = 122		No Adverse N = 521		p-Value
	n	%	n	%	n	%	
Age group							**0.006**
⩽20 years	57	8.9	9	15.8	48	84.2	
21—25 years	186	28.9	30	16.1	156	83.9	
26—35 years	334	51.9	60	18.0	274	82.0	
⩾36 years	66	10.3	23	34.9	43	65.2	
Level of education							0.745
Primary/none	200	31.1	42	21.0	158	29.0	
Junior secondary	277	43.1	51	18.4	226	81.6	
Senior secondary	94	14.6	18	19.2	76	80.9	
University/vocational	72	11.2	11	15.3	61	84.7	
Marital status							0.978
Single	107	16.6	21	19.6	86	80.4	
Married	458	71.2	86	18.8	372	81.2	
Living as married	78	12.2	15	19.2	63	80.8	
Employment							0.502
Unemployed	135	21.0	25	18.5	110	81.5	
Employed	65	10.1	9	13.9	56	86.2	
Self-employed	442	68.9	88	19.9	354	80.1	
Religion							0.764
Christianity	468	72.8	91	19.4	377	80.6	
Islam	167	26.0	29	17.4	138	82.6	
None	8	1.2	2	25.0	6	75.0	
Income (Cedis)							0.480
<500/Do not know	435	67.7	88	20.2	347	79.8	
500—2000	180	28.0	30	16.7	150	83.3	
>2000	28	4.4	4	14.3	24	85.7	
Health insurance							0.201
Yes	623	96.9	116	18.6	507	81.4	
No	20	3.1	6	30.0	14	70.0	
Duration of insurance[c]							0.274
3 months	71	11.4	16	22.5	55	77.5	
6 months	109	17.5	15	13.8	94	86.2	
9 months	64	10.3	13	20.3	51	79.7	
More than 1 year	375	60.2	70	18.7	305	81.3	
Do not know	4	0.6	2	50.0	2	50.0	
Parity							**0.002**
1	226	35.5	25	11.1	201	88.9	
2—5	393	60.8	88	22.4	305	77.6	
>5	24	3.7	9	37.5	15	62.5	
Adverse outcomes							
Small for gestational age			44	6.8			
Preterm delivery		NA	51	7.9	NA		NA
Low birth weight			36	5.6			
Still birth			41	6.4			

p-values were obtained using chi-square or Fishers exact tests.
[a] Column%.
[b] Row%.
[c] N = 623 only those with health insurance.

increased with increasing order of children. Women with >5 prior deliveries were more likely to experience an adverse outcome compared with women with a single delivery (OR = 3.33; 95% CI = 1.35—8.17) (Model 1). In Model 2, women with >5 deliveries were nearly 4 times more likely to experience an adverse outcome compared with women with one delivery (adjusted OR = 3.77,

Table 2 Antenatal care attendance and pregnancy outcome by self-reported barriers to antenatal services utilization in Kumasi, 2011.

Barriers	ANC attendance							Pregnancy outcome				
	N = 574		≤7		8—13			Adverse		No adverse		
	n	(%)	n	(%)	n	(%)	p-Value	n	(%)	n	(%)	p-Value
Cost	65	11.3	47	72.3	18	27.7	**0.017**	23	35.4	42	64.6	**0.019**
Lack of insurance	53	9.2	45	84.9	8	15.1	**<.001**	14	26.4	39	73.6	0.625
Distance	32	5.6	21	65.6	11	34.4	0.402	12	37.5	20	62.5	**0.059**
Attitude of staff	16	2.8	8	50.0	8	50.0	0.482	4	25.0	12	75.0	0.901
Fear of knowing HIV status	24	4.2	11	45.8	13	54.2	0.197	7	29.2	17	70.8	0.519
Cultural beliefs	16	2.8	11	68.8	5	31.3	0.400	7	43.8	9	56.3	**0.056**
Lack of nice clothes[a]	1	0.2	1	100	0	0.0	0.400	1	100	0	0.0	0.073
No confidence in services[a]	8	1.4	5	62.5	3	37.5	0.819	3	37.5	5	62.5	0.355
Unaware of pregnancy	49	8.5	40	81.6	9	18.4	**0.001**	11	22.5	38	77.6	0.830
Traveled	31	5.4	25	80.7	6	19.4	**0.010**	6	19.4	25	80.7	0.559
Holiday[a]	1	0.2	0	0.0	1	100	0.234	1	100	0	0.0	0.577
Attended as required	125	21.8	52	41.6	73	58.4	**<.001**	27	21.6	98	78.4	0.534
Did not know had to attend that many times	41	7.1	12	29.3	29	70.7	**<.001**	9	22.0	32	78.1	0.785
Not sick	63	11.0	45	71.4	18	28.6	**0.028**	17	27.0	46	73.0	0.515
No time to attend	40	7.0	25	62.5	15	37.5	0.598	7	17.5	33	82.5	0.340
Using herbal medicines[a]	2	0.4	2	100	0	0.0	0.233	1	50.0	1	50.0	0.381
Laziness[a]	9	1.6	6	66.7	3	33.3	0.618	1	11.1	8	88.9	0.371
Had drugs at home[a]	4	0.7	3	75.0	1	25.0	0.502	2	50.0	2	50.0	0.214
Delivered before due date[a]	1	0.2	0	0.0	1	100	0.234	1	100	0	0.0	0.073
Have experience[a]	2	0.4	2	100	0	0.0	0.233	0	0.0	2	100	0.430
Confused when to attend[a]	4	0.7	3	75.0	1	25.0	0.502	1	25.0	3	75.0	0.951
Waiting for more time[a]	2	0.4	2	100	0	0.0	0.233	1	50.0	1	50.0	0.381
Sick and hospitalized[a]	10	1.7	6	60.0	4	40.0	0.925	1	10.0	9	90.0	0.304
No complication with others[a]	1	0.2	1	100	0	0.0	0.400	0	0.0	1	100	0.577
Other reasons[a]	9	1.6	6	66.7	3	33.3	0.618	2	22.2	7	77.8	0.917

Other reasons (being shy, it was stressful, attended more than 8 but not recorded, not enough personnel/nothing done in 1st trimester).

[a] Fishers exact test, Bold = statistically significant.

95% CI = 1.50—9.53). The associations of distance to hospital and cultural beliefs with adverse outcomes were not statistically significant in the crude model. However, women who did not attend the required number of antenatal visits due to distance or cultural beliefs were twice as likely to experience an adverse outcome compared with women whose attendance was not influenced by these factors (OR = 2.02, 95% CI = 0.96—4.25; OR = 2.59, 95% CI = 0.95—7.08). After adjusting for age, level of education and marital status, only cost and distance were statistically significant. Women whose ANC attendance was influenced by cost or distance were two times more likely to experience an adverse outcome compared with women whose attendance was not influenced by these factors (adjusted OR = 1.86, 95% CI = 1.04—3.32, p = 0.035; adjusted OR = 2.24, 95% CI = 1.00—5.03, p = 0.051) (Model 2).

4. Discussion

Identifying non-geographic and modifiable barriers to ANC is important for policy formulation. Results from this study suggest that cost, parity and distance influence ANC attendance and are also associated with adverse pregnancy outcomes. These factors could be contributing to adverse outcomes by limiting the number of ANC visits attended and consequently the services obtained. In a prior study in Ghana, cost incurred while accessing ANC services was partly due to consultation fees and drugs [6]. The introduction of the NHIS in 2003 mandated that insured pregnant women get free antenatal services [14]. It has been reported that women insured by the present insurance scheme were more likely to use prenatal care and less likely to experience birth complications, while the uninsured were more likely to delay seeking ANC and develop

Table 3 Crude and adjusted ORs for association of selected barriers and factors that determine ANC utilization with adverse birth outcomes among pregnant women accessing ANC services in Kumasi, Ghana 2011.

Barriers	Crude[a]			Model 1[b]			Model 2[c]		
	OR	(95% CI)	p-Value	OR	(95% CI)	p-Value	OR	(95% CI)	p-Value
Cost	1.92	(1.11—3.33)	**0.020**	2.15	(1.16—3.99)	**0.016**	1.86	(1.04—3.32)	**0.035**
Lack of insurance	1.17	(0.62—2.23)		1.01	(0.49—2.08)				
Distance	2.02	(0.96—4.25)	0.063	2.15	(0.94—4.95)	0.071	2.24	(1.00—5.03)	**0.051**
Attitude of staff	1.08	(0.34—3.39)		0.87	(0.26—2.95)				
Fear of knowing HIV status	1.34	(0.54—3.31)		0.82	(0.30—2.26)				
Cultural beliefs	2.59	(0.95—7.08)	0.064	2.18	(0.74—6.40)	0.158	2.34	(.80—7.16)	0.118
Unaware of pregnancy	0.93	(0.46—1.87)		1.04	(0.47—2.32)				
Traveled	0.76	(0.31—1.90)		0.83	(0.31—2.23)				
Attended as required	0.86	(0.53—1.39)		1.05	(0.58—1.92)				
Not sure of number of times	0.90	(0.42—1.93)		1.11	(0.47—2.59)				
Not sick	1.22	(0.67—2.20)		1.33	(0.68—2.61)				
No time to attend	0.67	(0.29—1.54)		0.54	(0.22—1.34)				
Other reasons	1.08	(0.56—2.09)		1.07	(0.49—2.08)				
Parity									
1	ref			ref			ref		
2—5	1.45	(0.94—2.23)	0.090	1.56	(1.00—2.44)	**0.052**	1.52	(0.91—2.52)	0.107
>5	3.33	(1.35—8.17)	**0.009**	3.77	(1.50—9.53)	**0.005**	2.62	(0.88—7.75)	0.083
Income			0.473			0.616			
<¢500	1.27	(0.81—1.99)		1.11	(0.70—1.77)				
¢500—2000	ref			ref					
⩾¢2000	1.66	(0.59—4.66)		1.69	(0.59—4.85)				

Bold = statistically significant.
[a] Barriers that were statistically significant in Table 2 or biologically plausible.
[b] All variables in the crude model included in this multivariable model.
[c] Adjusted for age, level of education and marital status.

obstetric complications [14]. This study did not investigate the cost associated with ANC attendance. However, cost may be related to travel and unofficial fees [25]. Cost could also be due to feeding expenses for the pregnant woman and more so if she was accompanied by a family member. Buying drugs and supplies that were not provided or not covered by the NHIS could also constitute cost. Cost was also cited as an obstacle to enrolling women in the NHIS [14,26]. To avoid the long wait time in public facilities, some of these women may have ended up in private or maternal home facilities. The fees charged could be high and may determine how many times a woman attends ANC.

Cost as a determinant is re-enforced by the fact that 49.2% of these women had a primary level or no formal education and were of low-income level. The level of education of the pregnant woman [7,8] and that of her husband has been shown to be a barrier in accessing ANC even in developed countries [27]. A higher level of education would increase the woman's knowledge, awareness and effectiveness of antenatal services and the consequences. This knowledge could influence her healthcare decision-making. Lack of knowledge of obstetric complications was associated with underutilization of antenatal services in Indonesia [7]. Similar studies involving Planned Parenthood and other healthcare services in Metro Cebus, Philippines and Haiti observed that maternal education was the most consistent and important determinant of ANC use [28—30]. Educational level was a strong determinant of enrollment in the NHIS and those with less education were less likely to enroll [14]. Designing health education programs that take into consideration those with no formal or basic education would likely increase ANC utilization and likely reduce adverse birth outcomes. Educating women on the dangers of inadequate ANC utilization may be the best way to encourage ANC use [28]. There are many radio and television stations in Kumasi that broadcast health programs. Including and increasing the frequency of broadcast of antenatal health education programs could likely increase the uptake of

ANC services. Cell phone ownership in Ghana is high and most are fitted with radio or TV. This approach may be more convenient for some of these women (traders, seamstresses and hairdressers). These women spend a significant amount of time in the market every day and may be less aware of the dangers of inadequate ANC attendance. Exposure to mass media was seen to increase the odds of women seeking ANC in India [19], while less exposure to mass media was associated with underutilization of ANC services in Indonesia [7]. When a woman goes for antenatal care, the next ANC visit date is usually indicated in the maternal antenatal booklet. This is helpful, but can only be meaningful if the woman initiates ANC early. That is why many of the women indicated attending ANC as requested.

The distance traveled by some of the women to the hospital or health center for ANC could be substantial. While this study did not investigate participant's distance to the point of ANC service, distances longer than 3–5 km are deterrents to seeking ANC [9]. Even when distance was cited as a barrier to ANC use in Kenya, 18% of women still did not visit the nearest ANC facility [25]. The women in this study as in the Kenya study could also be considering the quality of care that is offered at their preferred point of service. Some of these women would prefer KATH (a referral hospital), where complications, if any, could be identified easily and early. The absence of comfortable transportation, and the pregnant woman's physical inability to walk or travel long distances could be reasons why distance was considered a factor by the women in this study. One study observed that eliminating travel distance to ANC increased demand for sufficient care [6]. Not all private health providers accept the government insurance. A policy that could facilitate acceptance of this insurance by all providers will offer pregnant women the choice of either using a private or public facility taking distance into consideration. This choice could likely minimize the aspect of cost and distance thereby increasing access to ANC, which may lower the prevalence of adverse outcomes. Adverse outcomes are confounded by both cost and distance. Women who may not attend the required number of ANC visits are more likely to be poor and malnourished. They may also be living far from the maternity center or hospital and may not be able to arrive in time for obstetrical intervention to save the pregnancy.

High parity was associated with adverse pregnancy outcomes. This finding is supported by a study in rural north India and Indonesia where they found an association between parity with reduced ANC use. Women who have experienced a previous pregnancy without complications may feel little need to seek care. Also, practical issues of attending a health facility when caring for children may influence ANC attendance [7]. In India, it was found that women with many children were less likely to use ANC services [19].

Despite the barriers, this study observed a low prevalence (19%) of adverse pregnancy outcomes compared with a previous report of 44.6% [11]. This low prevalence could be due to the introduction of the NHIS in 2003, and the changes made to the antenatal protocol in 2005 that provided for prophylactic treatment for malaria and intestinal helminths (infections that have been consistently linked with adverse pregnancy outcomes). The drop in the prevalence of adverse outcomes from the publication of the Yatich et al. study and this study could be due to the fact that the data for Yatich et al. were collected in 2006 while the data for the current study were collected in 2011. These changes in both insurance and preventive treatment were not in full effect in 2006 but were in effect in 2011 [11].

The rate of ANC attendance from this study is very high. Also, the proportion of women who did not attend ANC is lower (1.1%) compared with what was reported by Overbosch et al. (14%) [6]. The high rate of adverse pregnancy outcomes observed in this population despite the increase in ANC attendance cannot be explained by ANC attendance alone. Environmental, nutritional/metabolic, disease or genetic conditions could be playing a part in maintaining the high prevalence of adverse outcomes observed in this population. The content, quality and effectiveness of ANC services should be investigated.

This study was done in two hospitals that provide greater coverage of antenatal services not only to the people of Kumasi but the entire Ashanti and surrounding Brong-Ahafo, Central and Western regions. There is a dearth of information on the psychosocial and socioeconomic factors that influence the uptake of antenatal services and their impact on pregnancy outcomes in Kumasi, Ghana. Studies on risk factors for adverse pregnancy outcomes have mostly focused on family wealth and infectious diseases. To date, no study has assessed a wide array of psychosocial factors that influence ANC utilization and their association with birth outcomes. One study examined the association of family wealth and access to ANC, while another study investigated the association of family wealth with antepartum and

intrapartum stillbirth [6,31]. This study not only investigated factors influencing ANC utilization and their association with stillbirth, but also with preterm delivery, low birth weight and small for gestational age. Though working with a similar sub-population (women with uncomplicated pregnancy), the study by Yatich et al. and this study examined different risk factors for adverse pregnancy outcomes. The study by Yatich et al. examined the impact of parasitic infections on stillbirths while this study investigated the barriers associated with access to ANC services and their impact on pregnancy outcomes. The findings could be a representation of women with uncomplicated pregnancy in Kumasi since these two facilities serve people of all walks of life. This study corroborates other studies and re-enforces the need for a concerted action in addressing the persistent issues of cost, distance and the role of health education in accessing ANC. However, this study does not establish causality and is limited to cross-sectional interpretation. Excluding women who did not meet the eligibility criteria might have impacted the prevalence of the adverse outcomes and may not reflect the true prevalence in the entire population. Reasons for not attending ANC visits are not usually recorded in the maternal antenatal booklet. There is the problem of recall bias since an unfavorable outcome could influence a participant's response. This bias could be limited to women with stillbirths. Also, recall bias could lead to misclassification of preterm delivery since the duration of pregnancy was self-reported. Though the findings of this study suggest a low prevalence of adverse outcomes compared with that of a prior study, the results should be taken with some caution considering the above limitations.

5. Conclusion

Cost, distance and high parity were identified as some of the factors for inadequate utilization of ANC services. These factors were also associated with adverse pregnancy outcomes. Association is limited to cross-sectional interpretation. Minimizing cost and distance through a wider application of the NHIS and increasing awareness through antenatal health education could likely increase the use of antenatal services and further lower the prevalence of adverse pregnancy outcomes.

6. Conflict of interest

None declared.

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