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Research Article

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Burden And Determinants of Anaemia Among Pregnant Women Attending Antenatal Clinic at Rural Healthcare Centers in The Ada West District of Ghana

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Abstract

Introduction: *Anaemia during pregnancy is known to be a major contributor to maternal and neonatal morbidity, therefore affecting most pregnant women especially those in developing countries. Preventable causes such as poor maternal nutrition and infections causes severe complications in maternal and neonatal health. This study, therefore, aimed to determine the burden and determinants of anaemia among pregnant women attending antenatal clinics at rural facilities in the Ada West District of Ghana.*

Methodology: *The study was quantitative and employed a cross-sectional study design. A simple random sampling technique was applied to enlist respondents (n=345). Data was collected with the aid of validated and structured questions and was administered one on one with respondents. Data gathered were analysed with the (STATA version 17). Descriptive and inferential statistics were conducted on the data collected and findings were depicted graphically and on tables. In the bivariate and multivariate models, an alpha value less than 0.05 was considered statistically significant between the dependent and independent variables.*

Results: *The prevalence of anaemia among pregnant women was 51.0%. Unemployment and travelling long distances (>5km) were associated with anaemia. Again, late initiation to antenatal care, third trimester of pregnancy, and birth spacing of less than four years in addition to malaria parasite infection significantly contributed to anaemia. However, sleeping under insecticide-treated nets protected pregnant women from anaemia.*

Conclusion and Recommendation: *The prevalence of anaemia was high and factors such as unemployment, long distance to a health facility, late initiation of antenatal care, third trimester in pregnancy, and birth spacing less than a year, in addition to malaria parasite infection significantly predicted anaemia among pregnant women. Health education through mass media and during antenatal care clinics by health care practitioners would help reduce the occurrence of anaemia among pregnant women. Regular antenatal visits and testing of malaria parasite infection for pregnant women would also be beneficial in reducing the occurrence of anaemia. Further investigations are recommended to explore pregnant women's knowledge of anaemia and associated burden in the district.*

Keywords: Anaemia, antenatal, Clinic, Pregnant women, Prevalence, Risk factors.

Introduction

Anaemia during pregnancy has been known to be a significant public health challenge globally, particularly among pregnant women in low and middle-income countries [1,2]. Anaemia occurs when there is a reduction in the volume or amount of red blood cells or a decrease in haemoglobin concentration below the acceptable reference limit [1,3-5]. In terms of and based on the trimester of pregnancy, anaemia occurs when a haemoglobin concentration is less than 11.0 grams per deciliter in the first trimester, less than 10.5g/dl in the second trimester, and or third trimester [5]. In the Asian Pacific regions, anaemia occurs when a haemoglobin concentration falls below 10.5g/dl throughout pregnancy [1]. Anaemia during pregnancy is predominant in developing nations where there is poor maternal nutrition and the advent of parasitic infections [2].

The lack of nutritional inadequacy deprives red blood cell formation causing bone marrow failure to produce enough red blood cells required for the human body [3]. The combination of poverty, poor dietary consumption, and the high burden of diseases in pregnancy, genetic factors such as haemoglobinopathies or red blood cell membrane abnormalities, and low level of maternal education and residency influence pregnant women's risk of developing anaemia [5-8]. Different types of anaemia occur during pregnancy. However, anaemia caused by a deficiency of iron concentration is prevalent among pregnant women [3,9,10]. Anaemia may be classified as microcytic, normocytic, and macrocytic anaemia according to Mean Corpuscular Volume (MCV) [1,11]. Anaemia is presented in three clinical forms; mild when Hemoglobin (Hb) levels are between 10-11 g/dL, moderate for Haemoglobin between 7.0-9.9g/dL and severe for haemoglobin levels below 7.0g/dL [1,5,11].

The more pregnant women suffer from anaemia, the higher their risk of maternal morbidities and mortalities [6,7,12]. It is established that anaemia in pregnancy contributes to poor maternal and fetal health outcomes [2,6]. The complications caused by anaemia during pregnancy cause decreased oxygen supply to the placenta and the developing fetus resulting in adverse brain defects in neonates [3]. It also affects the immune system of pregnant women, increasing their risk of cardiac diseases, and poor work abilities[13]. In addition to the above effects of anaemia during pregnancy, it is found that anaemia is known to contribute to miscarriage and stillbirth among pregnant women [7,11].

Globally, anaemia occurring in pregnant women is on the rise, especially in developing countries despite measures taken to address it. Globally estimates show that about 38% of pregnant women are known to suffer from anaemia [1]. In advanced nations, anaemia is known to affect about 23% of pregnant women while in developing, nations anaemia affects about 50% of pregnant women despite improved interventions [3]. In sub-Saharan Africa, available literature had indicated, 9.2 million cases of anaemia are found among pregnant women [5]. For instance, in Ethiopia, it is found that one in every three pregnant women becomes anaemic despite effective measures taken to reduce the occurrence of anaemia in pregnancy [2]. In Sudan, about 53% of pregnant women become anaemic although most pregnant women are known to sleep under Insecticides mosquito nets [13]. A systematic review conducted in Uganda found that despite all efforts to downgrade the occurrence of anaemia among pregnant women, about 35.5% of the pregnant population suffer from anaemia [9].

In Ghana, a body of knowledge had indicated that every pregnant woman who attends to Antenatal clinic is given an iron supplement, anti-malarial drug, Insecticide Treated Net and Health education on nutrition and care for the pregnancy. However, it is shown that about 50.56% of pregnant women experience anaemia whilst pregnant [5]. Again, it is found that, in every ten pregnant women, four experience anaemia during pregnancy [5]. This makes anaemia in pregnancy a major challenge for most developing nations including Ghana [7]. In the Ada West District of Ghana, there is inadequate data on the burden and predictors of anaemia among pregnant women. Therefore, this study aimed to determine the burden and determinants of anaemia among pregnant women attending the antenatal clinic at rural health facilities in the Ada West District of Ghana.

Methods and Materials

Study Design

A quantitative study that employed a descriptive cross-sectional design to determine the burden and determinants of anaemia among pregnant women attending the antenatal clinic at rural health facilities in the Ada West District of Ghana.

Study population and sample size

The targeted population for the study consisted of all pregnant women beyond eighteen years who accessed antenatal care at selected rural health facilities in the Ada West District of Ghana. Eligible pregnant women in their respective trimesters of pregnancy who consented to partake in the study were considered for inclusion. Meanwhile severely sick and mentally challenged pregnant women were excluded from the study. Again, pregnant women who were due for delivery, and not a resident of the district were also excluded from the study. Furthermore, respondents who voluntarily refused consent were not included in the study. The study employed the simple Cochran formulae $n = (z^2 pq) / e^2$ for calculating the sample size. With a 31% prevalence of anaemia reported by, and with a 5% unresponsive rate, a sample size of 345 was estimated for the study [14].

Data Collection Tools And Techniques

The study administered a structured and validated questionnaire to gather respondents 'data. The health facilities in the districts were clustered into four based on the number of sub-districts. Each cluster (sub-district) represented health facilities. A health facility in a sub-district was purposively sampled for the study. Using the selected facility's antenatal attendance register book as a sampling frame, a simple random sampling technique was employed

in recruiting eligible respondents. Data collection was done by the principal investigator with the assistance of three trained research assistants. The questionnaires were read and filled out for respondents who could not read or write after they had been explained in their local language. For respondents who were able to read, the questionnaire was given to them to answer by themselves. Data collection was one on one with respondents. The data collection continued until the estimated sample size (345) was obtained.

Data Analysis

Data assembled from the survey was manually entered in STATA version 17 (Chicago). Categorical variables were coded and analysed descriptively into proportions and percentages. Continuous variables were expressed as mean standard deviations for normally distributed data. Findings were presented using tables and graphs. Pearson Chi-square test was used to measure the association between the dependent and the independent variables in the bivariate model. In the multivariate model, binary logistic regression was conducted to determine the odds of a relationship between the dependent and the independent variables at a 95% level of confidence and an alpha value <0.05 indicated a significant relationship.

Limitations of The Study

The haemoglobin concentration of respondents was taken from antenatal records and not directly measured at the laboratory and this was a significant limitation. Again, there is the possibility of recall bias on the part of the respondents relating to the contributory factors to anaemia. The findings of the study were also limited to adult pregnant women above 18 years and cannot be used to generalise all pregnant women especially those below eighteen years of age in the district.

Research Ethics

Approval to conduct the study was obtained from Ghana Health Service Ethics Review Committee with approval number (GHS-ERC063/09/22). Permission was also sought from the Regional Director of Health and Municipal Director of Health Service at Ada West District. Respondents' consent forms were thoroughly explained to them and they voluntarily agreed to participate in the study. Respondents were informed of their ability to withdraw from the study if they wish not to continue after initial consent.

Results

Three hundred and forty-five (n=345) pregnant women voluntarily participated in the study which yielded a response of 100%. The average score for respondents' age was 27±6 (18-48) years. About 43.5% of the respondents fell between the ages of 18-25 years while 41.2% were aged 26-33years. Additionally, 45.2% of the respondents were cohabiting while 35.9% were married. The majority (97.1%) of the respondents resided in rural areas. The majority (93.0%) of the respondents were Christians. About 56.5% of respondents had attained basic education, while (26.7%) had secondary education. Concerning respondents' distance to a health facility, about 40.3% of respondents travel between 2-4 kilometres to access health services while 29.0% travel less than one kilometer. Averagely 47.0% of the respondents lived on a monthly income of 500-1000 Ghana Cedis (Table 1).

Table 1: Sociodemographic characteristics of respondents

Variable	Category	Frequency	Percentage (%)
Age			
	18-25	150	43.5
	26-33	142	41.2
	34-41	46	13.3
	42-48	7	2.0
Marital Status			
	Married	124	35.9
	Single	65	18.8
	Co-habiting	156	45.2
Residency			
	Rural	335	97.1
	Urban	10	2.9
Religion			
	Christian	321	93.0
	Islamic	22	6.4
	Traditional	2	0.6
Education			

	Non-formal education	42	12.2
	Basic education	195	56.5
	Secondary education	92	26.7
	Tertiary education	16	4.6
Distance to the health facility			
	< 1km	100	29.0
	2-4km	139	40.3
	5-7km	67	19.4
	>8km	39	11.3
Employment status			
	Government work	22	6.4
	Self-employed	229	66.4
	Unemployed	94	27.2
Number of children			
	None	92	26.7
	One child	79	22.9
	Two children	68	19.7
	Three or more	106	30.7
Ethnicity			
	Ga-Adangbe	272	78.8
	Ewe	39	11.3
	Akan	16	4.6
	Others	18	5.2
Monthly income (GHS)			
	<500	131	38.0
	500-1000	162	47.0
	1001-1500	38	11.0
	>1500	2	0.6
	Not Sure	12	3.5

A little above average 176 (51.0%) of the respondents were anaemic while 169(49.0%) were non-anaemic. Most 114 (64.8%) of the anaemic respondents had moderate Anaemia, 60 (34.1%) were diagnosed with mild Anaemia while 2 (1.1%) were diagnosed with severe Anaemia (Figure 1).

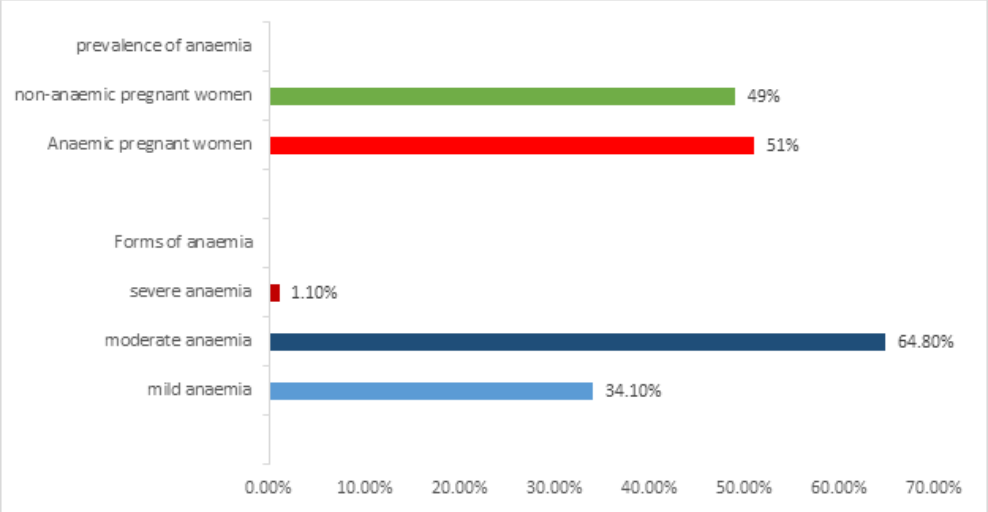

Figure 1: Prevalence and forms of anaemia among respondents

More than half, 57.7% of respondents initiated antenatal care early while 42.3% initiated care late. About 41.4% of respondents were in their second trimester while 37.7% were in their first trimester. Most 62.5% of respondents had one or two births while 36.8% had given birth three to five times. About 55.9% of respondents had 1-2 pregnancies while 37.4% had three to five pregnancies. About 53.0% of respondents sleep under Insecticides Treated Nets (ITN). About 15.7% of respondents tested positive for malaria while 84.3% tested negative for malaria. More than half (55.1%) of respondents had two to four antenatal visits while 31.6% had one visit. Most (60.0%) of respondents consume eggs one or two times a week. Most (66.7%) of the respondents eat fish or meat more than three times per week. Most (61.7%) of the respondents take green vegetables more than three times a week. The majority (85.8%) of the respondents were not sure of any food prohibition. Concerning respondents' husbands' level of education, about 46.1% had basic education while 37.4% had secondary education. Additionally, about (86.7%) of the respondent's husbands' occupations were self-employed (Table 2).

Table 2: Risk factors influencing anaemia among pregnant women

Variable	Category	Frequency	Percentage (%)
ANC Initiation			
	Late initiation	146	42.3
	Early initiation	199	57.7
Trimester of pregnancy			
	First Trimester	130	37.7
	Second Trimester	143	41.4
	Third Trimester	72	20.9
Parity			
	0-2	215	62.3
	3-5	127	36.8
	6 and more	3	0.9
Gravidity			
	None	17	4.9
	1-2 Gravid	193	55.9
	3-5 Gravid	129	37.4
	6 or more Gravid	6	1.7
Birth Spacing			
	Not sure	30	8.7

	One year's interval	177	51.3
	2-4 years interval	130	37.7
	5-6 years interval	8	2.3
Sleeping under ITN			
	Yes	183	53.0
	No	162	47.0
Malaria Infection			
	Positive	54	15.7
	Negative	291	84.3
Helminthic infection			
	Yes	33	9.6
	No	312	90.4
ANC Visitation			
	1 visit	109	31.6
	2-4 visits	190	55.1
	5-7 visits	44	12.8
	8-10 visits	2	0.6
Weekly egg consumption			
	Not sure	10	2.9
	1-2 times	207	60.0
	3-4 times	128	37.1
Fish/meat consumption			
	Not sure	2	0.6
	1-3 times per week	113	32.8
	>s times per week	230	66.7
Intake of green vegetables			
	Not sure	18	5.2
	1-3 times per week	114	33.0
	>3 times per week	213	61.7
Food prohibition			
	Not sure	296	85.8
	Meat/snails/Crabs	31	9.0
	Others (	18	5.2
Husbands education			
	Non-Formal Education	29	8.4
	Basic education	159	46.1
	Secondary education	129	37.4
	Tertiary education	28	8.1
Partners occupation			
	Self-employed	299	86.7
	Government employed	26	7.5
	unemployed	20	5.8

ANC: Antenatal clinic, ITN: Insecticide Treated Net.

Pearson Chi-square set a 95% confidence interval to determine the association between socio-demographic factors and respondents' anaemia status. A p-value less than 0.05 is considered statistically significant. The employment status of respondents was associated with the occurrence of anaemia ($X^2=13.9$, $p=0.001$). In addition, the distance travelled by respondents to access health services within the municipality was associated with anaemia and the difference was statistically significant ($X^2=8.35$, $p=0.039$). In the multivariate model, Binary logistic regression was conducted to determine the odds of socio-demographic variables on anaemia in a step-wise direction. Unemployed pregnant women were more likely to become anaemic during pregnancy [*AOR=2.6(0.09-0.71), P=0.009*]. Additionally, pregnant women who travelled between five to seven kilometers to access health care had increased odds to suffer from anaemia and [*AOR=4.2(0.22-0.81), P=0.009*] (Table 3).

Table 3: Association between sociodemographic factors and anaemia in pregnancy

Variable	Status of anaemia		X^2(p-value)	AOR (95%CI)
	Anaemia n (%)	Non-Anaemia n (%)		
Age (years)			2.1(0.56)	
18-25	78(47.2)	72(48.0)		
26-33	67(58.7)	75(52.8)		
34-41	27(58.7)	19(41.3)		
42-48	4(57.1)	3(42.9)		
Residency			3.46 (0.06)	
Rural	168(50.1)	167(49.9)		
Urban	8(80.0)	2(20.0)		
Marital status			1.53(0.46)	
Married	58(46.8)	66(53.2)		
Single	36(55.4)	29(44.6)		
Widow	82(52.6)	74v(47.4)		
Ethnic Group			3.14(0.37)	
Ga-Adangbe	139(51.1)	133(48.9)		
Ewe	16(41.0)	23(59.0)		
Akan	10(62.5)	6(37.5)		
Others	11(61.1)	7(38.9)		
Religion			2.11(0.35)	
Christian	165(51.4)	156(48.6)		
Islam	11(50.0)	11(50.0)		
Traditional	0(0.0)	2(100.0)		
Number of children			5.23(0.16)	
	None	53(57.6)	39(42.4)	
	One child	32(40.5)	47(59.5)	
	Two children	35(51.5)	33(48.5)	
	Three or more	56(52.8)	50(47.2)	
Level of Education			2.06(0.56)	
Non-formal education	19(45.2)	23(54.8)		
Basic education	98(50.3)	47(59.5)		
Secondary education	35(51.5)	33(48.5)		
Tertiary education	56(52.8)	50(47.2)		
Employment Status			13.9(0.001)*	
Government employed	8(36.4)	14(63.6)		Reference

Self-employed	105(45.9)	124(54.1)		0.64(0.25-1.60)
Unemployed	63(67.0)	31(33.0)		2.6(0.09-0.71)*
Distance to the health facility			8.35(0.039)*	
<1Km	46(46.0)	54(54.0)		Reference
2-4Km	70(50.4)	69(49.6)		0.78(0.45-1.33)
5-7Km	44(65.7)	23(34.3)		4.2(0.22-0.81)*
>8Km	16(41.6)	23(59.0)		1.15(0.53-2.47)
Monthly income (GHS)			2.29(0.68)	
<500	72(55.0)	59(45.0)		
500-1000	77(47.5)	85(52.5)		
1001-1500	21(50.0)	17(44.7)		
>1500	1(50.0)	1(50.0)		
Not sure	5(41.7)	7(58.3)		

**(p-value significant at <0.05), X^2: Chi-square value, AOR: Adjusted Odds Ratio, CI: Confidence interval, ANC: Antenatal care, ITN: Insecticides Treated Net.*

The Pearson Chi-square set at a 95% confidence level was used to determine the association between the risk factors and the occurrence of anaemia among pregnant women. The respondent's initiation of antenatal care was associated with anaemia (X^2 *=26.28, P=0.0001*). Additionally, the trimester of pregnancy is associated with anaemia among pregnant women (X^2 *=9.71, P=0.008*). Moreover, the gravidity of pregnant women was associated with anaemia (X^2 *=12.59, P=0.006*). The birth spacing interval of respondents was associated with anaemia in pregnancy among respondents (X^2 *=17.54, P=0.001*). In addition, sleeping under Insecticides Treated Nets established a significant association with anaemia (X^2 *=19.29, P=0.0001*). Furthermore, infection with malaria during pregnancy is associated with anaemia in pregnancy (X^2 *=13.62, P=0.001*). Adding to the above findings, it was established that, the participant's consumption of eggs per week was associated with anaemia among pregnant women (X^2 *=15.21, P=0.0001*). In the multivariate model after controlling for confounding variables, all the risk factors that showed a significant association with anaemia in the bivariate model were modelled in a step-wise direction. Pregnant women who initiated antenatal care late had increased odds of becoming anaemic [AOR=3.2(0.20-0.49), P=0.001].

Additionally, pregnant women who were in their third trimester were more likely to become anaemic [AOR=4.0(0.22-0.73), P=0.003]. Moreover, pregnant women whose birth spacing was within one year, two to four years had increased odds of becoming anaemic and the difference was statistically significant [AOR=7.0(1.36-20.99), P=0.0001], [AOR=7.6(2.50-22.96), P=0.0001] respectively. Further, pregnant women who sleep under Insecticide Treated Nets were less likely to become anaemic [AOR=0.38(0.25-0.59), P=0.0001]. Again, pregnant women who were infected with Malaria were more likely to become anaemic and the difference was significant statistically [AOR=1.31(0.16-0.59), P=0.0001] (Table 4).

Table 4: Association between risk factors and anaemia among pregnant women

Variable	Status of anaemia		X^2(p-value)	AOR(95%CI)
	Anaemia n (%)	Non-Anaemia n (%)		
ANC initiation			26.28(0.0001)*	
Late	98(67.1)	48(32.9		3.2(0.20-0.49)*
Early	78(39.7)	121(60.8)		Reference
Trimester of pregnancy			9.71(0.008)*	
First trimester	54(41.5)	76(58.5)		Reference
Second trimester	76(53.1)	67(46.9)		0.63(0.38-1.01)
Third trimester	46(63.9)	26(36.4)		4.0(0.22-0.73)*
Parity (number of pregnancies)			0.95(0.61)	
0-2	113(52.6)	102(47.4)		
3-5	61(48.0)	66(52.0)		

6 or more	2(66.7)	1(33.3)		
Gravidity (number of birth)			12.59(0.006)*	
None	15(88.2)	2(11.8)		Reference
1-2 births	88(45.6)	105(54.4)		0.71(0.08-6.53)
3-5 births	69(53.5)	60(46.5)		0.40(0.04-3.81)
>5 births	4(66.7)	2(33.3)		0.15(.008-2.82)
Birth spacing interval			17.54(0.001)*	
Not sure	26(86.7)	4(13.3)		Reference
1 year	85(48.0)	92(52.0)		7(1.36-20.99)*
2-4 years	60(46.2)	70(53.3)		7.6(2.50-22.96)*
5-6 years	5(62.5)	3(37.5)		3.90(0.66-23.05)
Sleep under ITN			19.29(0.0001)*	
Yes	73(39.9)	103(63.6)		0.38(0.25-0.59)*
No	110(60.1)	59(36.4)		Reference
Infection with Malaria			13.62(0.0001)*	
Positive	40(74.1)	14(25.9)		1.31(0.16-0.59)*
Negative	136(46.7)	291(53.3)		Reference
Helminthic infection			0.4(0.95)	
Yes	17(51.5)	16(48.5)		
No	159(51.0)	153(49.0)		
ANC visitation			7.17(0.06)	
1 time	67(61.5)	42(38.5)		
2-4 times	89(46.8)	101(53.2)		
5-7 times	19(43.2)	25(56.8)		
>7 times	1(50.0)	1(50.0)		
Egg consumption per week			15.21(0.0001)*	
None	5(50.0)	5(50.0)		Reference
1-3 times	123(59.4)	84(40.6)		0.64(0.15-2.79)
>3 times	48(37.5)	80(62.5)		1.37(0.30-5.74)
Fish/meat consumption per week			0.99(0.61)	
None	1(50.0)	1(50.0)		
1-3 times	62(54.9)	51(45.1)		
>3 times	113(49.1)	117(50.9)		
Green vegetable intake per week			3.45(0.17)	
None	13(72.2)	5(27.8)		
1-3 times	56(49.1)	58(50.9)		
>3 times	107(50.2)	106(49.8)		
Food prohibited during pregnancy			0.48(0.78)	
None	153(51.7)	143(48.3)		
Meat/snails/Crab	14(45.2)	17(54.8)		
others	9(50.0)	9(50.0)		
Partners Education			3.22(0.36)	

Non-formal education	16(55.2)	13(44.8)		
Basic education	85(53.5)	74(46.5)		
Secondary education	65(50.4)	64(49.6)		
Tertiary education	10(35.7)	18(64.3)		
Partners occupation			4.53(0.104)	
Self-employed	152(50.8)	147(49.2)		
Government employed	10(38.5)	16(61.5)		
Unemployed	14(70.0)	6(30.0)		

**(p-value significant at <0.05), X^2: Chi-square value, AOR: Adjusted Odds Ratio, CI: Confidence interval, ANC: Antenatal care, ITN: Insecticides Treated Net.*

Discussion

This study determined the prevalence and associated risk factors for anaemia among pregnant women attending antenatal care in the Ada West district of the Greater Accra Region of Ghana. The findings of the study demonstrated that the prevalence of anaemia among pregnant women was 51.0%. It was established that socio-demographic factors such as unemployment and pregnant women who travel a distance of five or more kilometres had an influence on anaemia among pregnant women. Moreover, the study found that factors such as late initiation of antenatal care, and pregnant women in the third trimester of pregnancy had increased odds of anaemia. Furthermore, pregnant women with birth spacing intervals of one and two-four years established a significant relationship to anaemia. Pregnant women who sleep under approved and insecticide-treated nets had reduced odds of becoming anaemic while infection with the malaria parasite increases pregnant women's chances of suffering from anaemia. The prevalence of anaemia among pregnant women attending antenatal clinics in the district was fifty-one per cent. This implies that, of every one hundred pregnant women who attend an antenatal clinic in the District, an estimated fifty-one are likely to become anaemic. Several studies conducted in Ghana reported a similar prevalence of anaemia among pregnant women [3,5,11]. In the Western Pacific regions of the World, the prevalence of anaemia stands at 49% and aligns with study findings [1]. A similar finding of 53% of anaemia among pregnant women had been reported in Southern Sudan [13]. Additionally, reported an anaemia prevalence of 51% which support the outcome of the present study. Additionally, found a 55.2% prevalence of anaemia among pregnant women in Nigeria, 56.5% by which supported current study findings [15-17].

In Uganda, a lower prevalence of 35.5% of anaemia during pregnancy was reported in the outcome of a systematic meta-analysis [9]. Nonetheless, a higher prevalence of 62.5% of anaemia among pregnant women had been reported which does not associate well with the outcome of this present study [18]. A lower prevalence of 41.8% and 33.1% of anaemia among pregnant women were found which did not support the outcome of this present study [19,20]. What could have accounted for the differences in findings could be attributed to variations in study sample sizes, geographical locations, sampling techniques and the various study designs adopted for conducting such studies. Additionally, the methods the study employed in determining the haemoglobin concentrations which define a pregnant woman's status of anaemia could account for the dissimilarities in the prevalence of anaemia among pregnant women.

Previous studies had indicated that unemployment contributes to the occurrence of anaemia among pregnant women and these findings support the outcome of this recent study [21,22]. Similarly, evidence suggests that pregnant women with no occupation are at a higher risk of suffering from anaemia and this also falls in line with this current study outcome [16]. Again, revealed that anaemia in pregnancy was recorded among those with no source of income and this also relates well with the outcome of this present study [6,23].

In Nigeria, it is discovered that unemployed pregnant women had an increased risk of suffering from anaemia and this is associated well with the outcome of this present study which aggresses with the present study outcome [24,25]. Moreover, it is found that the income level of pregnant women had been found associated with the occurrence of anaemia. Therefore, when pregnant women are unemployed, it affects their source of income level and as such makes them unable to live healthily, thereby making them develop anaemia [15,26]. However, studies had reported that unemployed pregnant women have no significant relationship to anaemia and this disagrees with the outcome of this present study [18,27].

The unemployed pregnant women have low purchasing power and are therefore unable to depend on foods rich in proteins, irons, and vitamins among others which are necessary for both maternal and foetal immune development, foetal growth and adequate provision of red blood cells. More so the inability of the pregnant mother to access good food rich in the required nutrient increases the foetal risk of poor spinal formation, and poor growth, after low fetal birth weight [28]. This present study also found that pregnant women who travel more than five or more kilometres had increased odds of anaemia. Comparing this current finding to other studies, reported in the literature, it was revealed that, geographical access to health facilities is a significant factor in the occurrence of anaemia among pregnant women [21]. Although there is a paucity of distance information travelled by pregnant women and the risk of anaemia. Arguably, most pregnant women who travel a long distance to ac-

cess health resided in rural areas, therefore, preventing most pregnant women from accessing healthcare particularly, when the situation is influenced by poor socio-economic and ecological factors [21,29,30]. Hence contributing to pregnant women's difficulty in accessing antenatal care after the risk of anaemia [20].

Pregnant women's late initiation of ante-natal care established increased odds of anaemia among women during pregnancy. Compared to other studies reported in the literature, it was found that delayed initiation of antennal care significantly increases pregnant women's likelihood of anaemia and the findings related well [15,21,31-33].

This present study also revealed that birth spacing of pregnant women in the first year, two to four years established a significant association with anaemia among pregnant women. In a cross-sectional study conducted to determine the factors that influence anaemia in pregnancy, it was disclosed that birth spacing correlated significantly with anaemia among pregnant women and this was associated well with the outcome of this present study [23,24,34]. The present survey demonstrated that pregnant women who are infected with malaria had an increased odd of anaemia, and comparing this present outcome to a study conducted by it was found that, pregnant women who had malaria infection had an increased risk of anaemia and findings correlated well [26]. Additionally, several studies had indicated that a high proportion of pregnant women with malaria infection have increased odds of anaemia and these reports support the outcome of this current study [35-37]. However, it was disclosed that pregnant women who sleep under approved and appropriate insecticide-treated nets have decreased odds of anaemia and this finding is supported by studies that revealed that pregnant women who sleep under ITN are protected against malaria parasite infection, hence they are less likely of anaemia [21,38].

Anaemia during pregnancy causes multiple complications such as maternal and foetal poor health after increased neonatal and maternal morbidities and mortalities [1,2,23]. Additionally, the reduced supply of blood to the foetus as a result of anaemia increases the foetal risk of neonatal brain defects leading to poor neonatal brain development and affecting neonatal intellectual abilities [2,3,39]. Aside from these complications, maternal anaemia contributes to intrauterine growth retardation, after low birth, Decreases fetal iron stores thereby affecting children's neurophysiological development [16,40-42]. This complicates the foetal-maternal health outcomes such as foetal immunity, after increased infection [43]. A maternal mother who has anaemia, has an increased risk of cardiac diseases and poor work abilities, hence affecting the productivity of pregnant women [13]. Anaemia among pregnant women is a major contributor to miscarriage and stillbirth, an indirect cause of maternal morbidity and mortality [7,11,24,44].

Conclusion and Recommendations

A slightly above fifty per cent of pregnant women in the district recorded haemoglobin concentration values below the accepted reference limit which was associated with severe complications for the mother and the child. Complications such as reduced foetal growth after low birth weight. Additionally, pregnant women who were unemployed and travelled a distance of five or more kilometres to access antenatal care were more likely to be diagnosed with anaemia. Moreover, pregnant women in their late initiation of antenatal care and third trimester had a higher chance of developing anaemia. Further, pregnant women diagnosed with malaria parasitemia subsequently had anaemia. However pregnant women who sleep under Insecticides Treated Net reduce their odds of anaemia during pregnancy. Health education on the need for early and regular antenatal visitation coupled with economic empowerment of pregnant women should be intensified. Again, there should be routine testing of malaria infection during antenatal care while encouraging pregnant women to sleep under Insecticide Treated Net.

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