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Anaemia at Booking and Related Factors in Pregnant Women Attending Antenatal Clinic in a Rural Health Facility in South-South Nigeria

Peter Waibode Alabrah [a*], Agoro, Eni-yimini Solomon [b], Peter Waripamo Oweisi [a], Anthony Okeoghene Eguvbe [c] and Osazee Kehinde [d]

[a] Department of Obstetrics and Gynaecology, Federal Medical Centre, Yenagoa, Nigeria.
[b] Directorate of Research and Quality Assurance (DR & QA), Federal University Otuoke, Bayelsa State, Nigeria.
[c] Department of Community Medicine, Federal Medical Centre, Yenagoa, Nigeria.
[d] Department of Obstetrics and Gynaecology, University of Benin Teaching Hospital, Benin City, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Anaemia in pregnancy has remained a universal public health issue, causing maternal and fetal morbidity and mortality. This prospective cross-sectional analytic study aimed to determine the prevalence of anaemia in pregnancy at booking and other related determinants. It was carried out at the antenatal booking clinic, Federal Medical Centre Yenagoa, Otuoke Outreach, Nigeria, from January 2017 to December 2020. The study utilized 770 pregnant women. A structured study pro forma was used to extract socio-demographic characteristics and other relevant data. Two to three drops of blood was collected from the participants and the haemoglobin was estimated using the HemoCue Hb 801 haemoglobin system. Overall the prevalence of anaemia in pregnancy at booking was 70.0% and the highest prevalence of anaemia in pregnancy at booking occurred in primigravida. Anemia in pregnancy was more common in social Class 3; 308 (40.0%), and age; 25–29: 66(32.3%). Moderate anaemia occurred more frequently in grand multipara 11 (18.5%) compared to other parities, but mild anaemia occurred more in para 2 to 4, 180 (67.2%). More than

**Corresponding author: E-mail: alabrahpee@gmail.com;*

50% of the women irrespective of social class had mild anaemia. Anaemia was more frequent in the 2nd trimester (56.4%). Expectedly, anaemia occurred more frequently in rural dwellers 603 (78.3%) compared to suburban 43 (5.6%) and urban dwellers 124 (16.1%). On factors related to anaemia at booking, there was significant association, between anaemia at booking with; social class p = 0.002, parity p = 0.011, and the trimester booking was done, p = 0.001.The prevalence of anaemia in pregnancy at booking was unacceptably high. Institution of preconception care, tailored surveillance and execution of policies aimed at prevention are apt, in the background of ensuring the education of the girl child.

Keywords: Anaemia; anaemia in pregnancy; haemoglobin; antenatal booking; Southern Nigeria.

1. INTRODUCTION

Anaemia has remained the commonest medical disorder in pregnancy [1] and is the most common haematologic abnormality diagnosed in pregnancy [2]. It is a frequent comorbidity in several nutritional and medical conditions [3]. Anaemia is a "medical condition which results when the number of healthy circulating erythrocytes (and consequently their oxygen-carrying capacity) is insufficient to satisfactorily transport oxygen to the tissues to meet the body's physiologic demands, which may vary according to age, sex, and pregnancy status" [4].

When body tissues are supplied with a scant amount of oxygen, many organs and functions are compromised. Anaemia decreases the woman's reserve to withstand bleeding either during or after childbirth, and it also predisposes to infections [5]. Anaemia during pregnancy is especially a concern because its sequela results in the increase in perinatal and maternal morbidity and mortality [6,7].

According to the World Health Organization (WHO) anaemia in pregnancy occurs when the haemoglobin concentration falls below 11g/dL (or haematocrit less than 33%) in pregnant women [8]. However, the baseline value of 10.0g/dL is recognized as the standard cut-off mark in developing countries like Nigeria and this is premised on the research by Lawson [9] who reported that significant adverse foetomaternal outcomes do not occur except the haemoglobin level drops below 10.0g/dl.
The global prevalence of anaemia in pregnant women is 36.5%, while in Africa it is 45.8% [10]. In Nigeria prevalence ranging from 23.7 to 88.7% [11,12], have been reported

The wide variations in the prevalence rates in different climes and regions are because of differences in socio-demographic characteristics, etiological factors, lifestyles, and health-seeking behaviour across different cultures, widespread use of haematinics and use of anti-malarial prophylaxis before booking for antenatal care services [4, 7, 8, 13].

The etiological factors implicated in anaemia during pregnancy in developing countries are multifactorial and may occur singly or in combination. They include micronutrient deficits in folate, iron, and vitamins A and B12 and anaemia triggered by parasitic infestations such as malaria and helminthiasis or chronic infections like tuberculosis and HIV [14-17]. The influence and impact of each of these factors identified as culpable for anaemia during gestation differ widely due to geographic location, weather, food practice, beliefs and religion, myths and the season. In Sub-Saharan Africa, nutritional anaemia is the commonest of anaemia during pregnancy and poor intake of diets rich in iron is implicated as the chief cause of anaemia among pregnant women [15,16,18].

This study sort to assess the prevalence of anaemia and its related factors in a rural hospital setting in South-South Nigeria.

2. METHODOLOGY

2.1 Study Design

This was a prospective cross-sectional analytic study .

2.2 Study Area

This study was carried out at the antenatal clinic of the Federal Medical Centre, Yenagoa, Otuoke Outreach between 1st of January 2017 to 31st December 2020.

2.3 Study Site

The Outreach is a forty-four (44) bedded hospital situate in Otuoke town. Otuoke is a rural suburb in the Ogbia local government area of Bayelsa

State in the Niger Delta region of Nigeria. The hospital acts mainly as a referral centre for other government-owned and private hospitals in Bayelsa East Senatorial zone, which has a population of 661,100 people [19].

The hospital has an established Obstetrics and Gynaecology department, which is manned by three (3) consultant Obstetricians and Gynaecologists and other doctors.

2.4 Study Population

This consisted of women who presented for antenatal booking regardless of maternal age, gestational age, and parity. Consent to participate in the study was gotten after they have been duly counselled on the nature of the study and assuring them of utmost confidentiality.

2.5 Sample Collection

The tip of the ring finger was disinfected with methylated spirit and then wiped dry. Using a lancet, the tip of the ring finger was punctured and the first 2 to 3 drops of blood were wiped off and the finger was gently squeezed until there were droplets of blood sufficient to fill the microcuvette which was then placed in the Hemocue machine and the result recorded.

2.6 Laboratory Procedure

The haemoglobin level was determined using the HemoCue Hb 801 haemoglobin photometer method.

2.7 Inclusion Criteria and Exclusion

Excluded from the study were; (1) patients with haemoglobinopathies (2) Patients with a known medical history of bleeding disorder and (3) multiple pregnancies, (4) hypertensive diseases of pregnancy, (5)A history of per vaginam bleeding before booking of index pregnancy, and (6) patients with renal or cardiac diseases. Included in the study were pregnant women without any of the exclusion criteria and who consented to participate in the study.

2.8 Data Entry

All pertinent data such as sociodemographic characteristics - age, parity, occupation, gestational age at booking were all entered into a self-designed study pro forma. Social class was determined according to the scheme reported by Oyedeji [21]

2.9 Definition of Anaemia

Anaemia was considered for Hb levels lower than 11 g/dL using the World Health Organization [20] level. It was further classified according to WHO criteria, into mild (Hb levels of 10.0 to 10.9g/dL), moderate (Hb levels of 7.0 to 9.9g/dL) and severe anaemia (Hb levels < 7.0g/dL). Lawson [9] defined anaemia in Third World countries as a haemoglobin level of <10 g/dl in pregnancy.

2.10 Statistical Analysis

This was performed with the SPSS software (statistical package for social sciences, SPSS v 23.0, Chicago, IL). Statistical significance was determined using the chi-square test, *p*-value at 0.05 was considered significant.

3. RESULTS

Seven hundred and seventy (770) women met the inclusion criteria and were enrolled in the study.

As shown in table 1, the mean age at booking is 28.8 ± 5.5. Expectedly, teenagers constituted the smallest group in the study, accounting for only 4.2% of the study population whilst the highest number of participants were in the age bracket 25 to 29 years, representing 32.2%. The majority of the women had secondary education (51.7%) and in keeping with where the study was carried out; were rural dwellers (78.3%).

As depicted in table 2 majority of the participant were para 0 (34.9%) and multipara (34.8%) and bookings were more frequently done in the second trimester representing (56.4%).

Employing the WHO criteria, 539 pregnant women were anaemic, and this gives a prevalence of anaemia of 70%. However, when the criteria by Lawson was used, the prevalence dropped to 36.2%. The mean haemoglobin level at booking was 10.7 ± 3.2.

Table 3 showed that anaemia was more common in the age group of 25 to 29 years (32.3%) No patient had severe anaemia and there was no significant statistical association between age group and the severity of anaemia p – 0.062.

Table 1. Sociodemographic characteristics of pregnant women participating in the study.

Characteristics	Frequency N = 770	Per cent (%)
Age Group		
Teenagers	32	4.2
20 - 24 years	149	19.4
25 - 29 years	249	32.3
30 - 34 years	198	25.7
>35 years	142	18.4
Mean Age ± SD 28.8 ± 5.5		
Religion		
Christian	758	98.4
Muslim	8	1.0
Others	4	0.5
Level of Education		
Primary	39	
Secondary	398	
Tertiary	333	
Marital Status		
Single	20	
Married	750	
Family Type		
Monogamous	746	
Polygamous	4	
Residence		
Rural	603	78.3
Suburban	43	5.6
Urban	124	16.1

Table 2. Clinical and Obstetric features among pregnant women participating in the study

Characteristics	Frequency N = 770	Percent (%)
Parity Range (0.0 – 11.0)		
0	269	34.9
1	174	22.6
2-4	268	34.8
≥ 5	59	7.7
Total	**770**	**100**
Trimester at booking		
1st trimester	131	17.0
2nd trimester	434	56.4
3rd trimester	205	26.6
Total	**770**	**100**
Mean ※EGA at booking (in weeks) ± SD	**21.2 ± 8.2**	
Hb (g/dl) level at booking using Lawson criteria		
Anaemia (< 9.9)	279	36.2
No Anaemia (≥10.0)	491	63.8
Hb (g/dl) level at booking using WHO criteria		
Anaemia (< 10.9)	539	70.0
No Anaemia (≥11.0)	231	30.0
Mean ± SD	**10.7 ± 3.2**	

※EGA = Estimated gestation age

Table 3. Association between the age and the degree of anaemia at booking

Age group	Haemoglobin level g/dl			Total (%)
	Anaemia (<10.9)		Normal	
	(7.0 – 9.9) Moderate	(10.0 – 10.9) Mild	(≥ 11.0) Normal	
	Freq (%)	Freq (%)	Freq (%)	
16 – 19 years	8 (25.0)	18 (56.3)	6 (18.8)	**32 (4.2)**
20 – 24 years	18 (12.1)	87 (58.4)	44 (29.5)	**149 (19.4)**
25 – 29 years	21 (8.4)	159 (63.9)	69 (27.7)	**249 (32.3)**
30 – 34 years	16 (8.1)	112 (56.6)	70 (35.4)	**198 (25.7)**
≥ 35 years	19 (13.4)	81 (57.0)	42 (29.6)	**142 (18.4)**
Total	**82 (10.6)**	**457 (59.4)**		
Grand Total	**539 (70.0)**		**231 (30.0)**	**770 (100.0)**

Pearson Σ^2 = 14.85; df = 8; p – 0.062

Table 4. Association between trimester at booking and anaemia

Trimester at booking	Haemoglobin level g/dl			Total (%)
	Anaemia		Normal	
	(7.0 – 9.9) Moderate	(10.0 – 10.9) Mild	(≥ 11.0) Normal	
	Freq (%)	Freq (%)	Freq (%)	
1st Trimester	7 (5.3)	59 (45.0)	65 (49.6)	**131 (17.0)**
2nd Trimester	54 (12.4)	265 (61.1)	113 (26.0)	**434 (56.4)**
3rd Trimester	19 (9.3)	133 (64.9)	53 (25.9)	**205 (26.6)**
Total	**82 (10.6)**	**457 (59.4)**		
Grand Total	**539 (70.0)**		**231 (30.0)**	**770 (100.0)**

Pearson Σ^2 = 31.94; df = 4; p – 0.001

Table 5. Association between parity and anaemia at booking

Parity	Haemoglobin level g/dl			Total (%)
	Anaemia (<10.9)		Normal	
	(7.0 – 9.9) Moderate	(10.0 – 10.9) Mild	(≥ 11.0) Normal	
	Freq (%)	Freq (%)	Freq (%)	
0	30 (11.2)	153 (56.9)	86 (32.0)	269 (34.9)
1	15 (8.6)	96 (55.2)	63 (36.2)	174 (22.6)
2 – 4	26 (9.7)	180 (67.2)	62 23.1)	268 (34.8)
≥ 5	11 (18.6)	28 (47.5)	20 (33.9)	59 (7.7)
Total	**82 (10.6)**	**457 (59.4)**		
Grand Total	**539 (70.0)**		**231 (30.0)**	**770 (100.0)**

Pearson Σ^2 = 16.54; df = 6; p – 0.011

Table 6. Association between parturients' Social class and Haemoglobin level at booking

Social class*	Haemoglobin level g/dl			Total (%)
	Anaemia		Normal	
	(7.0 – 9.9) Moderate	(10.0 – 10.9) Mild	(≥ 11.0) Normal	
	Freq (%)	Freq (%)	Freq (%)	
1	7 (10.1)	39 (56.5)	23 (33.3)	69 (9.0)
2	13 (6.5)	120 (60.0)	67 (33.5)	200 (26.0)
3	31 (10.1)	179 (58.1)	98 (31.8)	308 (40.0)
4	25 (30.5)	100 (61.7)	37 (22.8)	162 (21.0)
5	6 (19.4)	19 (61.3)	6 (19.4)	31 (4.0)
Total	**82 (10.6)**	**457 (59.4)**		
Grand Total	**539 (70.0)**		**231 (30.0)**	**770 (100.0)**

Pearson Σ^2 = 9.79; df = 8; p – 0.002. ***Social class by Oyedeji [21]***

Table7. Association between parturient's residential locality and Haemoglobin level at booking

Residence	Haemoglobin level g/dl			Total (%)
	Anaemia		Normal	
	(7.0 – 9.9) Moderate	(10.0 – 10.9) Mild	(≥ 11.0) Normal	
	Freq (%)	Freq (%)	Freq (%)	
Rural	65 (10.8)	368 (61.0)	170 (28.2)	603 (78.3)
Suburban	7 (16.3)	21 (48.8)	15 (34.9)	43 (5.6)
Urban	10 (8.1)	68 (54.8)	46 (37.1)	124 (16.1)
Total	**82 (10.6)**	**457 (59.4)**		
Grand Total	**539 (70.0)**		**231 (30.0)**	**770 (100.0)**

Pearson Σ^2 = 6.66; df = 4; p – 0.155

Table 4 shows that the highest prevalence of anaemia occurred in the second trimester (56.4%). There was a significant statistical relationship between anaemia and the trimester the pregnant women booked for antenatal care, *p* – 0.001.

Table 5 showed that anaemia was commoner in primigravidae, while moderate anaemia was more common in grand multiparas. There was also a significant statistical association between parity and anaemia at booking, *p* – 0.011.

Anaemia in pregnancy at booking was more prevalent in patients, in social class 3 (40.0%), and followed by social class 2 (26.0%). Unpredictably, it was the least common in the patients in social class 5. On the grading of anaemia in pregnancy at booking, mild (61.7%) and moderate (30.5%) anaemia occurred more frequently in women, in social class 4.

Anaemia in pregnancy at booking was more prevalent in rural dwellers but there is no statistically significant association between residence and anaemia.

4. DISCUSSION

A naemia in pregnancy at booking is prevalent as revealed by our study, 539 women of the total of 770 were anaemic giving a prevalence of 70%. This is even though 16.1% of the participants that booked for antenatal care are from an urban area (the hospital is 24.9 km from the state capital, and it is motorable). Due to the services offered in the hospital, a sizeable number of our obstetric population travel this journey to access obstetric services. However, using the Lawson [9] definition of anaemia in pregnancy as haemoglobin of below 10 g/dl as the cut off, only 36.2% of participants were anaemic at booking. Lawson [9] had reported that significant adverse foetomaternal effects do not occur until Haemoglobin falls below 10g/dl. The high prevalence reflects the meagre and harsh socioeconomic reality in a typical rural setting in the Niger Delta region of Bayelsa State, Nigeria. Similar comparable prevalence have been reported by other authors [22,23], while other authors reported lower prevalent values [13,24-27]. Nonye-Enyindah *et al*, [28] reported a prevalence of 86.4% from the same geopolitical zone this study was conducted.

The high prevalence of anaemia could be attributed to the myriad of risk factors for anaemia such as short inter-pregnancy interval, high parity, poverty, low socioeconomic status, poor health-seeking behaviour and lack of education [20, 29, 30].

On the grading of anaemia in pregnancy employing the WHO criteria, the majority of the pregnant women who had anaemia in pregnancy, 457(59.4%) had mild anaemia in pregnancy while 82 (10.6%) had moderate anaemia in pregnancy. Similar findings have been reported by other researchers [5, 11]. As it had been reported by other researchers [13, 24, 31], none of the pregnant women had severe anaemia in our study.

Mild anaemia was more prevalent in primigravida compared to other parities. However, moderate anaemia was a more frequent occurrence in grand multipara.

As was similarly reported by Onoh et al, [32] and Olatunbosun et al, [33] anaemia was commonest in the age group 25 to 29 years, and they constituted the highest number of participants in the study according to age. Within this age group, the proportion of pregnant women with anaemia was 32.3%. This finding is inconsistent with the reports by other authors, Paul et al, [34] reported that the highest prevalence of anaemia in pregnant women was within the age bracket of

34 to 39 years. This study did not establish any statistically significant relationship between age and anaemia at booking in pregnant women.

Anaemia in pregnancy was more common in the second trimester, accounting for 56.4% of cases across the trimesters. This might not be unconnected with the further haemodilution that occurs and reaches its peak in the second trimester because the majority of the participants in this study booked for antenatal care in the second trimester. This finding aligns with the report by Idowu *et al*, [23] but is at variance with the report by the WHO, [20]. The organization asserted that anaemia is considerably higher in the 3rd trimester of pregnancy than in the first two trimesters [20].

The highest prevalence of anaemia in pregnancy at booking was seen in primigravida (34.9%) and a similar finding was reported by Idowu et al, [23] and Lelissa et al [31]. This was followed by multipara (para 2-4) [34.8%] and grand multipara was the least at 7.7% (table 5). Though there was a statistically significant relationship between parity and anaemia at booking, our data did not establish any defined pattern between parity and anaemia in pregnancy at booking. This is at variance with the report by Adewara *et al,* [11] which established the correlation that the higher the parity, the higher the rate of anaemia in pregnancy at booking.

More than 50% of all pregnant women irrespective of the social class had mild anaemia using the WHO criteria. Anaemia in pregnancy at booking was more prevalent among women in social class 3 (40.0%), this is followed by social class 2 (26.0%). Surprisingly, it was least prevalent in women in social 5 (4.0%). This is at variance with the finding by Onoh *et al* [32] and Bukar *et al*, [35] who reported that it was more common in women in social class 4 and 5, while Onwuhafua *et al*, [36] reported that it was more prevalent in social class 1 and 2. However, when the grading of anaemia is considered, mild and moderate anaemia was more prevalent in pregnant women in social classes 4 and 5. In this class of pregnant women, they tend to be more ignorant, poor, and illiterate, reside more in the rural areas and have poor seeking behaviour.

Expectedly, anaemia in pregnancy at booking is more prevalent in rural dwellers than their counterparts in suburban and in urban areas. This was similarly reported by Iyanam *et al* [37]. Rural dwellers more frequently had mild anaemia, while suburban women had more of moderate anaemia.

5. CONCLUSION

The prevalence of anaemia in pregnancy at booking in a rural setting like Otuoke situate in the Niger Delta region of Nigeria is high. The foetomaternal implications of this across the trimesters and the puerperium are far-reaching if not properly managed. It is a reflection of the non-existence of preconception care in our locality. This study has shown that the majority of the pregnant women booked for ante-natal care in the second trimester and the prevalence of anaemia is more in the second trimester and in pregnant women who are para 0. Mild anaemia was more prevalent in primigravidae while moderate anaemia was a more frequent occurrence in grand multiparas.

To curb this high prevalence, advocacy and proactive interventions which includes the utilization of contraception, preconception counselling, prompt diagnosis and treatment of febrile illness, regular deworming exercise and education of the girl child should be promoted.

CONSENT

Written informed consent was obtained from the pregnant women before recruitment into the study.

ETHICAL APPROVAL

The authors herein affirm that this study was approved by the ethics committee of the hospital. (Approval no. FMCY/REC/ECC/2016/DEC/121). It was thus performed in accord with the ethical standards as set in the 1964 Declaration of HelsinkI.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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