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Original Article

Socio-economic determinants of prenatal anaemia in rural communities of South-West Nigeria: a preliminary report

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Abstract: Background: Anaemia is common worldwide and pregnant women are one of the most vulnerable group. Although, anaemia in the general population including pregnant women is multi-factorial in aetiology, the most frequent cause in pregnancy worldwide is iron deficiency. In Nigeria, an estimated prevalence of anaemia among pregnant women ranges from 35-75%. Anaemia in pregnancy (AIP) is associated with significant perinatal and maternal morbidity and mortality including premature birth and low birth weight. Aim: The aim of this study was to determine the prevalence, demographic and socio-economic determinants of anaemia in pregnancy in a rural community of South-West Nigeria. Materials and Methods: One-hundred and fifty consenting pregnant women aged 18-42 years in the three trimesters were recruited from four primary health centres of Ikene Local Government of Ogun State of Nigeria after ethical approval was obtained from the Ethics Unit of the Medical officer of Health of the Local Government. Pre-tested interviewer-administered questionnaire was used to collect data on socio-demographic information and 24-hour dietary recall. Using a finger prick, the haemoglobin concentration of each respondent was determined with a haemoglobinometer (DG-300HB manufactured by DouBle, China). Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 20. Results: All the respondents belonged to low socio-economic class. The mean haemoglobin (Hb) concentration obtained in this study was 10.22±1.60 g/dL with a range of 6-14.8 g/dL. Using WHO cut-off Hb concentration of 11 g/dL, the prevalence of anaemia in this study was 67.3%. The frequency of anaemia increased with increase in age group. *P*=0.010. About 21.4% of those with adequate dietary iron intake were anaemic when compared with 72.1% (98 of 136) of those with inadequate dietary iron intake who were anaemic. AOR-0.090; 95% CI- 0.018-0.457; *P*=0.004. Conclusion: Increasing age, low socio-economic status, poor health education and low dietary iron intake were the predominant socio-economic determinants of prenatal anaemia in the population studied. Efforts must be intensified to alleviate poverty in rural areas and give health education on iron-rich foods to girls and women of children-bearing age in the rural communities.

Keywords: Iron deficiency, women of reproductive age, rural community

Introduction

Anaemia is common worldwide and it affects 33% of the global population with pregnant women being the most vulnerable group [1]. The World Health Organization (WHO) defines anaemia in pregnancy as haemoglobin (Hb) concentration of less than 11.0 g/dL [2]. The

prevalence of anaemia during pregnancy worldwide has been estimated at 41.8% [3]. This corresponds to 56.4 million women [3].

With an estimated 17.2 million pregnant women corresponding to approximately 30% of the total global cases; sub-Saharan Africa is the most affected region [4]. In Nigeria, an estimated prevalence of anaemia among pregnant women ranges from 35-75% [5].

Anaemia is a major cause of maternal death and is responsible for 20% of maternal mortality worldwide [6]. It is also associated with premature birth, low birth weight and infant mortality [5]. Significantly associated with anaemia in pregnant women are chronic energy deficiency, meal frequency, dietary diversity, gravidity, parity, inter-pregnancy interval, chronic infections and parasitic infestations, micronutrient deficiency [7-10] and inherited conditions such as haemoglobinopathies and red cell structural and/or enzymatic abnormalities [10].

Social demographic factors such as age, place of residence, marital status, employment status, household size, educational and wealth status may also contribute to anaemia in pregnant women [7, 11].

In a study conducted by Sholeye *et al.,* in Shagamu South West Nigeria, anaemia was associated with household food security and level of food insecurity [12]. Another study on Ethiopian pregnant women identified education and job status as predictors of anaemia in pregnancy [13]. A report from India however stated that higher level of poverty, obesity (BMI≥25.0 kg) and lower educational levels are positively associated with the incidence of anaemia [14].

Anaemia in pregnancy increases the risk of postpartum haemorrhage, pregnancy-induced hypertension and placenta previae [15]. Overall, 20-40% of the estimated 50,000 maternal deaths worldwide associated with child birth or the postpartum period are attributed to anaemia during pregnancy [16].

Anaemia is also an established risk factor for intrauterine growth restriction and subsequent low birth weight, preterm delivery and prenatal death [17].

Monitoring of health problems and its socioeconomic determinants are essential for developing effective interventions. This is of utmost importance for countries like Nigeria where the burden of health and nutritional problems including anaemia is high [18].

This study was carried out to determine the prevalence of anaemia and the demographic and socio-economic determinants of anaemia in pregnancy in rural communities of South-West Nigeria.

Materials and methods

Study area

This descriptive cross-sectional study was carried out in four primary health care centres in Ikenne Local Government Area of Ogun State-Ikenne PHC Ward 1, Ilisan PHC Ward 8, Iperu Healthcare Ward and Ogere Health Centre.

Ikenne Local Government is one of the three local government areas where Remo people are found in Ogun State. The other two local governments are Sagamu and Remo North Local Governments. By the 2006 Nigeria Population Census, Remo Land had a population of 628,560 people (Ikenne LG-165,700; Sagamu LG-253,421; Remo North LG-209,439) [19].

Remo land is within latitude 60° South and 90° North and Longitude 20 30 mins West and 60 30 mins East. It has a tropical climate, a land area of 971.0 Km^2, a temperature range of 27°C and 29°C and annual rainfall of 105-128 cm [20].

Data collection, instrument and procedures

One-hundred and fifty pregnant women aged 18-42 years, covering the three trimesters were recruited.

Inclusion criteria

Pregnant women of ages between 18 and 42 years who registered for antenatal clinic in the four primary health care centres.

Exclusion criteria

Pregnant women with history of chronic inflammatory disorders such as diabetes, tuberculosis, human immunodeficiency virus and those with inherited anaemic disorders (such as sick-

le cell anaemia thalassaemia, and glucose -6-phosphate dehydrogenase deficiency) were excluded from the study.

Ethical considerations

This study received ethical approval from the Office of the Medical Officer of Health (MOH), Ikenne Local Government Area of Ogun State, Nigeria with approval memo number IKLG 102/21 dated 27 June 2019. Written informed consent was obtained from the respondents and they were assured that the information they would provide would be kept confidential and used only for the purposes of the study.

Questionnaire administration

Pretested interviewer-administered questionnaire was used to collect data. The questionnaire was designed by the authors and adjusted to local setting and pre-tested for congruency and exclusion of ambiguities. It was refined thereafter and applied in the target population. The English version of the questionnaire was translated into the native language of the study area and then translated back to English language by language and public health experts for the purpose of analysis.

Three days of training was given to data collectors and supervisors. Pretest was done on 5% of the total sample size out of the study area in any of the Health Centres. During pre-test, the applicability of data collection procedures and tools were evaluated. Regularly, all questionnaires were checked for completeness, clarity and consistency by the supervisors and investigators including dietitians.

The questionnaire was in two parts. The first focused on the socio-demographic information of the respondents. This included maternal age, weight, height, parity, gestational age, interval from the last child birth to the current one, level of education and occupation of the women. The second part was on dietary recall of what the respondents ate in at least the preceding 24 hours. The womens' dietary diversity score was used to assess the pregnant woman's dietary diversity.

From the weights and heights taken, body mass index was calculated for each subject and categorized into four groups: underweight (<18.5 kg/m^2), normal weight (18.5-4.9 kg/m^2), overweight (25-29.9 kg/m^2) and obese (≥30 kg/m^2) following the WHO guidelines which addresses obesity during pregnancy as well as the general population [21]. The Women Dietary Diversity Score (WDDS) was computed based on 9 food groups which aimed to reflect the micronutrient adequacy of the diet. Finally, the respondents' dietary intake was categorized into poor, medium and high dietary diversity score if she consumed ≤3 food groups, 4-5 food groups and ≥6 food groups, respectively [22]. Daily dietary iron intake was also calculated from the DDS.

Using a finger prick, the haemoglobin concentration of each participant was determined with a haemoglobinometer DG-300HB manufactured by DouBle, China.

Data processing and analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics, including frequencies and proportions were used to summarize variables. A binary logistic regression model was used to identify factors associated with anaemia. Variables with a *P*-value of <0.2 in the bivariate analysis was exported to the multivariate analysis to control the possible effect of confounders.

The Adjusted Odds Ratio (AOR) with a 95% confidence level was estimated to show the strength of association and a *P*-value of <0.05 was used to declare the statistical significance in the multivariate analysis of the study.

Results

Demographic information of the respondents as enumerated in **Table 1** revealed that the age group 25-29 years had the highest frequency (42%) while the age group 35 years and above was the least with 13.3%. Majority of the respondents 76% (114 of 150) were of Yoruba extraction, Igbos were 15.3%, Hausa 3.3% and other tribes were 5.4%. All respondents claimed regular ANC attendance but only 88 of them (58.7%) took routine antenatal drugs regularly. The mean BMI was 27.2±5.28 (range 15.95-42.87 Kg/m^2).

About 57.3% (86 of 150) of the respondents had secondary education. This was followed by those with primary education who constituted about 24.7% while only 8 (5.3%) of the respondents had no formal education.

Table 1. Socio-demographic characteristics

Variables		N (%)
Age (years)	18-24	31 (20.7)
	25-29	63 (42.0)
	30-34	36 (24.0)
	35-42	20 (13.3)
Education	None	8 (5.3)
	Primary	37 (24.7)
	Secondary	86 (57.3)
	Tertiary	19 (12.7)
Occupation	Artisans	72 (48.0)
	Housewives	32 (21.3)
	Employed	29 (19.4)
	Farmers	17 (11.3)
Parity	0	59 (39.3)
	1-3	76 (50.7)
	≥4	15 (10.0)
Gestational age	First	41 (27.3)
	Second	57 (38.0)
	Third	52 (34.7)

Table 2. Haemoglobin concentration in correlation with age, BMI and educational status

Variables	Hb<11 g/dL	Hb≥11 g/dL	Total	*P* value
Age (years)				
18-24	18 (58)	13 (42)	31	0.010
25-29	40 (63.5)	23 (36.5)	63	
30-34	27 (75.0)	9 (25.0)	36	
35-42	16 (80.0)	4 (20.0)	20	
BMI				
Underweight	8 (80.0)	2 (20)	10	0.324
Normal	44 (73.3)	16 (26.7)	60	
Overweight	21 (61.8)	13 (38.2)	34	
Obese	28 (60.9)	18 (39.1)	46	
Education				
None	5 (62.5)	3 (37.5)	8	0.125
Primary	24 (64.9)	13 (35.1)	37	
Secondary	60 (69.8)	26 (30.2)	86	
Tertiary	12 (63.2)	7 (36.8)	19	

Using the Kuppuswamy's scale, all the respondents belonged to the low socio-economic status with 48% being artisans (tailors, hair dressers etc.). Other groups included housewives (21.3%), and farmers (11.3%). Only 19.4% (29 of 150) of the respondents were employed as clerical officers, cleaners, messengers etc. in small/medium scale enterprises.

Respondents in the parity 1-3 group had the highest frequency (50.7%). This was followed by primigravidae with 39.3% (59 of 120). Women with parity of 4 or more were the least (10%).

When the women were grouped according to their gestational age, 27.3% (41 of 150) belonged to the first trimester, 38% (57 of 150) were in the second trimester and 34.7% (52 of 150) were in the third trimester.

Mean Hb concentration obtained in this study was 10.22±1.60 g/dL with a range of 6-14.8 g/dL and using the WHO cut-off Hb concentration of 11 g/dL, the prevalence of anaemia in this study was 67.3% (101 of 150).

Table 2 shows Hb concentration in correlation with age, BMI and educational status. The frequency of anaemia increased as age group increased. The frequency was lowest (58%) in the 18-24 years age group and highest in the 35-42 age group with 80% (16 of 20) *P*=0.010. Although not statistically significant, the Hb concentration of respondents increased progressively as BMI increased from underweight to obesity.

With 69.8% (60 of 101), anaemia was seen most among respondents with secondary education. This was followed closely (64.9%) by those with primary education. The frequency of anaemia was the lowest in those with tertiary education (62.3%) and with no formal education (62.5%) This was however not also statistically significant. *P*=0.125.

Haemoglobin concentration in correlation with parity, gestational age, dietary iron intake and DDS are shown in **Table 3**. Though no statistically significant differences were found, the percentage of those with anaemia was highest among the primigravida (67.8%) when compared with those with parity of 1-3 (67.1%) and with parity ≥4 (66.7%).

Though not also statistically significant, anaemia tended to reduce as pregnancy progressed. It was seen most among respondents in the first trimester (75.6%) and least in those in the third trimester (65.4%).

There was a statistically significant difference in the Hb concentrations between those with

Table 3. Haemoglobin concentration in correlation with parity, gestational age, dietary iron intake and DDS

Variables	Hb<11 g/dL	Hb≥11 g/dL	Total	*P* value
Parity				
0	40 (67.8)	19 (32.2)	59	0.602
1-3	51 (67.1)	25 (32.9)	76	
≥4	10 (66.7)	5 (33.3)	15	
Gestation				
1st trimester	31 (75.6)	10 (24.4)	41	0.147
2nd trimester	36 (63.2)	21 (36.8)	57	
3rd trimester	34 (65.4)	18 (34.6)	52	
Dietary Iron intake (≥27 mg/day)				
Adequate	3 (21.4)	11 (78.6)	14	0.002
Inadequate	98 (72.1)	38 (27.9)	136	
DDS				
Poor	17 (68.0)	8 (32)	25	0.065
Medium	52 (66.7)	26 (33.3)	78	
High	32 (68.1)	15 (31.9)	47	

DDS-Dietary diversity score.

adequate dietary iron intake and those without. Of the 14 out of the 150 respondents that had adequate dietary iron intake, only 3 (21.4%) had Hb concentration below the cut-off of 11 g/dL while 72.1% (98 of 136) of those with inadequate dietary iron intake had Hb concentration below the cut-off of 11 g/dL. AOR-0.090; 95% CI- 0.018-0.457; *P*=0.004.

Discussion

Anaemia in pregnancy is a major health issue in developing countries such as Nigeria. The prevalence (67.3%) obtained in this study falls within an estimate of 35-75% reported by Olujinmi et al. in Nigeria [5]. Although reports from Abeokuta and Ilesha both in South-West Nigeria revealed prevalence of 76.5% [23] and 62.2% [24] respectively, another study from Sagamu in the same geo-political region revealed a lower prevalence of 32.5% [12].

In our study, more women in their first trimester were anaemic compared to those in their second and third trimesters. This is contrary to the general belief that due to physiological adaptation to pregnancy, anaemia in pregnant women worsens as pregnancy progresses. We did not find any study with findings similar to ours. It may mean that majority of our respondents became pregnant and booked for ANC with an existing anaemia but got better as pregnancy progressed due to dietary advisory health talks and supplementary iron and folic acid received during the antenatal care. Further studies using a bigger sample size is therefore needed to confirm this finding.

Majority of our respondents had iron intake below the recommended value of ≥27 mg/day calculated from their daily dietary recall. This is not surprising as all our respondents belong to the low socio-economic class and lacked nutritional knowledge on consumption of cheap iron rich foods. It is a known fact that a lowsocio-economic status (SES) is related to unhealthy dietary habits; less nutritious, energy-dense foods are often cheaper sources of calories [25].

Although not statistically significant, our study found an association between body mass index (BMI) and Hb as fewer respondents in the overweight and obese categories were anaemic when compared with those who had normal weight or were underweight. Many reports are in agreement with this finding. In a cross-sectional study conducted at Khartoum, Sudan [26], it was found that in comparison with normal BMI, overweight and obesity were significantly associated with higher haemoglobin concentration in pregnancy. Rasmussen et al. also reported that haemoglobin levels during pregnancy were significantly associated with body mass index [27]. They found out that haemoglobin values were significantly lower for women with body mass index <19 kg/m^2 than for women with body mass index ≥19.

In our study, the percentage of those with anaemia was highest (67.8%) among the primigravidae. This agrees with a report by Idowu et al. which observed that anaemia was more prevalent among the primigravidae (80.6%) compared with the multigravidae (74.5%) (P>0.05). It is however at variance with some other

reports in which high parity is associated with anaemia in pregnancy [28].

In conclusion, the prevalence of anaemia in pregnancy is high in the studied area. All the respondents belong to the low socio-economic class. This may have contributed to the low dietary iron intake and high prevalence of anaemia observed in this study. Many respondents could have become pregnant with sub-optimal haemoglobin concentration. Efforts must be intensified to give health education on iron-rich foods to girls and women of children-bearing age in the rural communities.

The limitation of this preliminary report is that we did not analysed the iron profile of the respondents.

Disclosure of conflict of interest

None.

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