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IRON STATUS OF NON-PREGNANT WOMEN IN PORT – HARCOURT, NIGERIA

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ABSTRACT

Iron Deficiency (ID) is the commonest cause of malnutrition and anaemia worldwide. Iron stores in women of reproductive age are precarious and largely predict Iron Deficiency Anaemia (IDA) in pregnancy. The aim of this study was to assess the prevalence of ID and IDA in a group of non-pregnant women of reproductive age in Port Harcourt and determine what factors influence these in this group of women. Blood Samples from 126 healthy non pregnant premenopausal women were analyzed. The tests done include; Complete Blood Count (CBC), Erythrocyte Sedimentation Rate (ESR) and Serum Ferritin, (SF). Results showed that the means haemoglobin concentration (Hb) and SF were 123.5 ± 12.2g/L and 46.1±24.9µg/L respectively. The observed 32.4% prevalence of anaemia was associated with ID in 39.4% of cases. We recommend a pre-pregnancy CBC for women of reproductive age to detect and promptly treat anaemia as well as Iron fortification of staple foods, and possibly table salt in order to improve iron intake and iron status in non pregnant women and in the general population.

Keywords: Iron Stores, Menstruating Women, Iron Deficiency Anaemia, Anaemia in Pregnancy

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INTRODUCTION

Iron is the commonest element on the surface of the earth crust; ironically its deficiency is the commonest form of malnutrition worldwide. Iron deficiency affects over two billion people and it is severe enough to cause anaemia in about half of them (Worwood and Hoffbrand, 2005; Beutler, 2006). Iron deficiency may arise from inadequate dietary intake, impaired absorption, haemorrhage and increased physiologic demand of childhood, adolescence, menstruation, pregnancy and lactation (Viteri, 1994; Worwood and Hoffbrand, 2005, Beutler 2006). Menstrual blood loss has a median volume of 30ml, but the 95th percentile value is 118ml which is equivalent to about 1.9mg of iron loss daily. This has been found to be significantly associated with iron deficiency (Hughes-Jones et al., 2004; Worwood and Hoffbrand, 2005).

In the general population, the prevalence of iron deficiency (ID) is as high as 50% in developing countries compared to about 11% in developed countries (Beutler, 2006). Assessing the iron status of non-pregnant women becomes pertinent because pre-pregnancy iron store is the major predictor of Iron Deficiency (ID) and iron deficiency anaemia (IDA) in pregnancy (AIS, 2005; Beutler, 2006).

In this study, assay of serum ferritin (SF) which is regarded as the best non-invasive marker of the body's iron status was employed (Skoog, 1993; (AIS, 2006). A high degree of correlation has been demonstrated between SF and bone marrow iron stores in healthy young women (Puolakka, 1980).

Very little work has been done to assess the prevalence of ID and IDA in non pregnant women of reproductive age in Nigeria. This study is aimed at assessing ID and IDA in this group of women living in Port Harcourt, the capital of Rivers State in the South- South geopolitical zone of Nigeria. The effects of some known socio demographic factors associated with ID were also assessed.

MATERIALS AND METHOD

Subjects: One hundred and twenty-six (126) apparently healthy menstruating women were recruited into the study. They were randomly drawn from staff and relatives of patients at the University of Port-Harcourt Teaching Hospital (UPTH), Alakahia, Port Harcourt and the Demonstration clinic of the Rivers State College of Health Science and Technology (RSCHST), Rumu-eme, Port Harcourt.

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Additional subjects were recruited from three churches: Zion Baptist Church, Rumu-epirikom, Goodland Baptist church Rumu-igbo and Living Faith Church, Mgbuoba all in Port Harcourt in the course of their annual health week programme.

Ethical Considerations: Exclusion criteria were; child birth in the last one year, illness suggestive of infection/inflammation in the last seven days, major surgery or road traffic accident in the last one year, women with known haemoglobinopathy and bleeding disorders. Informed consent was obtained from the subjects and other relevant information was obtained via a structured self-administered questionnaire.

Sample Collection: Five milliliters (ml) of venous blood was then collected from each subject by venipuncture. Three ml was delivered into Ethylene Diamine Tetra Acetic acid (EDTA) bottles and mixed thoroughly. The remaining 2ml was left to clot and the serum was promptly separated into plain bottles.

Sample Analysis: The blood samples were analyzed in the Haematology laboratory of the University of Port Harcourt Teaching Hospital, Port Harcourt for CBC using the automated blood cell counter, PCE-210 (N). ERMA. Inc. Japan and, ESR (to assess the acute phase response) using the Westergren method described in Dacie and Lewis Practical Haematology (Lewis, 2004).

Subjects with gross elevations in ESR (>30mm/hr) were excluded from SF assay using the upper limit of 20m/hr reported by Araba (1997) as a guide. Serum ferritin (SF) was measured by an Enzyme-Linked Immunosorbent Assay (ELISA) technique using commercial kits from Clinotech diagnostics, Richmond Canada, 2008.

Statistical Analysis: Statistical analysis: the data generated was analyzed using Microsoft Excel and Epi Info™ version 6 developed by John Hopkin's University, Baltimore, USA and the Centers for disease control and prevention (CDC) for public health research (2001).

RESULTS

One hundred and twenty six (126) menstruating women participated in the study. Their ages ranged between 19 and 47 years with a mean of 27.6 years (SD, 5.7). Fifty eight (46%) of the women were married. The age-group distribution is shown in Table 1, while the distribution of parity is shown in Table 2.

The mean haemoglobin concentration (Hb) was 123.5 $\pm$ 12.2g/L, range 105.0 – 150.0g/L. The mean packed cell volume (PCV) was 34.1 $\pm$ 3.2%, range 27.9 – 42.0%. Applying the WHO/UNICEF cut off point for anaemia in menstruating women (Strolzfus and Dreyfus, 1998), of (Hb < 120g/L), the prevalence of anaemia was 32.4%. The mean serum ferritin (SF) was 46.1 (SD, 24.9µg/L), range 14.1 – 161.1µg/L.

Defining iron deficiency as SF less than 20µg/l for adult women as recommended by the American College of Obstetricians and Gynaecologists (ACOG), the prevalence rates of iron deficiency and iron deficiency anaemia were 24.4% and 14.9% respectively (ACOG Technical Bulletin 1993).

The mean SF levels increased significantly with increasing educational status of the women as shown in Table 3, while the mean SF levels also increased with the educational level of the spouses of the married women, but the differences were not statistically significant as shown in Table 4. Also, mean SF increased with longer child spacing with Pearson's Correlation Coefficient showing some degree of association with longer child spacing (see Table 5). Overall, there was no linear association between parity and SF.

Table 1: Age-group distribution

Age-group (years)	Number	%
15-24	48	38.1
25-34	62	49.3
35-44	15	11.9
>45	1	0.8
Total	126	100

Table 2: Distribution of parity

Parity	Number	%
0	64	50.8
1-2	36	28.7
3-4	20	16.5
> 5	6	4.9

Table 3: Distribution of SF by educational status of women

Educational status	Number	Mean SF (µg/L)
Primary	25	32.69
Secondary	70	38.11
Tertiary	31	45.70

P-value = 0.043, $X^2 = 8.162$.

Table 4: Distribution of SF by educational status of spouses

Educational status of spouse	Number	Mean SF (µg/L)
Primary	17	34.09
Secondary	68	37.78
Tertiary	41	49.28

P-value = 0.195, $X^2 = 4.699$

Table 5: Distribution of SF by child spacing

Child spacing (months)	Number	Mean SF (µg/L)
9-12	29	22.87
13-24	75	44.11
≥ 25	22	71.18

P – value = 0.988, $X^2 = 0.129$, r = 0.45, $\hat{r}_2 = 0.20$

DISCUSSION

Iron deficiency is the commonest cause of anaemia worldwide (Worwood and Hoffbrand, 2005; Beutler, 2006). In this study, almost a third (32.4%) of the women was anaemic. This is close to the prevalence rate of 39.5% reported amongst non-pregnant women of reproductive age in Calabar, South-South, Nigeria (Usanga et al., 1994). Similarly, a prevalence rate of 40.1% was found for anaemia amongst menstruating adolescents in K'Dere, a village in Rivers state (Barr et al., 1998). This age-group is particularly vulnerable because of the increased physiologic demand associated with adolescent growth surge and onset of menstruation. In Zaria, North West, Nigeria, a prevalence rate of 46%was reported in a smaller population (66) of poorly educated non pregnant women (Isah et al., 1985). However, in N'Djamema, Chad, a lower prevalence of anaemia in menstruating women (23.7%) was recorded (Prual et al., 1988).

In our study, the prevalence of ID and IDA were 24.4% and 14.9% respectively. This ID prevalence can be said to be close to the 23.7 % reported by Prual et al. (1988) in N'Djamena, Chad. A much higher prevalence of ID (46%) was found by Isah et al (1985) in Zaria amongst poorly educated women. Also the overall socio economic conditions in Zaria are probably lower than Port-Harcourt. Amongst non-pregnant factory workers in South Africa, the prevalence of ID and IDA were 40.0% and 27.4% respectively. This may be a reflection of the nutritional status in most developing countries because studies in more developed countries whose citizens uniformly enjoy much better nutritional status such as the USA and Demark reported lower prevalence rates of ID, IDA. In the USA, the prevalence rates for ID and IDA were 3.2% and 2.3% respectively while in Denmark the corresponding figures were 12.4% and 17.2% for ID and IDA (Worwood and Hoffbrand, 2005).

Our study also corroborated the reported huge contribution of ID to anaemia in non-pregnant women (Beutler, 2006). Amongst the anaemic women, 39.4% were associated with ID a figure that is comparable to 44.4% reported in Chad (Prual et al, 1998).

We also examined the influence of some known socio demographic factors on iron status. Mean SF increased with better educational status of the women (see Table 3) and their spouses (see Table 4). This is a reflection of better nutrition in families of higher socio-economic status. Mean SF also improved with longer child spacing (see Table 5) as more time is available for the women to recover from the iron cost of pregnancy, peuperium and lactation. This is in agreement with findings in the USA (Viteri, 1994) and Australia (AIS, 2006) where ID was worsened by poor child spacing. There was however no association between SF and parity in our study.

Indeed, a more elaborate study will be required to assess the contribution of other causes of ID like bleeding peptic ulcer disease, hookworm infestation, and menorrhagia (quantifying menstrual blood loss). In addition, the influence of subclinical inflammation on the level of the acute phase protein serum ferritin is better assessed by measuring serum levels of C – reactive protein (CRP) which we could not do in this study.

CONCLUSION

The prevalence of anaemia (32.4%) and its main contributor ID (24.4%) is unacceptably high in our study population, and particularly worrisome in a cosmopolitan city like Port Harcourt. We therefore recommend iron fortification of common staple foods and, possibly table salt as it is done for iodine in Nigeria. Also, a pre-pregnancy complete blood count should be included in routine tests for intending couples to detect and promptly treat possible anaemia. This will ensure adequate pre-pregnancy iron stores and hence, reduce the risk of iron deficiency anaemia in pregnancy.

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AUTHOR(S) CONTRIBUTION

Pughikumo, C.O. and Pughikumo, D.T, were involved with the conception of this work, Literature search, data analysis and final write up of this work. Olanrewaju, D.O. was involved in literature search, data analysis and final write up of this work. Ejele O. A. was involved in the data analysis, final write up and overall supervision of this work.