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ORIGINAL ARTICLE

Prevalence of Anaemia and Iron Requirement in Women Across Reproductive Phases in Calabar, Nigeria

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Abstract

Introduction: Maternal healthcare takes into consideration the immediate state of an individual woman with regards to health status and subsequent management. Anaemia is a common maternal health challenge that is affected by hormonal shifts in women. Thus, this study focused on prevalence of anaemia and iron requirement across women of premenopausal and postmenopausal phases.

Methods: This study enrolled apparently healthy 100 females with equal numbers of premenopausal and postmenopausal subjects. Blood sample was appropriately obtained from each subject for assessment of red cell and iron parameters. Microhaematocrit and cyanmethaemoglobin methods were employed for the measurement of packed cell volume and haemoglobin concentration respectively, while the iron parameters were assayed by colorimetric methods. Transferrin saturation was mathematically derived. Results are expressed as Frequencies and Mean ±SD, while student t-test was used for analysis of data on SPSS version 22.0. Statistical significance was drawn at a $p \leq 0.05$.

Results: Postmenopausal women had significantly higher values of packed cell volume (0.38 ± 0.03 l/l), haemoglobin concentration (125.50 ± 9.30 g/l), serum iron (23.17 ± 0.93 µmol/l) and transferrin saturation (36.88 ± 2.00 %) than the premenopausal women (0.37 ± 0.02 l/l, 121.44 ± 7.83 g/l, 15.53 ± 2.60 µmol/l and 20.70 ± 3.60 % respectively) while the premenopausal women had significantly higher values in total iron binding capacity (75.24 ± 3.32 µmol/l) than the postmenopausal women (62.97 ± 1.88 µmol/l. Whereas 30% of the premenopausal women were anaemic and 10% had low transferrin saturation, anaemia in postmenopausal women occurred at a prevalence of 18% and the indicators of iron need were adequate.

Conclusion: This study has shown that among apparently healthy individuals, prevalence of anaemia and iron requirement are lower in postmenopausal women than premenopausal women.

Key words: Anaemia, iron, premenopausal, postmenopausal

Introduction

Developing regions of the world are associated with challenges in the indices of human wellbeing including adequate healthcare provision. Among the commonest public health concerns globally is anaemia, and it remains prevalent in developing countries including Nigeria (1). Although anaemia affects the general population, women and children are known to be the most vulnerable groups (2,3). While the latter represents a homogenous group being clearly defined by definite age limits, adulthood in females consists of different phases that are primarily anchored around hormonal changes and reproductive states. The impact of these changes may not be easily ascertained but various health conditions have been observed to exhibit female preponderance (4-6). Thus, maternal healthcare takes into consideration the immediate state of an individual woman with regards to health status and subsequent management. Anaemia, as a common maternal health challenge, exerts immense morbidity and mortality burdens. This has necessitated continued effort towards its management and control (7,8).

Anaemia is a state of deficit in red blood cell parameters with the net effect of impairment in oxygen delivery. Its cutoff value using routine laboratory tests varies by age and gender. The World Health Organization has defined anaemia in non-pregnant and non-lactating women as hemoglobin concentrations less than 12.0 mg/dl (9). However, women appear to be disproportionately affected across the different phases of female adulthood. Apart from pregnancy where increased physiological demands predispose women to anaemia, menstruation has also been identified as a major contributing factor to the vulnerability of women with regards to anaemia. At the other end of the spectrum, post-reproductive women are not completely free from factors that contribute to anaemia as they could be prone to other health complications as well as inadequate nutritional intake (10). Menopause-associated changes in the parameters for screening of anaemia remain unclear but may also differ on the account of population diversity. Studying the red cell and iron parameters in premenopausal and postmenopausal women helps to assess menstrual influences and postmenopausal hormonal influences on these parameters. Altered iron metabolism are significant health concerns affecting women, particularly during the premenopausal and postmenopausal stages. Understanding these differences is important for identifying potential health implications and guiding appropriate interventions for women in different stages across the reproductive divide.

Materials and methods

This comparative study enrolled 100 females out of which 50 were of reproductive age while the other 50 were of post reproductive age. In addition, the study participants were apparently healthy and not on medication/ supplements within the preceding one year. Informed consent was obtained from each participant enrolled in the research and confidentiality was maintained. A structured questionnaire was administered to obtain biodata as well as pertinent information with regards to participants' reproductive state and supplement intake. Weight and height for the calculation of body mass index were measured using weighing scale and meter rule, while a measuring tape was used for the waist circumference.

Blood sample was appropriately obtained from each subject into dipotassium ethylene diamine tetra-acetic acid bottle at a concentration of

2mg/ml of blood for measurement of packed cell volume and haemoglobin concentration, and also plain bottle from which serum was harvested for analysis of serum iron and total iron-binding capacity. Microhaematocrit and cyanmethaemoglobin methods were employed for the measurement of packed cell volume and haemoglobin concentration respectively, while the iron parameters were assayed by colorimetric methods. Transferrin saturation was mathematically derived. Data generated were entered into Microsoft excel spreadsheet and analysed using Statistical Package for Social Sciences (SPSS) software version 22.0. Results are expressed as Frequencies and Mean±SD, while Student t-test was used for comparison. Statistical significance was drawn at a $p \leq 0.05$.

Results

This study observed significant differences between the measured parameters of pre-menopausal and Postmenopausal women. Postmenopausal women had significantly higher values of body mass index (25.72 ± 4.14 kg/m^2), waist circumference (89.98 ± 9.04 cm), packed cell volume (0.38 ± 0.03 l/l), haemoglobin concentration (125.50 ± 9.30 g/l), serum iron (23.17 ± 0.93 µmol/l) and transferrin saturation (36.88 ± 2.00 %) than the premenopausal women (22.16 ± 4.63 kg/ m^2, 77.58 ± 11.41 cm, 0.37 ± 0.02 l/l, 121.44 ± 7.83 g/l, 15.53 ± 2.60 µmol/l and 20.70 ± 3.60 % respectively) while the premenopausal women had significantly higher values in total iron binding capacity (75.24 ± 3.32 µmol/l) than the postmenopausal women (62.97 ± 1.88 µmol/l) as shown in Table 1.

Figure 2 Shows a distribution in Percentage of the population of premenopausal women with regards to anaemia and iron need. From the figure, 30% of the premenopausal women were anaemic as indicated in low haemoglobin concentration values. In addition, 10% of the premenopausal women had iron need as adjudged by low transferrin saturation. On the other hand, Figure 3 Shows a distribution in the percentage of the same indices among postmenopausal women. The prevalence of anaemia in this group was found to be 18% as observed from their haemoglobin concentration values, iron need was not observed in this group.

Discussion

The present study assessed the differences in selected anaemic indices alongside basic anthropometric variables between premenopausal and postmenopausal women. This investigation, in essence, sought to observe the prevalence of anaemia and iron requirement in apparently healthy women above reproductive age. The postmenopausal women had significantly higher values than premenopausal women with regards to BMI and waist circumference as well as PCV, Hb concentration, serum iron, and transferrin saturation. In line with normal iron metabolism, TIBC was lower in the former compared to the latter. Higher BMI in postmenopausal women than in premenopausal women has been previously reported and attributed to a number of factors. An important aspect of consideration is the impact of declining female reproductive hormone on body fat distribution. Waning estrogen levels with decreasing muscle mass trigger fat deposition and weight gain which is measurable as increased body mass index and waist circumference. In addition, reduction in physical activities as women advance in age further contributes to these observations (11-14).

Mean values of packed cell volume and haemoglobin concentration were higher in postmenopausal women compared to premenopausal women. At individual level also, the prevalence of anaemia was lesser in the post-reproductive phase. More importantly, the distribution of iron

parameters was observed to be in a similar manner, thus, underscoring the significant role of iron in the anaemia that occurs in females. Iron metabolism is tightly regulated in humans to ensure minimal loss, therefore changes in the dynamics of iron parameters can be quite insightful both in physiological states and pathological conditions (15). It has long been recognized that menstruation in female reproductive life poses a physiological challenge that confers vulnerability to this group. Hence, anaemia in women of reproductive age remains an unresolved health challenge, particularly in our locality where it is reported to increase the risk of gestational complications (16,17). Menopause and by extension age, therefore, accords some stability in iron metabolism that translates to lower prevalence of anaemia in women at this phase of life. This is obviously so because postmenopausal women generally experience increase in iron stores due to cessation of menstrual blood loss. Hormonal changes with the attendant adjustments in iron dynamics as occasioned by menopausal transition appear to consistently favor postmenopausal women as also reported in recent studies (18,19).

Table 1. Mean values of anthropometric variables and some indicators of anaemia between premenopausal and postmenopausal women

Parameters	Pre-Menopausal	Post-Menopausal	p–Value
	n = 50	n = 50	
BMI (25-29.9 kg/m^2)	22.16 ± 4.63	25.72 ± 4.14	0.001
WC (< 80 cm)	77.58 ± 11.41	89.98 ± 9.04	0.001
PCV (0.36-0.45 l/l)	0.37 ± 0.02	0.38 ± 0.03	0.019
Hb Conc. (120-150 g/l)	121.44 ± 7.83	125.50 ± 9.30	0.020
MCHC (320-360 g/l)	331.7 ± 2.1	332.0 ± 0.31	0.345
SI (11-29 µmol/l)	15.53 ± 2.60	23.17 ± 0.93	0.001
TIBC (45-81 µmol/l)	75.24 ± 3.32	62.97 ± 1.88	0.001
TS (15-40%)	20.70 ± 3.60	36.88 ± 2.00	0.001

Key: **BMI** = Body Mass Index, **WC** = Waist Circumference, **PCV** = Packed Cell Volume, **Hb Conc.** = Haemoglobin Concentration, **MCHC** = Mean Cell Haemoglobin Concentration, **SI** = Serum Iron, **TIBC** = Total Iron Binding Capacity and **TS** = Transferrin Saturation.

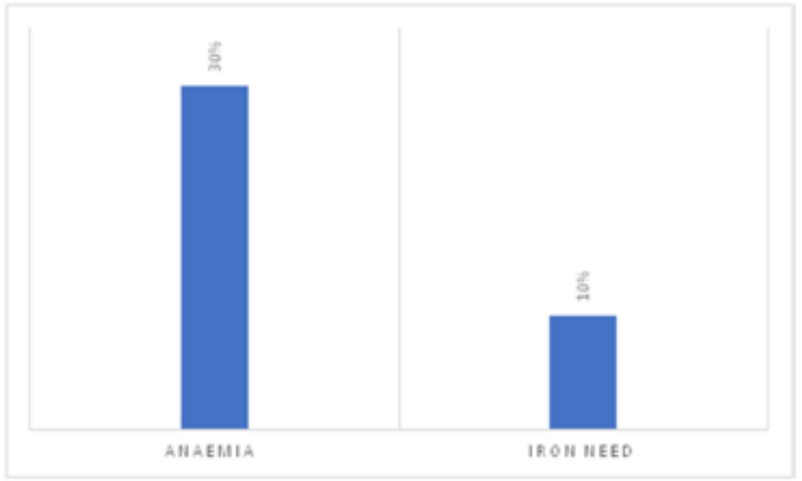

Figure 2. Frequency distribution of anaemia and iron need in premenopausal women

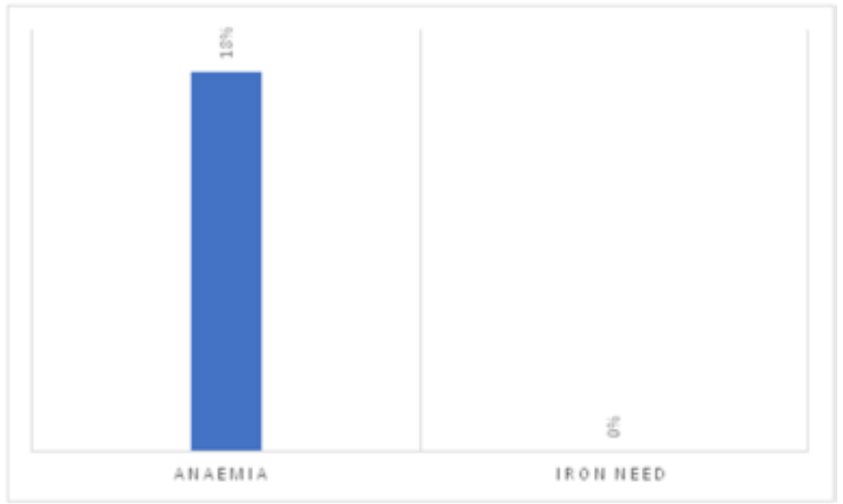

Figure 3. Frequency distribution of anaemia and iron need in postmenopausal women

Conclusion

This study has shown that among apparently healthy individuals, prevalence of anaemia and iron requirement are lower in postmenopausal women than premenopausal women.

Conflict of Interest

The authors declare no conflict of interest.

References

1. World Health Organization. Prevalence of anaemia among women of reproductive age (% of women ages 15-49) – Nigeria 2021. https://www.who.int accessed 5th May, 2022.
2. Pan American Health Organization. Anemia in women of reproductive age, and children under-five years in the Region of the Americas. ENLACE data portal. Department of Noncommunicable Diseases and Mental Health, Pan American Health Organization 2022. https://www.paho accessed 7th December, 2023.
3. Akwiwu EC, Akpotuzor JO. Ascorbic acid level, Total antioxidant status and Cellular Immune Response among Malaria infected children in Calabar Metropolis, Nigeria. Calabar Journal of Health Sciences 2018; 2 (1): 14-19.
4. Edem MS, Akwiwu EC, Akpotuzor JO, Asemota EA, Isong IK. Glycated Haemoglobin, Fasting Plasma Glucose, Plasminogen Activator Inhibitor Type-1 and Soluble Thrombomodulin Levels in Patients with Type 2 Diabetes Mellitus. Nigerian Journal of Physiological Science 2021; 36 (2): 159 – 164.
5. Akwiwu EC, Edem MS, Akpotuzor JO, Isong IK, Okafor AO, Okhhormhe ZA. Glycemic control and associated platelet indices among apparently healthy caregivers in Southern Nigeria. New Zealand Journal of Medical Laboratory Science 2020; 74: 87-90.
6. Akpotuzor JO, Akwiwu EC, Okpokam DC, Keunmoe P. Analyses of haematological malignancies records from University of Calabar Teaching Hospital Calabar, Nigeria (1983-2008). International Journal of Natural and Applied Sciences 2011;. 7(1): 133-136.
7. World Health Organization. Maternal mortality 2019 Fact sheets. https://www.who.int accessed 8th January, 2022.
8. World Health Organization. Maternal and Reproductive Health 2022. https://www.who.int accessed 17th May, 2023.
9. World Health Organization. Anaemia 2023. https://www.who.int accessed 27th November, 2023.
10. Chang VC, Cotterchio M, Kotsopoulos J, Bondy SJ. Iron status and associated factors among Canadian women: results from the Canadian Health Measures Survey. J. Nutr.2023; 153 (3): 781-797.
11. Fenton A. Weight, shape, and body composition changes at menopause. J Mid Life Health 2021; 12: 187-192.
12. Greendale GA, Sternfeld B, Huang MH, et al. Changes in body composition and weight during the menopause transition. JCI Insight 2019; 4 (5).
13. Banack HR, Bea JW, Chen Z, et al. Longitudinal patterns of abdominal visceral and subcutaneous adipose tissue, total body composition, and anthropometric measures in postmenopausal women: results from the Women's Health Initiative. Int J Obes 2023.
14. World Health Organization. Obesity factsheet.html. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
15. Akwiwu EC, Akpotuzor JO, Onukak EE, et al. Proportional Derangement in Iron Parameters of Sickle Cell Anaemia Subjects in Calabar Nigeria. Sokoto Journal of Medical Laboratory Science 2020; 5(3): 11 – 16.
16. Ndem BN, Akwiwu EC, Akpan PA, et al. Timely accessing of antenatal care and prevalence of vitamin B12 and folate deficiencies among pregnant women in a Nigerian population. New Zealand Journal of Medical Laboratory Science 2021; 75: 12-15.
17. Akwiwu EC, Udosen JE, Okpokam DC, Ukpabi SA, Akpotuzor JO, Ndem BN. Preconception Prevalence of Iron, Vitamin B12 and Folate Deficiencies among Women of Reproductive Age in a Nigerian Population. Tanzania Journal of Health Research 2023; 24 (4): 492-499.
18. Merlo F, Groothof D, Khatami F, et al. Changes in Iron Status Biomarkers with Advancing Age According to Sex and Menopause: A Population-Based Study. Journal of Clinical Medicine 2023; 12(16):5338.
19. Chen B, Li GF, Shen Y, Huang XI, Xu YJ. Reducing iron accumulation: A potential approach for the prevention and treatment of postmenopausal osteoporosis. Exp. Ther. Med. 2015; 10, 7–11.

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