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Research Article

Screening for Anaemia at Different Phases of the Menstrual Cycle among Female Students in a Nigerian University

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Abstract

Background: Menstrual cycle is the periodic physiological bleeding that characterises much of a woman's reproductive life. It is hypothesized that this blood loss could predispose women to anemia.

Aim: Therefore, this study was designed to employ haematocrit values to assess for anemia in women within reproductive age at different phases of the menstrual cycle.

Materials and Methods: Fifty-one (51) apparently healthy, regularly menstruating female students of the University of Jos, Nigeria between the ages of 19-30 years were followed up in a single cycle. We determined the haematocrit values of the study subjects using the micro haematocrit method during the pre-menstrual, menstrual and post-menstrual phases of the menstrual cycle. Variations in Haematocrit (Hct) values at the different phases of the menstrual cycle were analyzed using paired student t-test.

Results: The average haematocrit value at pre-menstrual phase was 40.04 ± 1.89 (%), the menstrual was 37.40 ± 3.25 (%) and the postmenstrual was 39.70 ± 2.18 (%). The decrease in the mean haematocrit value observed at the menstrual phase when compared to the average values reported at premenstrual and postmenstrual-phases was shown to be statistically significant ($P < 0.005$).

Conclusion: The data revealed that menstrual bleeding could be responsible for the decreased in the haematocrit values of the study participants.

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Clinical significance: Although the decrease in haematocrit values may not necessarily lead to an anaemic state, it is important to maintain a regular check on this parameter to avoid eventual onset of anemia in menstruating women as a result of blood loss.

Keywords: Anemia; Haematocrit; Menstrual cycle; Microhaematocrit method

Introduction

The menstrual cycle can be described as a series of carefully coordinated events that prepare a woman's body for of the ovaries releases an egg- a process called ovulation [1]. At the same time, hormonal changes prepare the uterus for pregnancy [2].These hormonal changes divide the menstrual cycle into three phases; the menstrual phase, oestrogenic phase, and the progesteronic phase. If ovulation takes place and the egg is not fertilized, the lining of the uterus sheds through the vagina [3].

The average length of the menstrual cycle is 28 days although a variation of between 21-40 days is normal [4]. Some factors, including age, weight, diet, amount of physical activity, level of stress and genetics have been identified to affect the cycle and the amount of blood loss. The length of the menstrual cycle is counted from the first day of menstrual bleeding until the day of the next menstrual bleeding [3].

Menstrual bleeding could be heavy or light. Blood loss in menstruation ranges from 30-80ml [5]. The blood loss during menstruation results in a negative iron load in women and increases the risk for developing iron-deficiency anemia [1,6]. Anemia in adolescent girls has been shown to contribute to maternal and foetal mortality and morbidity later in life [7].This makes the measurement of Packed Cell Volume (PCV) across the menstrual cycle very important. Packed cell volume is also known as haematocrit. It is the percentage of total volume of whole blood occupied by packed red blood cells when a known volume of blood is centrifuged ata constant speed for a constant period [8]. The measurement of PCV is used as a screening test for anemia which could be as a result of blood loss or other underlying disorders [9].

This study, therefore, seeks to measure the haematocrit values of apparently healthy volunteer female students attending University of Jos who have a regular menstrual cycle, at different phases of the menstrual cycle; the pre-menstrual, menstrual and post-menstrual phase. This study aimed at assessing for anemia at the different phases of the menstrual cycle and show whether or not menstruation could be a predisposing factor to anemia in females.

Materials and Methods

Study area/Population

This study was carried out in the University of Jos, Plateau State, Nigeria. The study population comprises 51 healthy female adults in

their reproductive years (19-30) having a regular menstrual cycle in the Department of Medical Laboratory Science, University of Jos, Nigeria.

Sampling/Study consent

After obtaining written informed consent from the study participants, we documented detailed history of each participant including the age, the age of menarche, the length of menstrual cycle and duration of menstrual flow.

Ethical clearance

The ethical clearance for this study was obtained from the Ethical Committee of Jos University Teaching Hospital (JUTH) Jos, Nigeria.

Inclusion and exclusion criteria

Non-pregnant women in their reproductive years (19-30), having regular menstrual cycles were included in the study. The presence of anemia, endocrinal, gynecological, for instance, excessive menstrual bleeding and haemostatic disorder (presence of any bleeding diathesis) and evidence of infection at the time of sampling were criteria for exclusion.

Blood sample collection/Experimental design

Three capillary blood samples were taken in a single menstrual cycle; during the menstrual phase, oestrogenic phase and progesteronic phase. The subjects were asked to report within 48 hours after onset of menses when the first sample of capillary blood was taken through finger prick under aseptic condition into a heparinised capillary tube. The second sample was taken similarly on the 9th day of the menstrual cycle, i.e. during the oestrogenic phase. The 3rd sample was taken on the 23rd day of the menstrual cycle, i.e. during the progesteronic phase.

All the samples were taken between 11:00 am - 12:00 noon to avoid diurnal variation and for consistency. Also, the samples were analysed immediately after collection to avoid any variations due to storage.

Laboratory methodology

The haematocrit values of participants were determined using the microhaematocrit method as described: Heparinized capillary tubes were two-thirds filled with blood from the capillary puncture and sealed on the dry end of the capillary tube with plasticine. The sealed tubes were placed in the Hawksley microhematocrit centrifuge and spun at a speed of 12,000 rpm for 5 minutes. The haematocrit or packed cell volume reading was obtained by adjusting the interface between the sealed end and the packed red cells column to zero on the micro-haematocrit reader. Haematocrit values were represented in % [10].

Data analysis/Statistical methods

The data obtained from the study were analyzed using the student's paired T-test and presented in tables to compare values of PCV at the 3 phases of the menstrual cycle. Frequency tables of information gotten from the detailed history of the study participants are also presented to show the interaction between these factors and anemia through the menstrual cycle.

Results

The description of study population including age distribution, the Age of Menarche (A.O.M), duration of Shortest Cycle (S.C) and Longest Cycle (L.C) and also the Duration of Menstrual Flow (D.M.F) of the subjects in clustered column charts are shown in Figures 1 to 5.

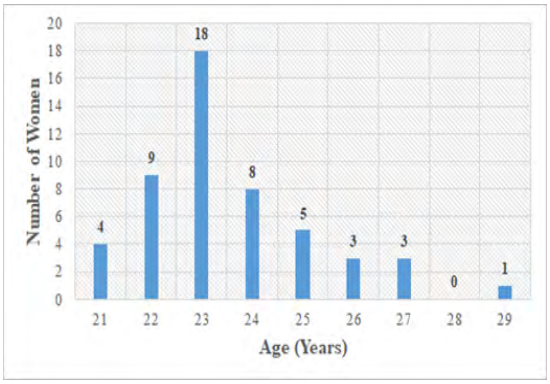

Figure 1: Distribution of study participants by age.

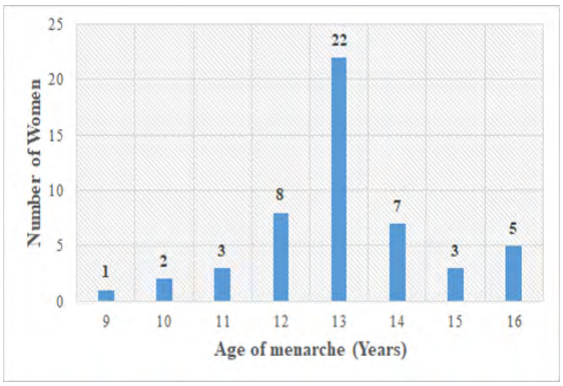

Figure 2: Distribution of study participants according to age of menarche (A.O.M) in years.

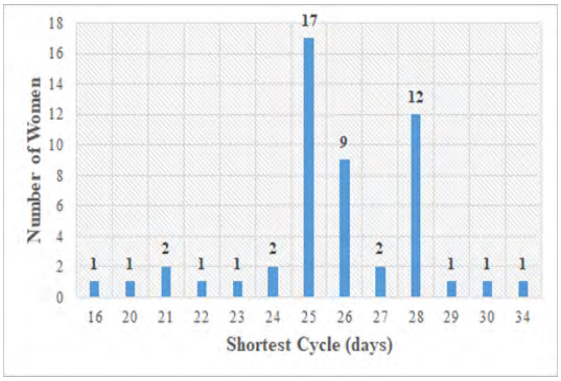

Figure 3: Outlook of study participants according to the shortest cycle (S.C) in days.

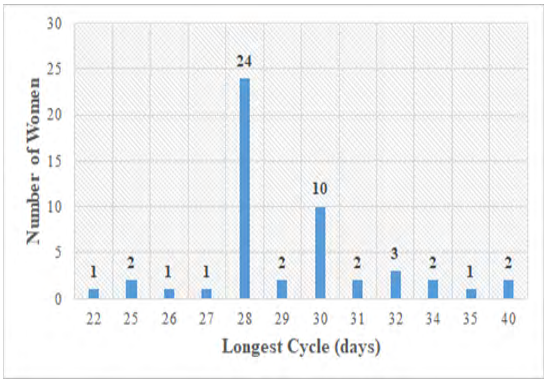

Figure 4: The spread of study participants according to longest cycle (L.C) in days.

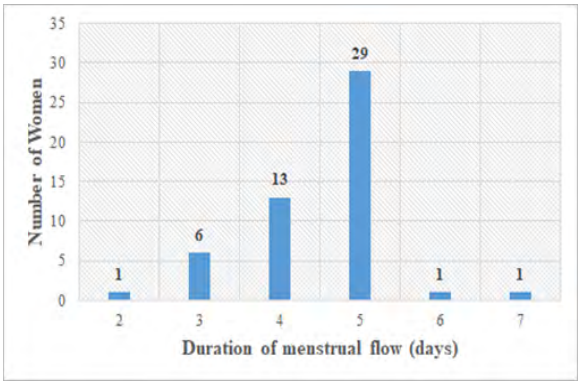

Figure 5: Distribution of study participants according to duration of menstrual flow (D.M.F) in days.

Table 1 shows the mean and standard deviation of haematocrit values of study subjects at the premenstrual (40.04 ± 1.89), menstrual (37.40 ± 3.25) and postmenstrual (39.70 ± 2.18) phases of the menstrual cycle. Significant rise in haematocrit values were recorded in the premenstrual and postmenstrual phases of menstrual cycle when compared to the menstrual phase (p = 0.0001). However, the difference seen between the premenstrual and postmenstrual PCV values was not significant (p = 0.4070).

The Phase of Menstrual cycle	Mean ± SD	T-test value	P-value
Pre-menstrual	40.04 ± 1.89	4.9677	0.0001
Menstrual	37.40 ± 3.25	4.3664	0.0001
Post-menstrual	39.7 ± 2.18	0.8327	0.407

Table 1: The Mean and standard deviation of haematocrit values of study subjects at different phases of menstrual cycle.

Discussion

It has been hypothesized that blood loss during menstruation may result in the depletion of iron load in women thereby increasing the risk for developing iron-deficiency anemia [6,11]. Therefore, this study was designed to assess for anemia in women within reproductive age at different phases of the menstrual cycle. After securing ethical clearance from the Ethics Committee of Jos University Teaching Hospital, we obtained informed consent from prospective study participants. We recruited 51 women between the ages of 19-30 and determined their haematocrit values in a single menstrual cycle. These subjects had regular menstrual cycles.

Most ladies who participated were 23 years of age. The length of the menstrual cycle of majority of the subjects ranged from 25-30 days. The duration of menstrual flow of majority of the study subjects ranged between 3-5 days with 5 days having the highest frequency of 29 occurrences.

From the menstrual history of each subject recorded, abnormal patterns were not seen in the menstrual bleeding phase. The age of menarche recorded had majority having menarcheal age of 12 years and above. Earlier studies by Kulkarni et al., reported that there is no association between status of menarche, menarcheal age and anemia [7]. These findings are supported in this study as subjects showed similar menstrual patterns irrespective of their age of menarche.

The menstrual, postmenstrual and premenstrual PCV values were also estimated for each subject. The mean pre-menstrual PCV (%) was found to be 40.04, menstrual 37.40 and post menstrual was 39.7. The T-test values of premenstrual and menstrual PCV was 4.9677 which gave a P value that was statistically significant (P = 0.0001). Likewise, the menstrual and post menstrual T-test value (4.3664) also gave a P value which was statistically significant (P = 0.0001). The postmenstrual and premenstrual T-test value (0.8327) however, did not give a statistically significant P value (0.4070). The significance in p values obtained reflects that menstrual bleeding indeed could be a predisposing factor to anemia in females supporting our earlier hypothesis.

This study focused on apparently healthy unmarried young ladies with no abnormal menstrual bleeding. Hence, any decrease in haematocrit value seen was due to the physiologic condition being experienced. We however, did not estimate the blood loss for each study participant and interaction of factors such as weight, body mass index, level of physical activity; stress and nutritional status were not studied. These findings are similar to findings by Malini K who reported a minimal rise in PCV in the proliferative (post menstrual) and secretory (pre-menstrual) phases when compared to the menstrual phase [12]. However, the rise in both phases in that study was not found to be statistically significant. Rajnee et al., also reported a non-significant difference in the hemoglobin concentration and haematocrit during the menstruation and follicular phase of the menstrual cycle [13]. Our findings however proved to be statistically significant. This might be as a result of the narrow age group we considered and also the health status of our study subjects.

In this study, the blood loss was not estimated. However, the loss was sufficient enough to cause a significant decrease in haematocrit which was shown to be statistically significant when compared to the pre-menstrual and post menstrual haematocrit values. This decrease however, cannot be interpreted in isolation without putting into consideration the mean PCV of the menstrual phase. The mean PCV was found to be 37.4%. This value when compared to the normal range of PCV for females 37-47% is not alarming despite the statistical significance of the decrease [14,15].

Further studies could be carried out in order to find out why women have symptoms of anemia such as dizziness during the menstrual bleeding phase since the PCV does not qualify them to be anemic. In order to reduce the discomfort caused by the physical changes experienced during menses, women should ensure they take on a healthy diet; reduce the consumption of salt, caffeine and alcohol and also ensure regular exercise [16].

The menstrual bleeding phase of the menstrual cycle can lead to a decrease in haematocrit value. This is due to the blood loss during this phase. However, menstruation does not lead to anemia among healthy regularly menstruating females.

References

1. Fatima S, Kamal RB, Bajpai M, Gupta P, Chawla K (2017) Variation of Haemoglobin level during Follicular and Luteal Phases of menstrual cycle. IJAR 3: 973-975.
2. Guyton AC (1991) Female physiology before pregnancy and the female hormones. Textbook of medical physiology, Saunders, USA, Pg No: 899-914.
3. Mtawali G, Pina M, Angle M, Murphy C (1997) The menstrual cycle and its relation to contraceptive methods: A reference for reproductive health trainers. INTRAH, USA, Pg No: 1-90.
4. Xiao S, Coppeta JR, Rogers HB, Isenberg BC, Zhu J, et al. (2017) A microfluidic culture model of the human reproductive tract and 28-day menstrual cycle. Nat Commun 8: 14584.
5. Kim I, Yetley EA, Calvo MS (1993) Variations in iron-status measures during the menstrual cycle. Am J Clin Nutr 58: 705-709.
6. Javaid A, Hasan R, Naim T (2007) A Comparative Study of Body Weight, Hemoglobin Concentration and Hematocrit During Follicular and Luteal Phases of Menstrual Cycle. J Med Sci 7: 146-149.
7. Kulkarni MV, Durge P, Kasturwar N (2012) Prevalence of anemia among adolescent girls in an urban slum. Natl J Community Med 3: 108-111.
8. Sa'adu B (2013) Effect of Water Restriction and Ascorbic Acid Supplimentation on Rectal Temperature, Body Weight and Hematological Indices in Japanese Quails in Sokoto, NIGERIA. UDUS-OER, Nigeria.
9. Fortney S, Beckett WS, Carpenter AJ, Davis J, Drew H, et al. (1988) Changes in plasma volume during bed rest: effects of menstrual cycle and estrogen administration. J Appl Physiol 65: 525-533.
10. Petersson K, Jakobssona O, Ohlssona P, Augustssona P, Scheding S, et al. (2018) Acoustofluidic hematocrit determination. Analytica chimica acta 1000: 199-204.
11. Silotry N, Kumari NH, Kumari R (2011) A comparision of haemoglobin levels in women with and without premenstrual syndrome during premenstrual, menstrual and postmenstrual stages. International Journal of Biological & Medical Research 2: 1017-1022.
12. Malini K (2006) Haematological Profile in Different Phases Of Menstrual Cycle. Rajiv Gandhi University of Health Sciences, India.
13. Rajnee, Chawla VK, Choudhary R, Binawara BK, Choudhary S (2010) Haematological and electrocardiographic variations during menstrual cycle. Pak J Physiol 6: 18-21.
14. Akinbami AA, Ajibola SO, Rabiu KA, Adewunmi AA, Dosunmu AO, et al. (2013) Hematological profile of normal pregnant women in Lagos, Nigeria. Int J Womens Health 5: 227-232.
15. Kueviakoe IM, Segbena AY, Jouault H, Vovor A, Imbert M (2011) Hematological reference values for healthy adults in Togo. ISRN hematology, Article ID: 736062.
16. Price WA, Giannini AJ (1983) Binge eating during menstruation. J Clin Psychiatry 44: 431.

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