



Evaluation of Some Haematological Parameters Among Post-menopausal Women in Bayelsa State, Nigeria: A Case Study of Patients Attending Federal Medical Centre, Yenagoa

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Abstract: This study evaluated some haematological parameters among post-menopausal women in Yenagoa, Bayelsa state, Nigeria. Sixty two post-menopausal women within the age of 52 –70 and forty adult females within the age of 18 – 32 participated in this study. About 5ml of blood was collected from each participant and analyzed using Westergren method for erythrocyte sedimentation rate (ESR) and automated haematology analyser (System XS-1000i) for packed cell volume (PCV), haemoglobin (Hb), total white cell count (WBC), platelet count (PLT) and differential viz: lymphocytes, neutrophil, monocytes, eosinophils and basophils. Results showed that the test (post-menopausal women) and control subject had 12.21±1.00 g/dl and 13.22±0.71 g/dl respectively (Hb), 36.60±3.00% and 39.70±2.22% respectively (PCV), 5.24±0.63×10⁹/L and 7.23±1.04×10⁹/L respectively (WBC), 174.63±27.46×10⁹/L and 260.20±45.54×10⁹/L respectively (PLT) and 43.02±6.77 mm/hour and 8.08±2.68 mm/hour respectively (ESR). Statistically, there was a significant (P<0.05) reduction in PLT, PCV, Hb and monocytes, and significant increase in ESR and neutrophil among the post-menopausal women when compared to the control. Other blood differential such as lymphocytes, eosinophils and basophils were not affected by menopause. This suggests that post-menopausal changes alter some haematological parameters, which may predispose the women to infections.

Keywords: Age, Estrogen, Haematological Indices, Post-Menopausal, Yenagoa Metropolis

1. Introduction

During pregnancy there is continuous repair of micro tears in the endothelium lining leading to expansion of the blood vessel especially at the uterus leading to laceration [1]. The change in the body system during pregnancy leads to adaptation in the metabolic processes of the body. The adjustments vary depending on the pre-pregnancy nutrition

of the women, genetic determinants, fetal size and maternal lifestyle [2]. Furthermore, the authors reported that several parameters generally decline due to haemodilution and increases when the need arises [2].

Menopause is a permanent cessation of menstruation (for over 1 year) due to loss of ovarian activity [3 – 7]. Menopause is caused by several factors. But the most common one is natural ageing while others are through hysterectomy, ovarian cancer patients, chemotherapy,

pituitary gland disorders and very poor health condition [5]. Ageing comes with the inability of the body to produce estradiol or inhibin, therefore, the follicle-stimulating hormone and luteinizing hormone can no longer be inhibited by estrogen's negative feedback mechanism [5, 8, 9]. Furthermore, with ageing leading to menopause, the cyclical production of estradiol and progesterone by the ovaries reduces and becomes inconsistent [5, 9]. These usually occur in the late 40s to early 50s of age but could also occur any time after 35 years of age [5, 8]. Menopause occurs predominantly within 48 – 55 years of age [6].

Ageing is related with immune system response defect and multiple infections [10 – 13]. As humans advance in age, the capacity to produce active immune response to foreign antigens and or to fight against infections decreases [13]. In women, the onset of menopause is characterized by decrease in estrogen levels which plays a vital role in regulating the immune response [13].

At menopause and post-menopause phase of women life, several social, reproductive, physical, cognitive and psychological health impacts occur [6, 7, 14] and are characterized by fluctuations and deficiencies in estrogen levels [8]. This could lead to reduction in the quality of life [6]. Some of the health changes associated with menopause and post-menopause state include increased risk of osteoporosis; a contributing factor of heart disease (due to a decline in estrogen), chronic irritation, vaginal dryness, and susceptibility to infection (due to atrophy, i.e. thin vaginal tissues), thinner and dryer skin (due to decline in estrogen level leading to decline in collagen and elastin) [5, 6]. Typically, osteoporosis is one of the common disorders associated with elderly population, and it's a major public health problem in the world [15]. Women with osteoporosis often have poor quality life characterized by, reduced height, pain complaints, limited motor activity and decreased mood [16].

Transition from one physiological being to another could alter the blood parameters. Other factors could lead to alteration in haematological parameters include habits such as smoking [17], disease condition such as acute malaria [18], health related condition such as pregnancy [1, 2], diabetics among others. For instance, pregnancy leads to changes in haematological, cardiovascular, renal, metabolic, respiratory and immunological parameters [1]. A study have been carried out on haematological profiles such as red blood cell count, packed cell volume, haemoglobin level and mean corpuscular volume in menopausal women in Zaria [3]. Therefore, this present study was focused on some haematological parameters among post-menopausal women in Yenagoa metropolis, Bayelsa state, Nigeria.

2. Materials and Methods

2.1. Study Area

Bayelsa state is one of the core Niger Delta states. The state lies within Latitude 40 151 North and Latitude 50 and 231 South and longitude 50 221 West and 60 451 East [1].

Bayelsa state shares boundary with Delta State in the North, Rivers State in the East and the Atlantic Ocean in the Western and Southernmost parts [1, 19]. The state lies in the sedimentary basin. Furthermore, fishing is a major occupation of the indigenous people of the region. Civil service and business are major source of livelihood of resident of the state capital-Yenagoa metropolis. The temperature and relative humidity of the area is $28 \pm 6^\circ\text{C}$ and 50 - 95% respectively.

2.2. Selection Criteria for Subjects

Inclusion Criteria: Subjects for this research were individuals attending the general outpatient department of the Federal Medical Centre Yenagoa. Only post-menopausal women within 50 – 65 age grade was recruited for the exercise. Evidence of cessation of menstruation for more than one year was confirmed by the Consultant through patient's medical history. Control subjects were 40 adult females within the reproductive age of 18 – 32 years.

Exclusion criteria: Pregnant women, lactating mothers, and individuals with known cases of HIV/AIDs, hepatitis, tuberculosis, diabetics and cardiovascular diseases.

2.3. Blood Collection

A standard venipuncture technique was used to collect 5ml of blood from each subject from the antecubital or dorsal vein and dispensed into a dipotassium EDTA anticoagulant vacutainer containing 1.5 mg/ml of anhydrous salt and mixed for haemoglobin counts, packed cell volume, platelets, total while blood cell count, differential counts and erythrocyte sedimentation rate.

2.4. Laboratory Analysis

White blood cells, haemoglobin, platelets, differentials count were estimated using sysmex XS1000i automated analyzer. Erythrocyte sedimentation rate was analyzed using westergren method.

2.4.1. White Blood Cells Count and Platelets Counts

The principle and procedure were based on the description previously applied in similar study [20].

Principle: White blood cells and platelets counts were counted by impedance method. This was based on the measurement of changes in electrical resistance produced by a particle suspended in a conductive diluent as it passed through an aperture of known dimensions.

Procedure: An electrode was submerged in the liquid on both sides of the aperture to create an electrical pathway. As the particles passed through the aperture, a transitory change in the resistance between the electrode was produced. This change produced a measureable electrical pulse. The number of pulse generated indicates the number of particles that passed through the aperture. The amplitude of each pulse was proportional to the volume of each particle. Each pulse was amplified and compared to the internal reference channels which only accepted the pulse of certain amplitudes. For

white blood cells and platelets, if the pulse generated is above the threshold then it's counted as white blood cells and platelets respectively.

2.4.2. Haemoglobin

The principle and procedure was based on the description previously applied in similar study [20].

Principles: Haemoglobin was determined by the colorimetric method. The white blood cells/haemoglobin dilution was placed in the white blood cell bath where it was bubble mixed with certain amount of lyse, which converts haemoglobin to a haemoglobin complex that was measured at 525nm.

Procedure: An LED was mounted on one side of the bath and emits a beam of light, which passes through the sample and a 525nm filter, and then is measured by a photo-sensor that is mounted on the opposite side. The signal is then amplified and the voltage is measured and compared to the blank reference reading. The haemoglobin was calculated as:

$$\text{Haemoglobin (g/dl)} = \text{constant} \times \text{Log}_{10} (\text{Blank photocurrent/sample photocurrent})$$

2.4.3. Differentials

The procedure was based on the description previously provided applied in similar study [20].

With the help of the diluent and lyse, the Sysmex XS-1000i sized the white blood cells into five sub-populations.

Procedure: After sample aspiration, a part of the whole blood sample was diluted to 1:50 with lysing reagent stromatolyser-4DL and then stromatolyser-4DS dye was added. After a predefined response time, the stained sample was introduced into the detector where forward light scatter and side fluorescent emission were measured. From this, five leukocyte populations were computed viz: neutrophil, lymphocyte, monocyte, eosinophil and basophil counts.

2.4.4. Erythrocytes Sedimentation Rate

The Erythrocytes sedimentation rate was estimated using westergren method previously applied in similar study [21] with slight modification [20]. The anticoagulated blood was diluted in a plastic tube with a piercable cap already containing 3.2 trisodium citrate (diluent) in the proportion of 4 volumes of blood to 1 volume of trisodium citrate (1ml of blood to 0.25ml of trisodium citrate). The blood was then properly mixed in the tube by several inversions. The dry and clean westergren graduated tube (dispette) was then used in piercing through the piercable cap of the tube containing the diluted blood from the one 190mm end of the graduated tube and by penetration the blood was drawn up to the 0mm mark and placed in a rack and was allowed to stand vertically away from direct sun light and disturbance for one hour at room temperature. The rate of fall of red cells out of plasma was then read in millimeter per hour (mm/hr).

2.5. Statistical Analysis

SPSS version 20 was used to carry out the statistical

analysis. Data were presented as mean \pm standard deviation. t-test was used to show significant difference at $P < 0.05$ among test subjects.

3. Results and Discussion

Table 1 presents some haematological parameters among post-menopausal women in Yenagoa, Bayelsa state. In the post-menopausal women (subjects) and control were 12.21 \pm 1.00 g/dl and 13.22 \pm 0.71 g/dl respectively (haemoglobin), 36.60 \pm 3.00% and 39.70 \pm 2.22% respectively (packed cell volume), 5.24 \pm 0.63 $\times 10^9$ /L and 7.23 \pm 1.04 $\times 10^9$ /L respectively (white blood cell), 174.63 \pm 27.46 $\times 10^9$ /L and 260.20 \pm 45.54 $\times 10^9$ /L respectively (platelets) and 43.02 \pm 6.77 mm/hour and 8.08 \pm 2.68 mm/hour (erythrocyte sedimentation rate). Basically, there was significant difference ($P < 0.001$) among the subjects and the control. Haemoglobin, platelets, packed cell volume and white blood cell showed a significant reduction in the post-menopausal women, while erythrocyte sedimentation rate showed a significant increase in the post-menopausal women. The variation could be due to changes in the body physiology with ageing. Furthermore, it could also be due to nutritional/dietary intake of some nutrients, environmental and or genetic makeup. Poor nutrition resulting in vitamin B12 and folic acid deficiency in old age could cause early haematological changes during ageing [22].

Typically, ageing also occurs in the immune system and it's known as immunosenescence and this could leads to changes in immune responses (both innate and adaptive) [13]. This could lead to enhanced infection susceptibility and reduced vaccination response [13]. Specifically, the variation in packed cell volume may suggest haemodilutary effect of estrogen with age. The significant decline in platelets counts among the post-menopausal women suggests that they are at risk of thrombopoietic effect which may have resulted from variation in estrogen level. Also, decrease in white blood count suggests reduction in estrogen level thereby reducing the ability to fight foreign antigen. This is an indication that post-menopausal women may be predisposed to infection compared to their pre-menopausal counterparts.

A change in body physiological conditions such as pregnancy could alter the haemoglobin, packed cell volume and erythrocyte sedimentation rate [1]. Habits could also change some haematological parameters of blood. For instance, marijuana smoking by male significantly affects erythrocyte sedimentation rate and apparently alters haemoglobin and packed cell volume [17]. Post-menopausal women usually have higher mean waist circumference, systolic blood pressure, pulse pressure, total cholesterol, LDL cholesterol, and triglyceride levels compared to their pre-menopausal counterparts [23]. Furthermore, changes in these parameters may also vary with age thereby leading to variation in haematological parameters.

Table 1. Effect of Some Haematological Parameters Among Post-menopausal Women in Yenagoa, Bayelsa State, Nigeria.

Parameters	Mean±standard error		t-value	P-value
	Before (n=62)	After (n=40)		
Hb, (g/dl)	12.21±1.00	13.22±0.71	-5.585	0.000
PCV,%	36.60±3.00	39.70±2.22	-5.620	0.000
WBC, ×10 ⁹ /L	5.24±0.63	7.23±1.04	-12.069	0.000
Platelets, ×10 ⁹ /L	174.63±27.46	260.20±45.54	-11.845	0.000
ESR, mm/hour	43.02±6.77	8.08±2.68	31.046	0.000
Neutrophil,%	66.94±7.00	64.95±2.92	1.699	0.092
Lymphocytes,%	27.65±6.27	29.78±3.61	-1.947	0.054
Monocytes,%	3.21±1.13	3.85±1.85	-2.172	0.032
Eosinophils,%	1.36±0.72	1.50±0.79	-1.557	0.123
Basophils,%	0.20±0.02	0.30±0.02	-1.245	0.241

NA= Not Applicable.

The findings of this study is close to the reported that non pregnant women within the age of 18 – 40 in Yenagoa metropolis, Nigeria had white blood cell, haemoglobin, platelets and packed cell volume of $5.4 \times 10^9/L$, $211 \times 10^9/L$, 12.5g/dl and 38.0% respectively, but contrary to erythrocytes sedimentation rate which was 9.00 mm/hour [1]. The results of white blood cell and platelets in this study had some similarity with another study that showed the effect of oral contraceptive pills on haematological indices [24]. Furthermore, haemoglobin, red blood cell count and packed cell volume of individual within the age grade of 20 – 89 do not significantly vary in male but significantly varies in females [22]. This could be due to the changes in body physiology among females probably due to mensuration, pregnancy and menopause conditions.

Furthermore, neutrophil, lymphocytes, monocytes, eosinophils and basophils in the subject and control were 66.94±7.00% and 64.95±2.92%, 27.65±6.27% and 29.78±3.61%, 3.21±1.13% and 3.85±1.85%, 1.36±0.72% and 1.50±0.79%, and 0.20±0.02% and 0.30±0.02% respectively. Typically, there is no significant difference ($P > 0.05$) among the subjects and control apart from the monocytes. Lymphocytes, basophils and eosinophils showed apparent reduction among the post-menopausal women compared to the control. In addition, monocytes showed a significant decline among post-menopausal women.

The findings of this study is close to previous work on neutrophil, lymphocytes, monocytes and eosinophils with a value of 66%, 31%, 2% and 1% respectively [1]. The authors further reported that changes in body physiology resulting from pregnancy do not show much variation in blood differential parameters (neutrophil, lymphocytes, monocytes, eosinophils), platelets and white blood cell counts. These tend to agree with the result of this present study. Also habit such as marijuana smoking by male significantly affects lymphocytes and neutrophil, and apparently alters other differential parameters (monocytes, eosinophils, basophils) [17]. The trend of blood differential, in this present study had some similarity with previous work on the effect of oral contraceptive pills on haematological indices [24]. The variation in the monocyte counts suggests the effect of mediation by estrogen receptors.

4. Conclusion

The study investigated some haematological parameters among post-menopausal women in Yenagoa, Bayelsa state, Nigeria. The study found that at menopause the blood indices such as packed cell volume, haemoglobin level, white blood cells, platelet count, lymphocytes, monocytes and eosinophils decreased while erythrocyte sedimentation rate and neutrophil were elevated, and basophils was unaffected. Therefore, the alteration in some haematological parameters due to menopause could predispose the women to infections.

Ethical Consideration

Permission was obtained from the ethics committees of the Medical Laboratory Science Department of Madonna University, Elele, Nigeria and Federal Medical Centre Yenagoa, Nigeria. Informed consent was obtained from the patients prior to sample collections.

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