Contraception Usage and Haematological Indices among Women of Reproductive Age in Benin City, Nigeria

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ABSTRACT

Evidence has shown that two hundred million pregnancies occur annually, of which 50% are unplanned while 25% unwanted. Contraception is a vital aspect of reproductive health and plays a key role in the prevention of unwanted pregnancy. To determine the type of contraceptive usage and some haematological indices of women on contraceptives. This study comprised 200 healthy female subjects [50 non-contraceptive users (group A), 50 non-hormonal contraceptive users (Group B), 50 progestin-only users (group C) and 50 combined contraceptives users (group D)]. A structured questionnaire was used to obtain the socio-demographic data of the participants. Four (4)mL of venous blood was collected from each participant into a pre-labeled di-potassium ethylene diamine tetra-acetic acid (K_2EDTA) container and the samples were analyzed for haematological indices using a three parts ERMA haematology autoanalyser PCE-210N. Data analysis was carried out using the statistical package for social sciences (SPSS) version 17.0 software. Majority of the participants were married (88%) with 12% unmarried. The Mean ± SD HGB (g/dL), HCT (%), MCV (fl), MCH (pg), and MPV (fl) in group B subjects were significantly higher compared to group A ($p<0.05$). There was a statistically significant decrease in the HGB, HCT, MCV, MCH and MPV values of Group A compared to Group C ($p<0.05$). The mean values of HGB, HCT and MCH among group D were statistically significantly higher compared to group A ($p<0.05$). The use of contraceptives has an effect on haematological indices with variations depending on the type of contraceptive.

Keywords: Contraception, haematological indices, Nigerian women

INTRODUCTION

Contraception can be defined as a family planning technique that involves the use of pills, sexual practices, surgical procedures or various devices to avoid pregnancy. In the developed world, global family planning programs have been in existence for decades and are designed to primarily supply couples with the family planning methods that best suit their needs. One essential factor in public health and welfare that preserves the overall reproductive health of women and permits them to choose the movement of a planned pregnancy is birth control. According to studies, two hundred million pregnancies are reported to occur annually, of which 50% are unplanned while 25% unwanted. Unsafe abortion which has become a swift response to manage these pregnancies arising from poor or no contraceptive use, especially in developing countries, has been identified to significantly contribute to maternal deaths globally.[1,2,3] It has been estimated that more than 3,000 women die yearly in Nigeria as a result of unsafe abortion, therefore the need for client-oriented contraceptive information-based services to influence fertility control is imperative.[4,5,6] In Nigeria, the high population growth rate in some regions has been a cause of concern for policy-makers and population experts.[7] The Multiple Indicator Cluster Survey conducted in 2011 revealed that the contraceptive incidence rate is 17.5% and the unmet need for contraception is 19.4%.[8] Also, the NPC, 2014 revealed that overall, only 10% of married women use a modern birth control method and an additional 5% use traditional methods while only about 40% of sexually active, unmarried women are using a modern birth control method most commonly the female condom.[9]

Haematological indices are important diagnostic indices in many human diseases. The packed cell volume and haemoglobin

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values are also used to quantify the red blood cells and haemoglobin respectively. A reduction in these values leads to anaemia and eventually death. White blood cells are the defence cells of the body.[10] Platelets play a major role in blood clotting and any malfunction or reduction in platelet count leads to prolonged bleeding and severe blood loss.[11] Some studies indicate that these contraceptives, particularly hormonal contraceptives can cause alterations in some trace elements and vitamins which influence haemopoiesis in humans.[12,13] Furthermore, other studies indicate that various haematological changes are associated with the use of hormonal contraceptives. The objective of this study was to determine haematological changes that might occur in users of different contraceptive methods among women of reproductive age attending Family Planning Clinics in Benin City.

MATERIALS AND METHODS

Study site

This is a comparative descriptive case-control study carried out among women attending family planning clinics of Faith Mediplex Hospital, Central Hospital and Planned Parenthood Federation of Nigeria (PPFN), located in Oredo Local Government Area, of Benin City, Edo State.

Sample Size

The minimum sample size (n) was calculated using sample size determination formula for health studies[14] and a 10.1% contraceptive prevalence for modern methods among Nigerians.[15]

$$n = \frac{Z^2\, p(1-p)}{d^2}$$

Where; n= required sample size
Z= Value of normal distribution at confidence level at 95% (standard value of 1.96)
p= Contraceptive prevalence for modern methods among Nigerians, 10.1%.
d=Margin of error at 5% (standard value of 0.05)
Substituting into the above formula; we have

$$n = \frac{1.96^2 \times 0.101 \times (1 - 0.101)}{0.05^2}$$
$$= 139.525$$
$$= 140$$

A total of two hundred samples were used for this study. One hundred and fifty (150) users of contraceptives and fifty (50) non-users of contraceptives were recruited for the purpose of this study.

Study Population

The study population consists of 200 healthy female subjects. They consist of one-hundred (100) female subjects on hormonal contraceptives [50 females on progestin-only contraceptives (group C) and 50 females on combined hormonal contraceptives (group D)], 50 female subjects on non-hormonal contraceptives (group B) and 50 female subjects were non-contraceptive users (controls, group A). The socio-demographic data were obtained using a semi-structured questionnaire.

Inclusion and Exclusion Criteria

Females of reproductive age between 18 years to 45 years on contraceptives without chronic illness were recruited for the study. Hospitalized patients, surgical patients and pregnant women or those with chronic illnesses were excluded from the study.

Ethical Consideration

Ethical approval was obtained from Research Ethics Committee on Human Subjects from Edo State Ministry of Health, Benin City (Ref. Number: HA.737/50 issued on 2nd March 2021). Informed consent for participation in the study was sought from each participant before inclusion in the study.

Data Analysis

The results generated from laboratory investigations were tabulated, encoded and statistically analysed with the Statistical Package for Social Sciences (SPSS) program. Students-t-test and Analysis of variance were used to compare continuous variables. A p-value of =0.05 was considered statistically significant.

Method

Following the administration of the questionnaire and giving of consent to participate in the study, four (4)mL of venous blood was collected via standard venipuncture technique from each participant into a pre-labelled container containing di-potassium ethylene diamine tetra-acetic acid (K2EDTA), and mixed thoroughly. The blood samples were analysed for haematological parameters immediately after collection using a three parts ERMA HAEMATOLOGY autoanalyser PCE-210N (Diamond Diagnostic; Holliston, USA).

Detection Principle of Autoanalyzer

The instrument counts and sizes the cells. It detects and measures changes in electrical resistance when a particle (such as a cell) passes through a gem aperture sensor. The sample is diluted in a conductive liquid. Each time a blood cell will pass through the aperture a resistant signal will be generated because blood cells are bad conductors. According to the Ohm formulary: U=RI (U =Voltage I =Current R =Resistance). If I is invariable, U is increased as cell volume increases. Treat by magnifying circuit, the voltage signal is amplified; background noise is removed, and receives the signal is to be analysed. WBC and RBC/PLT are analysed by two different circuits. The MPU analyses and calculates the cells, and then gives the histograms. The count of PLT adopts an advanced liquid, electron and soft system, which can settle the repetitive count of the cells. If RBC enters the analysis area, they will have similar pulses with PLT.

RESULTS

The results obtained in this study are shown in Tables 1-3. Table 1 shows the social demographic characteristics of the study subjects. A higher proportion of the participants on contraceptives were between the ages 29-39yrs (45%). Greater percentages (88%) were married, while 12% were not married. Furthermore, 31% and 90% of the study and control subjects were traders and students, respectively. In terms of educational status, the majority of the subjects (97% and 100% of the study and control subjects, respectively) had some level of educational qualification. From this table, it is also shown that there are statistically significant relationships between the use of contraceptives and age group ($p<0.001$), marital status ($p<0.001$), occupation ($p < 0.001$), and educational status ($p < 0.001$) of the subjects.

Table 2 shows contraceptive usage based on the ethnicity of the study subjects. Majority of the subjects on IUCD (36%) were Bini, followed by microgynon (24%), Implanon (19%), depo-provera (14%), jadelle (5%) and noristerat (2%). Furthermore, only 7% of the subjects from Bini were on medication; while others (93%) are those from other ethnic groups who were not on any medication.

Table 3 shows the comparison of Mean ± SD of haematological variables of four groups namely; groups A, B, C, and D, representing control, non-hormonal contraceptive, progestin-only, and combined hormonal contraceptive subjects, respectively. Comparing groups A and B; HGB (g/dL) (12.56±0.18), HCT (%) (37.64±0.51), MCV (fl) (92.14±1.01), MCH (pg) (30.58±0.47), and MPV (fl) (9.476±0.14) in group B were significantly higher compared with HGB (11.05±0.26), HCT (33.69±0.69), MCV (74.48±1.61), MCH (24.45±0.62) and MPV (8.71±0.22) values of group A ($p<0.05$). Comparing groups A and C; HGB (13.59±0.14), HCT (40.44±0.58), MCV (94.00±0.82), MCH (31.39±0.39), MPV (152.1±8.03) and platelet count (208.70±19.10) were significantly higher in group C ($p<0.05$) than group A. Conversely, HGB (12.23±0.27), HCT (37.6±1.02) and MCH (30.49±0.93) were statistically significantly higher in group D compared to group A ($p<0.05$). Comparing groups B and C; HGB (12.56±0.18) and HCT (37.64±0.51), were significantly lower in group B compared to group C ($p<0.05$). The monocyte (10.55±0.97), granulocyte (42.78±1.35), and MPV (9.48±0.14) values of group B were significantly higher compared to group D ($p<0.05$). Comparing groups C and D; granulocyte (47.93±1.38), HGB (13.59±0.14), HCT (40.44±0.59), MCV (94.00±0.82), platelet count (252.10±8.03), MPV (152.10±8.03), PDW (13.60±0.29), and PLCR (20.95±0.63) were higher in group C than group D ($p<0.05$) (Table 3).

Table 1: Social demographics of study subjects

Variables	On Contraceptive (%)	Non Contraceptive (%)	χ^2	p-value
Age Range				
18-28yrs	54(36%)	45(90%)	21.23	<0.001
29-39yrs	68(45%)	5(10%)		
40-45yrs	28(19%)	0(0%)		
Tribe				
Bini	84(56%)	15(30%)	20.52	0.001
Esan	24(16%)	0(0%)		
Etsako	8(5%)	0(0%)		
Others	34(23%)	35(70%)		
Marital Status				
Married	132(88%)	5(10%)	64.32	<0.001
Single	18(12%)	45(90%)		
Divorced	0(0%)	0(0%)		
Widow	0(0%)	0(0%)		
Occupation				
Civil servants	40(27%)	5(10%)	108.3	<0.001
Trader	46(31%)	0(0%)		
Student	6(4%)	45(90%)		
Farmer	2(1%)	0(0%)		
Unemployed	2(1%)	0(0%)		
Artisan	38(25%)	0(0%)		
Housewife	16(11%)	0(0%)		
Educational Status				
None	4(3%)	0(0%)	26.42	<0.001
Primary	8(5%)	0(0%)		
SSCE	86(57%)	2(4%)		
Tertiary	52(35%)	48(96%)		

Table 2: Contraceptive usage based on ethnicity of study subjects

Variables	Bini (%)	Esan (%)	Etsako (%)	Others (%)	χ^2	p-value
Types of Contraceptives						
IUCD	30(36%)	8(33%)	2(25%)	16(47%)	19.23	0.2034
Depo-provera	12(14%)	2(8%)	0(0%)	2(6%)		
Noristerat	2(2%)	0(0%)	0(0%)	0(0%)		
Jadelle	4(5%)	4(17%)	0(0%)	2(6%)		
Implanon	16(19%)	4(17%)	0(0%)	6(18%)		
Microgynon	20(24%)	6(25%)	6(75%)	8(24%)		
Route of Administration						
Tablet	20(24%)	6(25%)	6(75%)	8(24%)	16.84	0.0513
Injection	16(18%)	2(8%)	0(0%)	2(6%)		
Insertions	28(33%)	8(33%)	2(25%)	16(47%)		
Rings	0(0%)	0(0%)	0(0%)	0(0%)		
Implant	20(24%)	8(33%)	0(0%)	8(24%)		
Others	0(0%)	0(0%)	0(0%)	0(0%)		
Duration of Use						
0-5yrs	68(81%)	22(92%)	8(100%)	28(82%)	4.352	0.6292
6- 10yrs	14(17%)	2(8%)	0(0%)	6(18%)		
11-15yrs	0(0%)	0(0%)	0(0%)	0(0%)		
16-20yrs	2(2%)	0(0%)	0(0%)	0(0%)		
21-25yrs	0(0%)	0(0%)	0(0%)	0(0%)		
Others	0(0%)	0(0%)	0(0%)	0(0%)		
Medication						
Medication (Yes)	6(7%)	0(0%)	0(0%)	0(0%)	4.911	0.1785
Medication (No)	78(93%)	24(100%)	8(100%)	34(100%)		

Table 3: Mean comparison of haematological parameters among the studied groups

Parameters	Control subjects (A) (n=50)	Non-hormonal contraceptive subjects (B) (n=50)	Progestin-only subjects (C) (n=50)	Combined hormonal contraceptive subjects (D) (n=50)	F Value	P Value
TWBC ($X10^6$/uL)	4.57±0.34	3.99±0.17^{d}	4.32±0.21	5.02±0.37^{b}	2.799	0.041
Lymphocyte Count (%)	44.70±3.02	45.43±1.10	45.51±1.05	50.45±2.14	2.527	0.059
Monocyte (%)	9.54±0.85	10.55±0.97^{d}	7.99±0.64	7.52±0.67^{b}	3.298	0.021
Granulocyte (%)	45.76±2.49^{d}	42.78±1.35^{d}	47.93±1.38^{d}	28.21±3.01^{abc}	18.32	0.001
RBC ($X10^6$/uL)	4.54±0.09	4.11±0.07	4.34±0.06	4.15±0.19	1.797	0.149
Haemoglobin (g/dL)	11.05±0.26^{bcd}	12.56±0.18^{ac}	13.59±0.14^{abd}	12.23±0.27^{ac}	17.01	0.001
HCT (%)	33.69±0.69^{bcd}	37.64±0.51^{ac}	40.44±0.59^{abd}	37.60±1.02^{ac}	8.98	0.001
MCV (fl)	74.48±1.61^{bc}	92.14±1.01^{ad}	94.00±0.82^{ad}	74.29±1.75^{bc}	63.61	0.001
MCH (pg)	24.45±0.612^{bcd}	30.58±0.47^{a}	31.39±0.39^{a}	30.49±0.93^{a}	12.91	0.001
MCHC (g/dL) 3	2.76±0.17	33.33±0.25	33.40±0.26	34.29±1.09	0.7434	0.527
PLT Count ($X10^6$/uL)	208.70±19.10^{c}	168.60±9.43^{d}	252.10±8.03^{ad}	225.80±11.64^{bc}	10.61	0.001
MPV (fl)	8.71±0.22^{bc}	9.48±0.14^{ad}	152.10±8.03^{ad}	8.55±0.22^{bc}	13.28	0.001
PDW (%)	13.90±0.51^{d}	13.03±0.36	13.60±0.29^{d}	11.79±0.41^{ac}	5.845	0.008
PCT (%)	0.18±0.01	0.16±0.01^{d}	0.14±0.01^{d}	0.21±0.01^{bc}	7.266	0.001
P-LCR (%)	17.16±1.97	17.87±0.98	20.95±0.63^{d}	16.31±0.84^{c}	4.929	0.002

Key: p=0.05- Significant; p = 0.05- Not significant. a represents significance with control, b represents significance with non-hormonal contraceptive subjects, c represents significance with progestin-only subjects, and d represents significance with combined hormonal contraceptive subjects. TWBC, total white blood cell; RBC, red blood cell; HCT, haematocrit; MCV, mean corpuscular volume; MCH, mean corpuscular haemoglobin; MCHC, mean corpuscular haemoglobin concentration; PLT Count, platelet count; MPV, mean platelet volume; PDW, platelet distribution width; PCT, platelet crit; P-LCR, platelet-large cell ratio

DISCUSSION

Haematological indices are used routinely to identify and monitor certain physiological and pathological alterations in humans. This is so because most illnesses do influence haematopoietic physiology and immunological responses that might change their composition.[16] Haematological indices outside the reference ranges are used to indicate cancers, immunological diseases and cardiovascular diseases. Also, RDW and other red cell indices that measure the changes in the size of erythrocytes in circulating blood are usually used for the differential diagnosis of haematological disorders such as iron deficiency anaemia. In this study, the age range with the most predominant contraceptive users was similar to that obtained from a study carried out in Kaduna in 2018, which was 20-39(41.33%).[17] Furthermore, a study carried out by [18], reported that women within the age range of 25-34(64%), had higher levels of awareness and knowledge of contraception (Table 1).

A great proportion of the study subjects were married, with a low percentage being single, this could be attributed to the fact that this study involved women attending family planning clinics, of which majority are usually married. Meanwhile, younger and single ladies usually obtain contraceptives from patent medicine vendors, and this remains largely un-documented. [15] Also, it was reported that sociocultural and religious objections to any contraceptive methods among unmarried women may explain why such unmarried adolescents may not attend reproductive health clinics despite being sexually active. Furthermore, this aligns with a similar study carried out by Obi and Labiran, in which 83.9% of the study population were, married (Table 1).[18]

With regards to the difference in ethnicity, the intrauterine copper device (IUCD) was the most preferred method of contraception among subjects from Bini (Table 2). This may be because IUCDs are usually obtained from clinics and the majority of the studied subjects were women attending family planning clinics in Benin City according to the NDHS report in 2008, the majority of IUCDs are available in government hospitals. Also, one of the most reliable and widely used reversible modern contraceptive methods with the potential to

reduce the total number of unwanted pregnancies more than any other contraceptive method is the IUCD.[19,20]

Cellular components from peripheral blood have long been hinged on for assessment of health status. Either through direct quantitative measurement of leucocyte, thrombocyte and erythrocyte count or morphological analysis of these cellular components, they are useful in diagnosis.[21] The haematological result in this study indicates that the mean haemoglobin, haematocrit, MCV and MCH of non-hormonal contraceptive (NHC) subjects, was significantly higher compared to control subjects. This finding is however not consistent with the work of,[22] who reported a decrease in haemoglobin levels among IUCD users, which was attributed to the increased vaginal blood loss. The increase obtained in this study may be due to regular intake of iron supplements, a factor necessary for the formation of haemoglobin which is recommended as part of services provided in family planning clinics to non-hormonal contraceptive users, particularly those on intrauterine copper devices (IUCD), as it has been demonstrated that the use of IUCD could result in anaemia or aggravation of pre-existing anaemia. In this study, the mean platelet count value of NHC subjects showed a statistically significant decrease compared to the controls, while the MPV mean value showed a statistically significant increase when also compared to the controls. Non-hormonal contraceptives have not been shown to affect platelet count, except for the IUCD which does not have a direct effect on this blood cell but can cause low platelet count due to heavy bleeding, which is a side effect of IUCD usage. Disruption of the endometrial vasculature at menstrual shedding is the reason for initiation of menstrual blood loss and the spurting of blood from gaping exposed vessels has been observed at the hysteroscopic examination of the menstrual endometrium. The cessation of this bleeding requires platelet aggregation and clot formation [23], thus the reduction in platelet count. A high MPV often indicates that there are more young platelets in blood circulation.[24] Platelet activation is related to inflammation and thrombosis, and MPV is used to measure platelet size.[25] The MPV is an indicator of platelet activation and plays a role in coronary artery disease (CAD) pathophysiology and endothelial dysfunction (Table 3).[26,27]

Progestin-only contraceptive (POC) subjects showed a statistically significant increase in haemoglobin and haematocrit compared to the control subjects. This is in agreement with the study carried out by Okoye and Uwakue, who reported significant increases in haemoglobin and haematocrit values among the studied group.[28] A significant increase in MCV and MCH was also observed among POC subjects compared to control subjects. This increase may be due to decreased menstrual loss rather than erythroplasia since the red cell count was not significantly different among both groups. This might also be a reflection of the several cyclical variations that occur in the cellular and fluid portion of blood, and whole-blood viscosity throughout the menstrual cycle of contraceptive naïve users, which may not occur in contraceptive users.[17] The finding is also similar to the work of Afsar *et al*. and Sajida *et al*.[29,30] The platelet count of POC subjects was statistically significantly higher than the controls, this finding is similar to the work of Okoye and Uwakue, who reported a significant increase in platelet count in their findings.[28] The percentage granulocyte count shows a significant decrease in combined hormonal contraceptives (CHC) subjects compared to the controls. This might be an indication of an infection, which could be bacterial. Furthermore, percentage granulocyte count is linked to duration of contraceptive use as demonstrated by Egbunah *et al*. and Okoroiwu *et al*.[17,31] Among CHC subjects, there was a significant increase in haemoglobin, haematocrit, and MCH levels compared to the control subjects. This is similar to the findings of Jamil *et al*. who reported that the reason for this increase might be due to decreased menstrual loss in CHC users.[22] Abubakar, in his study

suggested that ferrous tablets included in combined hormonal contraceptive pills, decreased menstrual loss/amenorrhea and absence of childbirth may have contributed either individually or collectively (Table 3). [32]

In comparing haematological data between NHC subjects and POC users, the most striking features were the statistically significant increase in the haemoglobin and haematocrit values among POC users. This is in agreement with the study carried out by[22], who associated the reason for this decrease in haemoglobin levels among IUCD users to the increased vaginal blood loss/amenorrhea often experienced by users. Among NHC and CHC subjects, a statistically significant difference is seen in the TWBC, however when compared to the control subjects, the TWBC values were not significantly different. This is in line with the findings of [33] but at variance with the findings of, [34] who reported lower TWBC count among combined hormonal contraceptive users and further suggested that prolonged use of combined hormonal contraceptives may lower the immunity of the users. Furthermore, the platelet count was higher for CHC subjects. This is in line with the study carried out by,[22] who suggested that this increase may be a result of hyper-coagulation and inflammation (Table 3).

CONCLUSION

This study indicates there are statistically significant relationships between the use of contraceptives with age group, tribe, marital status, occupation, and educational status of the subjects. The result of this study also suggests that the use of hormonal contraceptives whether POC or COC is associated with good haemoglobin profiles because of the low blood loss episodes. This proves that the use of contraceptives affects haematological indices, with variations depending on the type of contraceptive.

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