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Haematological Profiles of Women on Some Contraceptives in Selected Family Planning Clinics in Kaduna State, Nigeria

Authors
Egbunah, M. O[*1]., Eze, E. M[1]., Ebirien-Agana, B.S[1]., Jeremiah, Z. A[2]
[1]Department of Medical Laboratory Science, Rivers State University, Nkpolu-Oroworukwu Port Harcourt,
[2]Department of Medical Laboratory Science, Faculty of Basic Medical Sciences, College of Health Sciences, Niger Delta University, Bayelsa State, Nigeria
Corresponding Author
Egbunah, M. O
Email: *mariaogonna@yahoo.com*, Phone: +234-802-818-9000

Abstract
This study assessed the haematological profile of women of reproductive age on progestogen-only injectable and implant hormonal contraceptives in a selected family planning clinics in Kaduna State. A total of 250 women comprising 150 contraceptive users and100 non-users attending the family planning clinic of Yusuf Dantsoho Memorial Hospital and Primary Health Centre, in Kaduna State of Nigeria participated in this study. Two milliliter of venous blood was collected from each participant using standard venipuncture technique. The samples were analyzed for full blood count using auto analyzer. All standard operating procedures were adhered to. The data obtained was analyzed using R 3.03 software. The Mean±SD lymphocytes ($x10^9$/l), lymphocyte (%), granulocyte (%) (2.64±0.79$x10^9$/L, 41.41±6.70%, 44.09± 6.57% in these order) for contraceptives users were significantly lower than the control group (2.95± 0.77 $x10^9$/L, 48.14 ± 6.38%, 44.83±9.14% in these order) ($P<0.05$). The contraceptive users had a greater mean values for MCV and MCH (81.89±6.36fl, 25.40 ± 0.15pg respectively) compared to non-users (79.13±5.70 fl; 24.71± 0.26pg respectively) ($p<0.05$). Contraceptive users were divided into implant and injectable groups. The implant users showed decreased TWBC:5.66±0.82$x10^9$/L, lymphocytes:2.28±0.37$x10^9$/L, granulocytes:2.36±0.39$x10^9$/L, MCV: 78.44±4.82fl, MCH: 24.23±1.13pg and increased RBC: 5.16 ± 0.66 x 10^{12}/l compared to 6.81±1.90 $x10^9$/L, 2.97±0.86 $x10^9$/L, 3.08±1.07 $x10^9$/L, 83.30±6.37fl, 25.88±1.92pg and 4.88 ± 0.56 $X10^{12}$/L in these orderfor the injectable users ($p<0.05$).The use of implants may dampen the immunity of the users and lead to microytic hypochromic anaemia. Baseline evaluation of anaemia in women prior to commencement of hormonal contraceptives is recommended.

Keywords: *Haematological profile, contraceptives, women, family, Kaduna, Nigeria.*

Introduction

"Hormonal contraceptives are synthetic biochemical substances used to prevent unintended pregnancy[1]. Hormonal contraceptives have been available for more than 50years and currently millions of women worldwide use hormonal contraceptives. In the Western Europe and the United states, approximately 80% of women of reproductive ages relied upon hormonal contraceptive methods to prevent unintended

pregnancy"[2]. In the region of Africa to the south of the Sahara, women of child bearing age who use contraceptives, have escalated to about six times over in 2006, compared to what it was in 1991". "Nigeria Demographic and Health Survey revealed that the frequency of hormonal contraception in Nigerian women of reproductive age, have stagnated, remaining about 9% between 2008 and 2013"[3-4]. The first available hormonal contraceptive was developed into oral contraceptive pills containing estrogen and progestogen as the active ingredients, and was approved in 1960 by the Federal Drug Administration". Today other available non-oral routes of administration of hormonal contraceptives which contain only progestogen have been developed: a patch, a vaginal ring, subcutaneous implants and injectables".

"Progestin-only contraceptive injectables and implants are highly effective, longer-acting contraceptive methods that can be used by most women in most circumstances". "Globally, 6% of women using modern contraceptives use injectables and 1% use implants"[5]. "Injectables are the predominant contraceptive method used in Sub- Saharan Africa, and account for 43% of modern contraceptive methods used". A study of the comparison of contraceptive methods chosen by women at a family planning clinic in Northern Nigeria, revealed that injectable contraceptives is the preferred method of choice by both breastfeeding and non-breastfeeding mothers in Kaduna State"[6].

"The three progestin-only injectables available are depomedroxyprogesterone acetate (DMPA), the principal long-acting progestogen-only injectable contraceptive available in the United States, contain 150 mg/ml and provided intramuscularly (DMPA-IM) , Sayana press which is a lower-dose, subcutaneous formulation of the depot-medroxyprogesterone acetate (depo-subQ provera" 104™, 104mg/0.65 ml) and Norethisterone enanthate (NET-EN) 200 mg/ml, provided intramuscularly.

"Moreover, the contraceptive subcutaneous implants have been found worldwide, to be safe and effective long term method of contraception". It consists of a heterogenous group of contraceptives which contain different progestogen preparations and dosages with different intended durations of use"[7-9]. "The first available implant was Norplant, followed by Jadelle which is two-rod method; contain 150 mg of levonorgestrel (LNG), 75 mg in each rod and intended for five years of use"."Another type of implant is Implanon which contains 68 mg of etonogestrel (ENG) and is licensed for 3 years"' use[10]. "Subsequent Implanon has the advantage of being radiopaque and easy to remove". "Progestin-only contraceptive injectables and implants are suitable for women who want a reliable, reversible form of contraception, and have numerous advantages such as; better compliance than oral contraceptives which requires daily vigilance and is independent of the time of intercourse[11]. Depomedroxyprogesterone may not pose the risk associated with third-generation progestins". "These contraceptives are often used when combined oral contraceptives are contraindicated[12].

These methods of contraception prevent pregnancy through ovulation suppression and by increasing the thickness of cervical mucus, which presents a barrier for sperm penetration". "In addition, they change the quality of the endometrium, making it an unfavorable environment for fertilization and implantation".

"Safe use of these hormonal preparations still remained quite controversial"[13].[14]"itemized the advantages to include the good contraceptive effect, reduced risk of endometrial and ovarian cancers, less anaemia and dysmenorrhea, minimal effect on blood pressure, negligible blood glucose changes, nonteratogenic property, and no appreciable interaction with medications". "However, these contraceptives have quite a number of side effects which include irregular menses, amenorrhea, weight gain, wild headache and abdominal pain or discomfort"[15]. The most

drastic but rare side effect has been predisposition to increased risk of thromboembolic phenomena" [12].

moreover, physiological variations have been observed in several parameters (including blood count) in the human body as part of the normal circadian rhythm, which could be seasonal or diurna"l[16].[17]"reported that oestrogen administration significantly increased the division and proliferation of haematopoetic stem cell (HSCs) and thus explains the higher blood counts in women during the reproductive years"."It has been observed in our family planning clinic that women taking hormonal contraceptives face the problem of irregular vaginal bleeding, amenorrhea and sometimes excessive bleeding which could lead to anaemia and alterations in the haematological variables."Despite the wide spread use of these drugs and the several studies being carried out all over the world today, there are limited studies on the effect of non-oral progestin contraceptives on the haematological indices in Northern Nigerian women" "hence this study.

Materials and Methods

Study Design

This is a comparative cross-sectional study carried out among women attending family planning clinic of Yusuf Danstoho Memorial Hospital, Kaduna and Primary Health Center, Kaduna South, in Kaduna State who were on either progestogen-only injectables (DMPA or Noristerat or Sayana press) or subcutaneous implant (Implanon or Jadelle). The blood pressure and weight of these subjects were determined by the Nurses working in the family planning Clinic. Informations on age, duration of use, menstrual flow, parity, history of disease and reaction to the contraceptives were obtained from the patients using a structured questionnaire.

Study Area

The study was conducted in family planning clinic (FPC) of Yusuf Dantsoho Memorial Hospital, Kaduna and in Primary Health Center, Kaduna South, in Kaduna State of Nigeria."Kaduna state is located between latitude 90N and 120N of the equator and longitude 60E and 90E of the prime meridian". "The state shares boundaries with Abuja and Niger at the South-West, Katsina, and Zamfara at the North-West, Kano and Bauchi at the North-East, Plateau and Nasarawa at the South-East".

Study Population

"The total study population consists of two hundred and fifty (250) apparently healthy, non-pregnant, non- smoking women, aged between 18 and 50years. One hundred and fifty (150) women on either injectable or implant progestogen-only contraceptives served as the study subjects while one "hundred (100) healthy non-pregnant women of the same age bracket who never used hormonal contraceptive or any family planning method, constituted the control participants".

Inclusion Criteria

"The entire contraceptive users were subjects who were aged between 18 and 50years, sexually active, normotensive females using long acting contraceptives for a period of at least 2months and above, Women who were willing to participate in the study, non-pregnant and not smoking, women on progestogen-only implant and injectable contraceptives, without underlying disease condition".

Exclusion Criteria

Exclusion criteria included; age (<18years or >50years), COC use or combined injectable contraceptives, "non-hormonal contraceptive use and contraceptive use of < 2months, hypertensive, presence of underlying disease condition and failure to give informed consent to participate in the study".

Ethical Consideration

"The study was approved by the Research Ethical Committee of the Kaduna State ministry of Health and Primary Healthcare Centre, Kaduna". "In addition, each of the participants in this study gave informed consent to participate".

Sample Collection

Two milliliters (2mls) of whole blood was collected by standard venipuncture technique as

described by Dacie & Lewis (2006) from each participant into dipotassium ethylene diamine tetra-acetic acid (K_2EDTA) bottle to the final concentration of" 1.5mg/ml and mixed properly to avoid clotting

Sample Analysis

The reagents were commercially acquired and manufacturer's standard operating procedures were strictly followed. "The whole blood samples in the EDTA containers were analyzed immediately after collection in Yusuf Dantsoho Hospital using a three parts automated haematology analyzer Humacount plus (Human Germany). Calibration and standardization of the equipment, processing and analysis of the samples were done strictly according to the manufacturer's instructions.

Procedure

The whole blood was properly mixed and inserted into the probe. Twenty microlitre of the blood was aspirated as the button was pressed. The analysis was immediately done and the results displayed on the screen after about 1-2minutes, which was printed by the printer.

Data Analysis

All generated data were analyzed using R 3.03 (2016) software. Comparison between two factors was analyzed using T-test while comparisons among three or more factors were analyzed using Analysis of Variance. The Tukey procedure for mean comparison was used to rank the means after a significant effect was observed. Phenotypic correlations between variables were computed using Spearman correlation. Significance was established at $p < 0.05$.

Results

Table 1 showed the demographic characteristics of the contraceptive users. Out of the 150 contraceptive users, 51(34%) were< 20years while 62(41.33%) were between 20-39years and 37(24.7%) were 40years and above. 39(26%) were Christians while 111(74%) were Muslims. However, their educational status were as follows: primary school: 19(12.66%), secondary education: 86(57.33%), Tertiary education: 35 (23.33%) and no formal education: 10(33.33%).None smoked. The menstrual flow showed that 25(16.7%) had amenorrhea, 12(8%) had normal flow, 58(38.7%) had irregular menses, 2(1.33%) had uncontrolled bleeding and 53(35.3%) had spotting.

Table 1: Demographic Characteristics of Contraceptive Users

Characteristics	**N**	**%**
	AGE	
<20	51	34
20-39	62	41.33
40 and above	37	24.7
Total	**150**	**100**
	Religion	
Christians	39	26
Muslims	111	74
Total	**150**	**100**
	Educational Status	
Primary	19	12.66
Secondary	86	57.33
Tertiary	35	23.33
None	10	6.66
Total	**150**	**100**
	Smoking	
Yes	Nil	
No	150	100
Total	**150**	**100**
Menstrual Flow		
No menses	25	**16.7**
Normal	12	**8**
Irregular	58	**38.7**
Uncontrolled bleeding	2	**1.33**
Spotting	53	**35.3**
Total	**150**	**100**

Table 2 showed the comparison of Mean±SD of Haematological Variables of Women on both injectable and implant contraceptives and non-contraceptive users. There was no significant difference between the mean values of total WBC, haemoglobin concentration, red cell count, hematocrit, mean cell hemoglobin concentration and platelet count of contraceptive and non-contraceptive users (P>0.05). The mean values of absolute lymphocyte count ($2.64 \pm 0.79 \times 10^9$/L), percentage lymphocyte count (41.41± 6.70%) and percentage granulocyte count (44.09 ± 6.57%)

among the contraceptive users were significantly lower than the mean values of absolute lymphocyte count (2.95± 0.77 x 10^9/L), percentage lymphocyte count (48.14 ± 6.38%) and percentage granulocyte count (44.83 ± 9.14%) among the non-contraceptive users (p<0.05) in these order. The contraceptive users had a greater mean values for MCV (81.89±6.36fl) and MCH (25.40 ± 0.15 pg) than the non-contraceptive users (MCV: 79.13±5.70 fl; MCH: 24.71± 0.26pg) (p<0.05) respectively.

Table 2: Comparison of Mean±SD of Haematological Variables of Women on both injectables and implant Contraceptives and Control Subjects

		Group	
Parameters	**Contraceptive users (n=150)**	**Non-contraceptive users (n=100)**	P-value
TWBC (X10^9/L)	6.48±1.74	6.01±1.59	0.1234
LYMPH (X10^9/L)	2.64±0.79[b]	2.95±0.77[a]	0.0260*
GRAN (X10^9/L)	2.87±0.98[a]	2.53±0.96[b]	0.0496*
LYMPH (%)	41.41±6.70[b]	48.14±6.38[a]	0.0001*
GRAN (%)	44.83±9.14[a]	44.09±6.57[b]	0.0113*
HGB (g/dl)	12.58±1.48	12.34±1.57	0.3606
RBC (X10^{12}/L)	4.96±0.60	4.98±0.63	0.8192
HCT (%)	40.40±0.44	39.39±0.77	0.2564
MCV (fL)	81.89±6.36[b]	79.13±5.70[a]	0.0121*
MCH (pg)	25.40±0.15[b]	24.71±0.26[a]	0.0230*
MCHC (g/dl)	31.12±1.42	31.39±1.57	0.3000
PLT (X10^9/L)	217.7±53.88	215.23±55.39	0.7945

Means with different superscript differ significantly, *P<0.05; SD-Standard deviation, Lymph (X10^9/L) =Absolute Lymphocyte Count; Gran (X10^9/L)=Absolute Granulocyte Count; Lymph (%)=Percentage Lymphocyte Count; Gran (%)=Percentage Granulocyte; HGB=Haemoglobin; RBC=Red Blood Cell Count; HCT=Haematocrit; MCV=Mean Cell Volume; MCH=Mean Cell Haemoglobin; MCHC=Mean Cell Haemoglobin Concentration; PLT=Platelet Count.

Table 3 showed the comparison of Mean±SD of Haematological Variables of Women on implants and injectables. A comparison of complete blood picture revealed that the women on progestin-only implant contraceptives had decreased mean (Twbc: 5.66±0.82 x10^9/L, absolute lymphocytes: 2.28±0.37 x10^9/L, granulocytes:2.36±0.39 x10^9/L, MCV: 78.44±4.92fl and MCH: 24.23±1.13pg) which is statistically significantly different from those on injectables Twbc (6.81±1.90 x 10^9/L), absolute indices (lymphocytes:2.79±0.86 x 10^9/L, granulocytes: 3.08±1.07 x 10^9/L), MCV (83.30±6.37fl) and MCH (25.88 ± 1.92pg) (P<0.05) in these order. The mean value of RBC of women on implants (5.16 ± 0.66 x 10^{12}/l) is statistically significantly higher than those on injectable contraceptives (4.88 ± 0.56 X10^{12}/L) (p<0.05). There was no significant difference in the mean value of percentage lymphocyte count, percentage granulocyte count, haemoglobin, haematocrit, MCHC and platelet count of the two groups (p>0.05).

Table 3: Comparison of Mean±SD of Haematological Parameters of Women on Implants and Injectable Contraceptives.

	Group		
Parameters	**Implant (n=63)**	**Injectables (n=87)**	**P-value**
TWBC (X10^9/L)	5.66±0.82[b]	6.81±1.90[a]	0.0004*
LYMPH (X10^9/L)	2.28±0.37[b]	2.79±0.86[a]	0.0005*
GRAN (X10^9/L)	2.36±0.39[b]	3.08±1.07[a]	0.0001*
LYMPH (%)	41.15±6.05	41.52±6.98	0.7750
GRAN (%)	42.95±6.90	44.56±6.41	0.1994
HGB (g/dl)	12.51±1.43	12.61±1.51	0.7160

RBC ($X10^{12}$/L)	5.16±0.66[a]	4.88±0.56[b]	0.0112*
HCT (%)	40.34±4.62	40.42±4.88	0.9345
MCV (fL)	78.44±4.92[a]	83.30±6.37[b]	0.0001*
MCH (pg)	24.23±1.13[a]	25.88±1.92[b]	0.0001*
MCHC (g/dl)	31.00±1.46	31.18±1.41	0.5182
PLT ($X10^9$/L)	219.37±67.58	217.03±47.53	0.8204

Means with different superscript differ significantly, *P<0.05.Lymph ($X10^9$/L)=Absolute Lymphocyte Count; Gran ($X10^9$/L)=Absolute Granulocyte Count; Lymph (%)=Percentage Lymphocyte Count; Gran (%)=Percentage Granulocyte; HGB=Haemoglobin; RBC=Red Blood Cell Count; HCT=Haematocrit; MCV=Mean Cell Volume; MCH=Mean Cell Haemoglobin; MCHC=Mean Cell Haemoglobin Concentration; PLT=Platelet Count.

Table 4 showed the comparison of Mean±SD of haematological parameters based on route of contraceptive administration. The complete blood picture showed a significant decrease in the mean values of Twbc:(6.03±1.33 x 10^9/L), percentage lymphocyte count:(39.98±6.51%), absolute lymphocyte count:(2.31±0.11 x 10^9/L), absolute granulocyte count:(2.61±0.77 x 10^9/L), MCV: (78.84±5.01fl) and MCH:(24.33±1.14pg)among women who had subcutaneous administration of contraceptive compared to those who had intramuscular administration of contraceptive Twbc (6.70±0.18 x 10^9/L), percentage lymphocyte count (42.14 ± 6.71%), absolute lymphocyte count (2.81±0.08 x 10^9/L), absolute granulocyte count (3.00±1.05 x10/L), MCV (83.42±6.44fl) and MCH (25.93±1.96pg) - ($P < 0.05$) in these order. There was significant decrease in the mean value of RBC among women on intramuscular route of contraceptive administration compared to those subcutaneously administered contraceptive ($P < 0.05$). There was no significant difference in the mean values of HGB, HCT, MCHC and platelet count between the intramuscular and subcutaneous routes of administration ($p>0.05$).

Table 4: Comparison of Mean±SD of Haematological Parameters Based on Route of Contraceptive Administration

	Route of administration		
Parameters	**Intramuscular (n=72)**	**Subcutaneous (n=78)**	**P-value**
TWBC ($X10^9$/L)	6.70±0.18	6.03±1.33	0.0346*
LYMPH ($X10^9$/L)	2.81±0.08	2.31±0.11	0.0005*
GRAN ($X10^9$/L)	3.00±1.05	2.61±0.77	0.0273*
LYMPH (%)	42.14±6.71	39.98±6.51	0.0395*
GRAN (%)	41.77±4.73	44.65±6.85	0.0450*
HGB (g/dl)	12.63±1.54	12.49±1.36	0.6202
RBC ($X10^{12}$/L)	4.88±0.56	5.13±0.62	0.0209*
HCT (%)	40.47±5.02	40.25±4.26	0.8002
MCV (fL)	83.42±6.44	78.84±5.01	0.0001*
MCH (pg)	25.93±1.96	24.33±1.14	0.0001*
MCHC (g/dl)	31.20±1.44	30.98±1.39	0.4123
PLT ($X10^9$/L)	217.62±48.94	217.90±63.11	0.9774

Means with different superscript differ significantly, *P<0.05. Lymph ($X10^9$/L)=Absolute Lymphocyte Count; Gran ($X10^9$/L)=Absolute Granulocyte Count; Lymph (%)=Percentage Lymphocyte Count; Gran (%)=Percentage Granulocyte; HGB=Haemoglobin; RBC=Red Blood Cell Count; HCT=Haematocrit; MCV=Mean Cell Volume; MCH=Mean Cell Haemoglobin; MCHC=Mean Cell Haemoglobin Concentration; PLT=Platelet Count.

Figure1a showed the scatter plot matrix of correlation of duration of contraceptive use with haematological parameters of subjects on implants. Duration of contraceptive use had strong and negative correlation with TWBC (r=-0.7254), moderate positive association with absolute granulocyte count (r=0.6817), mild, positive association with percentage lymphocyte count (r=0.4504) and RBC (r=0.4525) ($p<0.05$).

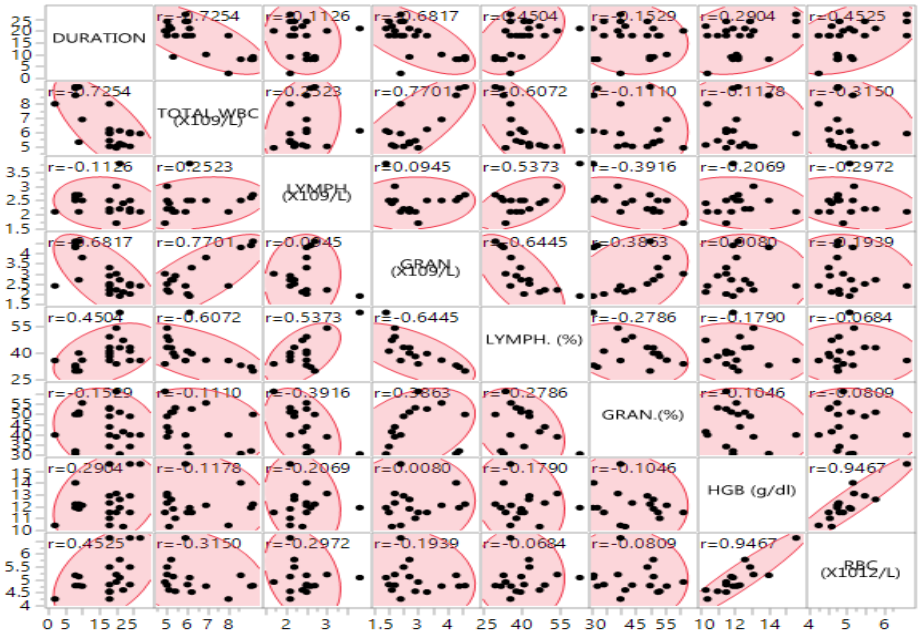

Figure 1a: The Scatter plot Matrix of Correlation of Duration of Contraceptive Use with Haematological Parameters of Subjects on Implants

Figure 1b showed the scatter plot matrix of correlation of duration of contraceptive use with other haematological parameters of subjects on implants. Duration of contraceptive use has negative and moderate correlation with MCV (r=-0.4487) and MCH (r=-0.5678) (p<0.05)

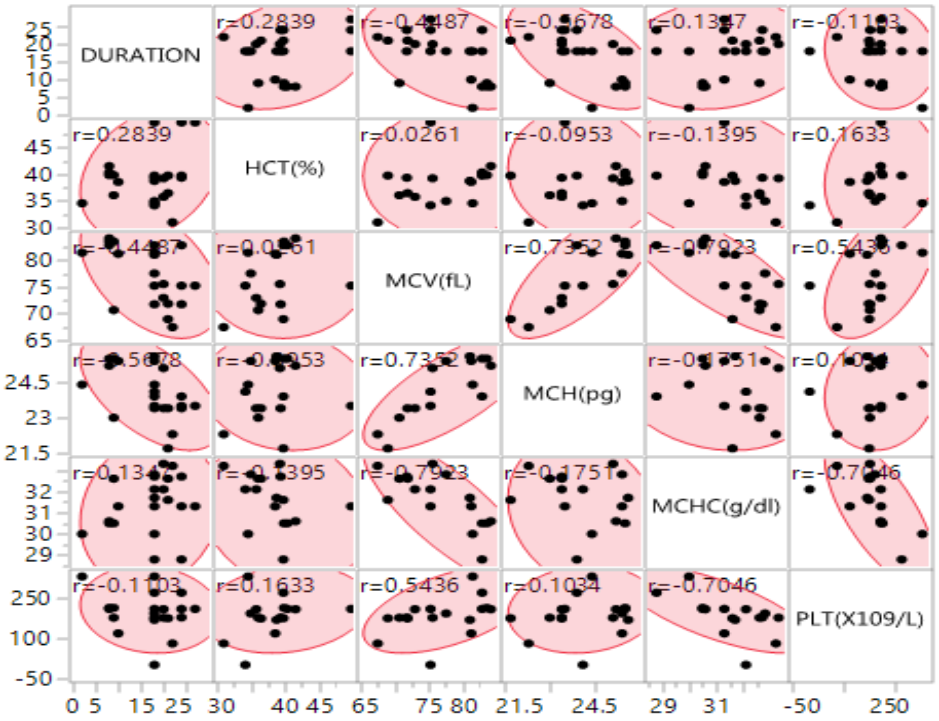

Figure 1b: The Scatter plot Matrix of Correlation of Duration of Contraceptive Use with Other Haematological Parameters of Subjects on Implants.

Figure 2a showed the scatter plot matrix of correlation of duration of contraceptive use with haematological parameters of subjects on injectables. Duration of contraceptive use has no significant association with TWBC, absolute lymphocyte count, absolute granulocyte count, percentage lymphocyte and granulocyte count, HGB, and RBC (P>0.05).

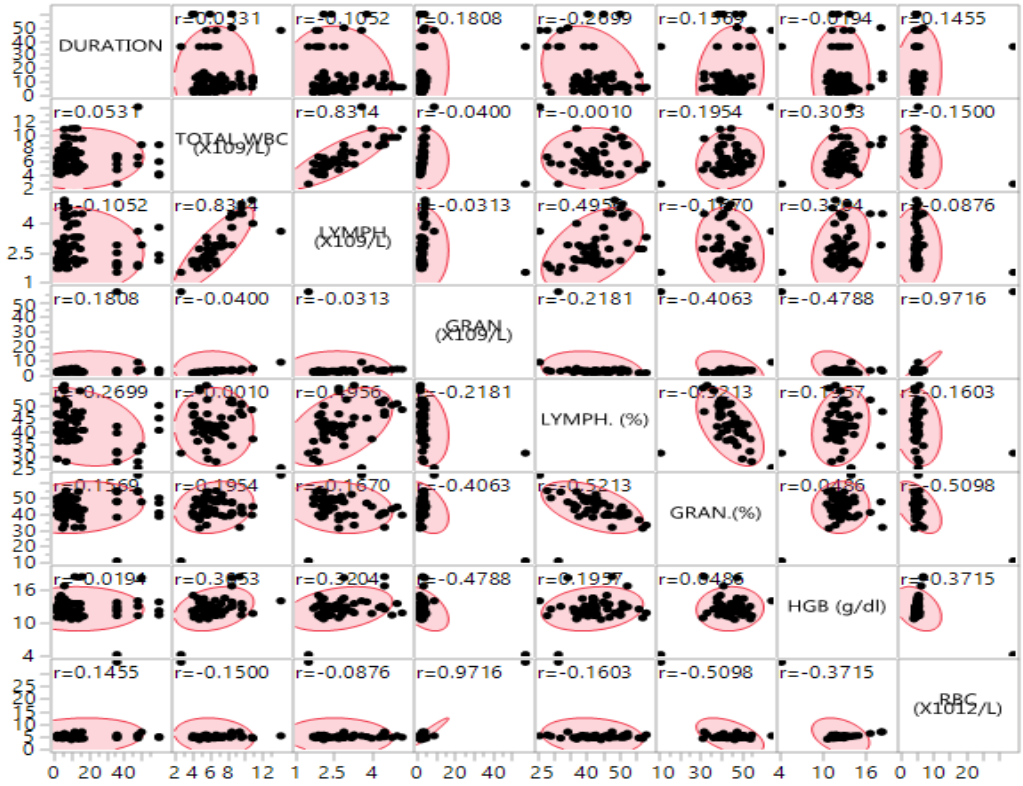

Figure 2a: The Scatter plot Matrix of Correlation of Duration of Contraceptive Use With Haematological Parameters of Subjects on Injectables

Figure 2b showed the scatterplot matrix of correlation of duration of contraceptive use with other haematological parameters of subjects on injectables. Duration of contraceptive use has no significant association with HCT, MCV, MCH, MCHC and platelet count (p>0.05).

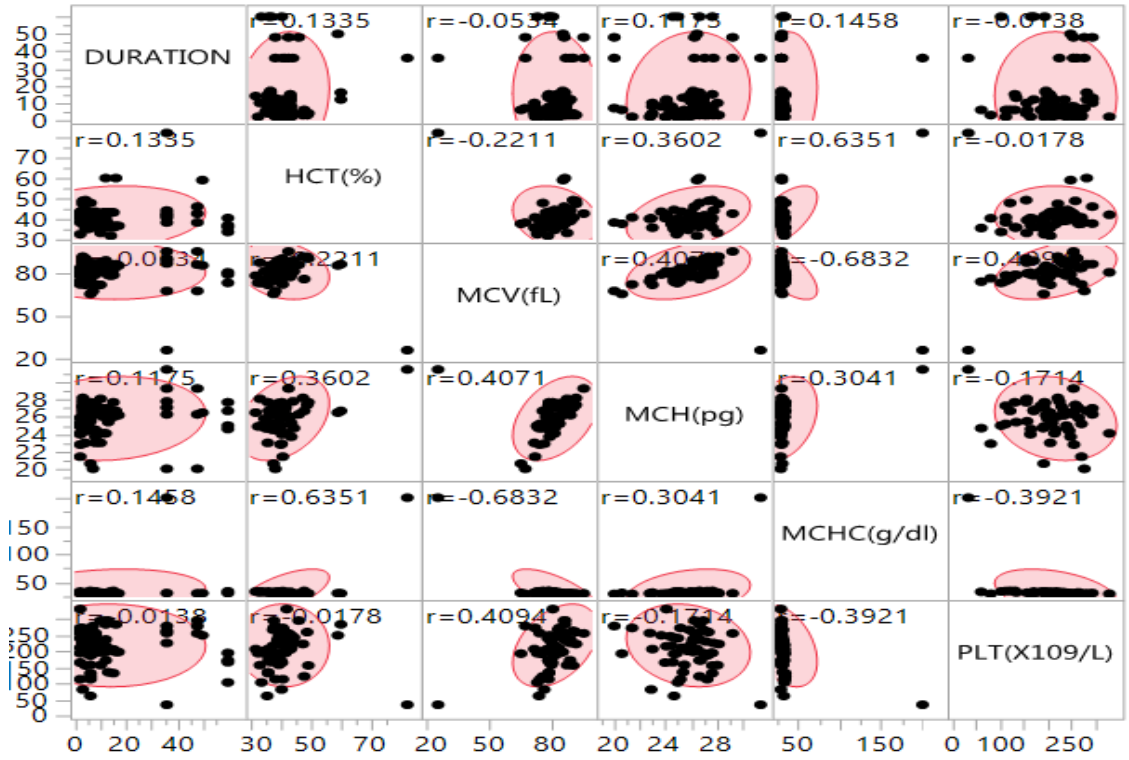

Figure 2b: The Scatter plot Matrix of Correlation of Duration of Contraceptive Use with other Haematological Parameters of Subjects on Injectables.

Discussion

The haematological results in the present study showed that the mean total WBC of progestogen-only contraceptive users was marginally higher compared to controls though, not significant. The report in this study is at variance with the findings of some authors[18-19] who reported lower TWBC count and that of[20] who reported no change. The increase of TWBC in this study may be a reflection of the fact that progestogen-only contraceptives could cause some type of infection among the users. Moreover, the increase in percentage granulocyte count and absolute granulocyte count among the study group might be an indication that the type of infection could be bacterial in nature. The absolute and percentage lymphocytes count in this study show a significant decrease among contraceptive users compared to the controls. This finding is in consonance with the report of[19] who reported significant decrease in lymphocyte count in their study group compared to the controls. The decrease in the lymphocyte count could be an indication of compromised immunity in progestogen-only contraceptive users.

A significant increase in MCV and MCH was observed among the contraceptive users compared to the control group. The finding of increased MCV and MCH in this study is in agreement with the work of[13], and the work of[18]. This is in contrast to the work of[19] who observed a decrease in the treated group even though it was not statistically significant. The increased MCV and MCH found in this study may be due to less menstrual loss rather than erythroplasia since the red cell count was not significantly different. 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 in the non-users of hormonal contraceptives which may not occur in contraceptive users. In contrast to the work of[21] who reported significant increases in haemoglobin, haematocrit and platelet count among the treated group compared to the control, this study showed no significant difference in these parameters among the contraceptive users and the controls.

In the comparison of haematological data between the implant and injectable contraceptive users, the most striking findings were significant reduction in TWBC, absolute lymphocyte and granulocyte counts, low MCV and MCH values found among the implant users. This result is consistent with[19] and[22]. However, the finding of low white cell count in this study is at variance with the findings of[21] who reported increases in TWBC, neutrophils and lymphocytes. The findings in this study suggest that use of implant may derange the immunity of the users.[23] had documented increased haemoglobin levels in women on subcutaneous contraceptive implants in spite of the bleeding irregularities encountered as one of the major side effects of subcutaneous contraceptive implant use. This is a beneficial effect in developing countries with high prevalence of anaemia. This is not in conformity with the finding of lower haemoglobin and haematocrit levels in this study though, not significant. The observation in this study agrees with the work of[24] who observed a reduction in Red blood cells (RBC), in steroidal combined oral treated rats compared to the control. A similar study of the effect of combined oral contraceptive on haemalological and biochemical parameters in female wistar rats by[19] also demonstrated a reduction in haemoglobin, packed cell volume, Red blood Cell Count (RBC) in all the group treated with oral contraceptive, compared to the controls. The same authors also observed significant increase in MCHC with no significant changes in MCV and MCH, in treated groups compared to the control. The authors suggested that these may be as a result of the haemodilutary effect of estrogen and the effect of estrogen on the cytokines like IL-11 and IL-6.

The observation of significant lower MCV and MCH in this work is not in agreement with the work of[19] who reported no change in MCV and MCH; and[25] who showed decreased red cell

indices in implant group as compared to the injectable group. Also the finding from this study is however contrary to that of other researchers [26-28] who reported no changes in full blood count of women on hormonal contraceptives. The reduction in MCV and MCH could herald microcytic anaemia in women on implant in this region of the country. In addition, the difference in the MCV and MCH between women on injectable and contraceptive implant may be as a result of the use of different progestogens and dosages with different route of administration. Moreover, duration of contraceptive use has an inverse association with MCV and MCH.

However, the mean RBC among women on contraceptive implant is significantly higher than for those on injectables. This is in contrast with the work of[25] who reported decreased RBC among the contraceptive implant users compared to the injectable users.

The effect of route of administration on haematological variables shows significant reductions in TWBC, absolute lymphocyte and percentage lymphocyte count, absolute granulocyte, MCV and MCH in women who take progestogen-only contraceptives subcutaneously compared to subjects on intramuscular route of administration. The observation in this study agrees with the work of[25] who in the evaluation of full blood count of different contraceptive users, showed that haemoglobin levels were highest among oral contraceptive and injectable users, while implant showed the levels in between the increased haemoglobin level of implant and oral contraceptive and decreased levels of intra uterine contraceptive device. The reduction in TWBC, absolute lymphocyte and percentage lymphocyte count, absolute granulocyte could indicate immune system derangement in women who take progestogen-only contraceptives subcutaneously thereby making them susceptible to infections. In this study, the duration of contraceptive use has a positive significant relationship with absolute granulocyte and inverse association with TWBC.

Moreover, the findings of low MCV and MCH among subcutaneous POCs users indicate microcytic aneamia which may be caused by iron deficiency. The low MCV and MCH may be due to poor dietary intake of iron among the contraceptive users in subcutaneous group. However, the women on subcutaneous route of contraceptive administration show significant increase in red cell count compared to the intramuscular group. This observation is not consistent with the work of[24] who observed a reduction in Red blood cells (RBC), in steroidal combined oral treated group compared to the control. The finding in this study is in contrast to the work of[29] who reported that although there were slight increases in blood haematological parameters, however, they were considered statistically insignificant when compared with the control.

Conclusion

The findings in this study showed a significant reduction in leucocytes, MCV and MCH among the implant users. This suggests that women on progestogen-only contraceptive implant are at high risk of developing infection and microcytic anaemia. Though this may be due to socio-economic reasons, more research is required to elucidate these issues. Baseline evaluation of anaemia in women prior to using the hormonal contraceptive methods is also recommended.

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