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Original Research Article

Influence of Two Kinds of Combined Oral Contraceptives on Some Red Blood Cell (RBC) Parameters in Women Attending Family Planning Unit in University of Port Harcourt Teaching Hospital

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Abstract

Background: The use of hormonal contraceptives is on the increase among women of reproductive age in Nigeria. In this study effort was made to examine the influence of combined oral contraceptives on some Red blood cell (RBC) parameters in women attending family planning unit. ***Materials and Methods***: Data for this study were obtained through questionnaire administered on one hundred and twenty (120) respondents who were randomly purposively selected. The subjects blood samples were collected and analysed using appropriate techniques. One way ANOVA was adopted as statistical analysis method for the study. ***Results and Discussions*:** It was observed that while combined oral contraceptives therapy caused reduction in MCV value, MCHC was significantly raised. The significant increase in haematocrit value coupled with con-comitant reduction in haemoglobin concentration in circulation as reported by this study is of great advantage in terms of oxygen carrying and delivery capacity of red blood cells and maintenance of normal function in individuals. ***Conclusion*:** The combined oral contraceptives does not show the capacity of inducing anaemia in users.

Keywords: Combined, Oral contraceptives, Red blood cell, Women, Family planning.

INTRODUCTION

The term "contraception" is a process of birth control by the use of various methods and materials in the prevention of conception or pregnancy. Many social practices reduce the birth rates, delaying marriages, imposing taboos on the frequency of marital intercourse, and prolonged breastfeeding. Contraception, however, is usually taken to mean the deliberate resort to practices which prevent sexual intercourse resulting in the birth of a child, or - more strictly speaking, to preclude conception (Hatcher, Trussel, and Stewart, 2000). Methods can be divided into natural and artificial. Also, the latter method can be

subdivided, though not entirely, into barrier and chemical methods locally applied to the genitals; intrauterine, surgical, and the more recent use of hormonal contraceptives. Magical prescriptions of pregnancy have also proliferated, and refraining from sexual intercourse may have been an underestimated element in an attempt to restrict family size. A modification is indulgence only when the woman is believed to be infertile. Thus, the relationship between menstruation and ovulation was not reliably established until in 1929, and many previous calculations of a "safe period" were seriously in error, though due to variation in cycles of individual women, even an inaccurate idea may have been occasionally effective in delaying if not preventing conception (Mansour, Gemzell-Dancelsson, Inki, and Jensen, 2011).

Hormonal contraceptives aside their role in preventing pregnancy are also associated with a wide range of health implications. Hormone therapy that contains estrogen has been shown to influence blood flow (Dinenno, Jones, Seals, and Tanaka, 1999; Dunbar and Kenney, 2000; Dinenno *et al.*, 2001). Moreau *et al.*, (2003) have also shown that blood flow declines on estrogen- deficient women due to reduction in vascular resistance and increase in estrogen supplemented therapy; this implies that vascular resistance must be significantly reduced to improve blood How. Administration of oral contraceptive (OC) steroids has been shown to increase plasma viscosity and haematocrit value (Ernst *et al.*, 1989; Rosenson, Staffileno, Cormick, and Tangney, 1996), thus reduce the blood fluidity. This is demonstrated in studies documented by Lowe *et al.*, 1980). Studies have shown that higher dose of OC reduce blood fluidity.

In the light of the above findings, it was suggested that the increase in haematocrit provide evidence that the raise in blood viscosity and plasma viscosity seem in OC treated rats was likely to be a secondary effect to the erythropoietic effect of OC steroids (Rowan *et al.*, 2012).

Since the introduction of the various contraception methods in the 20th century, several millions of women in the reproductive age group all over the world have made use of it to prevent unwanted pregnancies and abortions and also permit improvement in the timing of child birth. The wide spread use of contraceptives (hormonal) provides an opportunity for assessing the influence of estrogens and progestrogens on various biochemical parameters of the female (Obisesan, Adenaik, Okunla, and Adcnaika, 2002). It is even possible that some of the side effects of these compounds might be associated with such metabolic effects. Oral contraceptives have been implicated in many diseases such as thromboembolic disease, myocadiac infarction, circulatory disorders, and carcinogenicity (Gaspard, 1990; Slone, Shapire, and Kafmann, 1981; Cell, 1983). Furthermore, its negative effects on the liver, heart, diabetes, obesity, hypertension and high serum cholesterol levels are well documented (Gaspard, 1987).

However, the biochemical profile of women on contraceptives use showed different changes in the plasma total protein, albumin, globulin and cholesterol levels (Bockner and Roman, 1986; Obesesan *et al.*, 2002).

MATERIALS AND METHODS

Subject selection

Blood sample collection for this research work were done in the Family Planning Units of University of Port Harcourt Teaching Hospital (UPTH) and the volunteer female undergraduate students of University of Port Harcourt who were not on contraceptives constituted the control subject, after approval from ethics Committee of the same hospital. The subjects' ages were in the range of 20 to 30 years and all the subjects were confirmed to be regular clients of the Family Planning Clinic of the Department of Obstetrics and Gynaecology, Blood samples were collected from female subjects using anonymous ' self-administered questionnaire as template or guide. Efforts were made to ensure that the subjects conform to the following criteria before mobilizing them for study.

i. Has no history of recent blood loss, blood disorder or pile (Hemorrhoids)
ii. No treatment for anemia in form of iron tablets or vitamin $B|_2$
iii. No pregnancy within the last six months
iv. No cardiac or endocrine disorder.

A total of 120 women subjects were involved in this study and grouped into three. These were group 1 that consisted of 50 female volunteer subjects without contraceptives which served as control group, group II consisted of 30 women with oestrogen (methyloestranolone and methylostradiol) combined oral contraceptive and group III consisted of 40 women on norgesterol-estradiol combined oral contraceptives.

Blood sample collection and determination of haematological parameters

Blood samples were collected by a vacutainer in the morning hours into EDTA sample bottles for determination of haemotological parameters. The anti-"coagulated blood samples were used for the determination of erythrocyte count, packed cell volume (PCV), haemoglobin content (Hb), WBC and the differential white cell counts. Haematological indices, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC), were calculated from the erythrocytic series values as described by Dacie and Lewis (1995). The analysis of the various haematological parameters was done with the aid of an automatic haematology analyzer (BC-2300, Mindiay, Germany).

Statistical Analysis

Statistical analysis was carried out using window SPSS package (SPSS-15.0 version). Data were analyzed using one way ANOVA followed by post hoc test-least significant difference (LSD), while charts were done using Microsoft Excel. The data were expressed as mean ± standard error and values of P < 0.05 were considered significant.

RESULTS AND DISCUSSION

Evaluation of the erythrocyte parameters and the haematological indices

The combined oral contraceptives significantly reduced red blood cell count and the hacmatocrit when compared with the control group (p<0.05).

Comparison between the combined oral contraceptive groups showed that group:

i. [Oestrogen] significantly reduced RBC and haematocrit with respect to group

ii. [Norgcstcrol-estradiol] (p<0.05), Figures 1 and 2.

The oestrogen (group II) combined oral contraceptives significantly reduced the haemoglobin concentration when compared with the control group (p<0.05), Norgcstcrol-estradiol (group III) only showed marginal reduction. Comparison between the combined oral contraceptive groups showed at group III [Norgcstcrol-estradiol] significantly increased the haemoglobin concentration with respect to group II [oestrogen] (p<0.05), Figure 3.

While the oestrogen (group II) combined oral contraceptives significantly increased mean corpuscular volume (MCV), the Norgcstcrol-estradiol (group HI) significantly reduced MCV when compared with the control group (p<0.05). Comparison between the combined oral contraceptive groups showed that group III [Norgcstcrol-estradiol] significantly reduced MCV with respect to & group II [oestrogen] (p<0.05), Figure 4.

While the oestrogen (group II) combined oral contraceptives significantly reduced mean corpuscular haemoglobin (MCH) when compared with the control group (p<0.05), the Norgesterol-estradiol (group III) showed no significant effect. Comparison between the combined oral contraceptive groups showed that group III [Norgesterol-estradiol] significantly increased MCH with respect to group II [oestrogen] (p<0.05), figure 5. While the combined oral contraceptives significantly increased the mean corpuscular haemoglobin concentration (MCHC) when compared with the control group (p<0.05), the oestrogen (group II) combined oral contraceptives significantly increased MCHC higher than group III [Norgesterol-estradiol] (p<0.05), Figure 6.

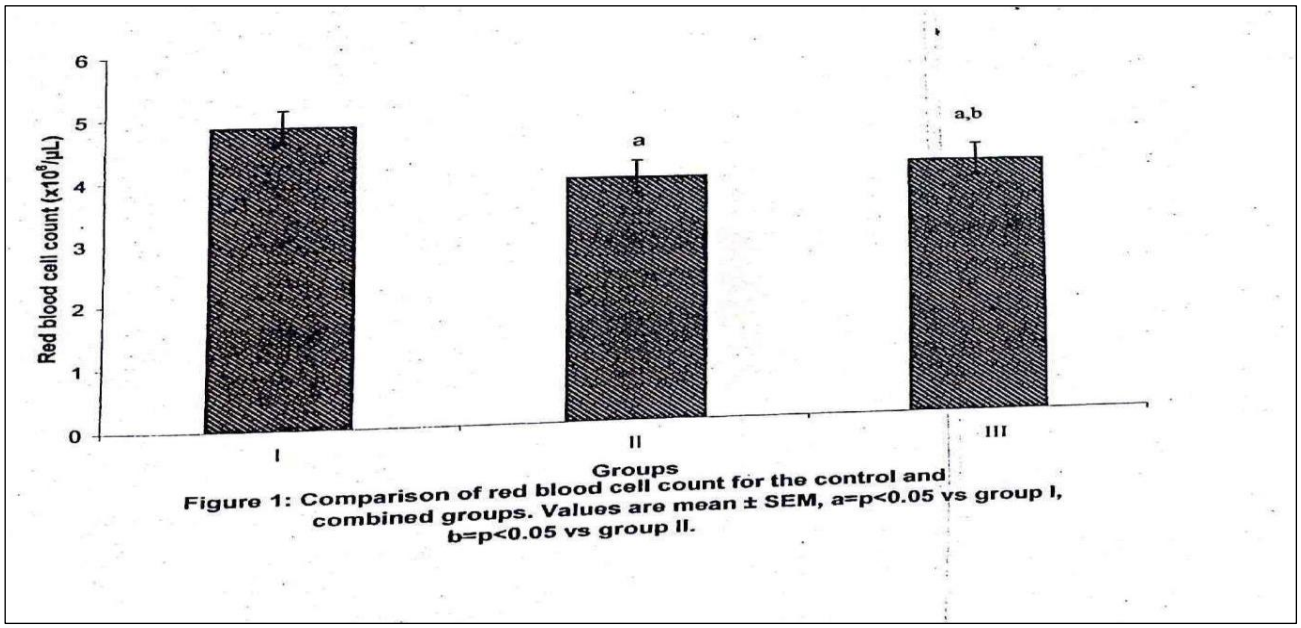

Figure 1: Comparison of red blood cell count for the control and combined groups. Values are mean ± SEM, a=p<0.05 vs group I, b=p<0.05 vs group II.

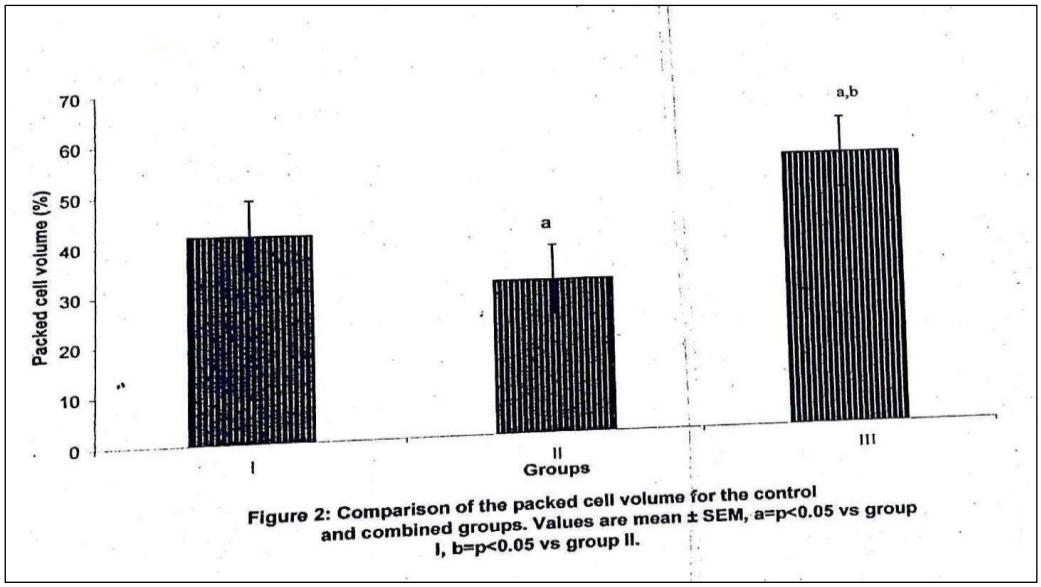

Figure 2: Comparison of the packed cell volume for the control and combined groups. Values are mean ± SEM, a=p<0.05 vs group I, b=p<0.05 vs group II.

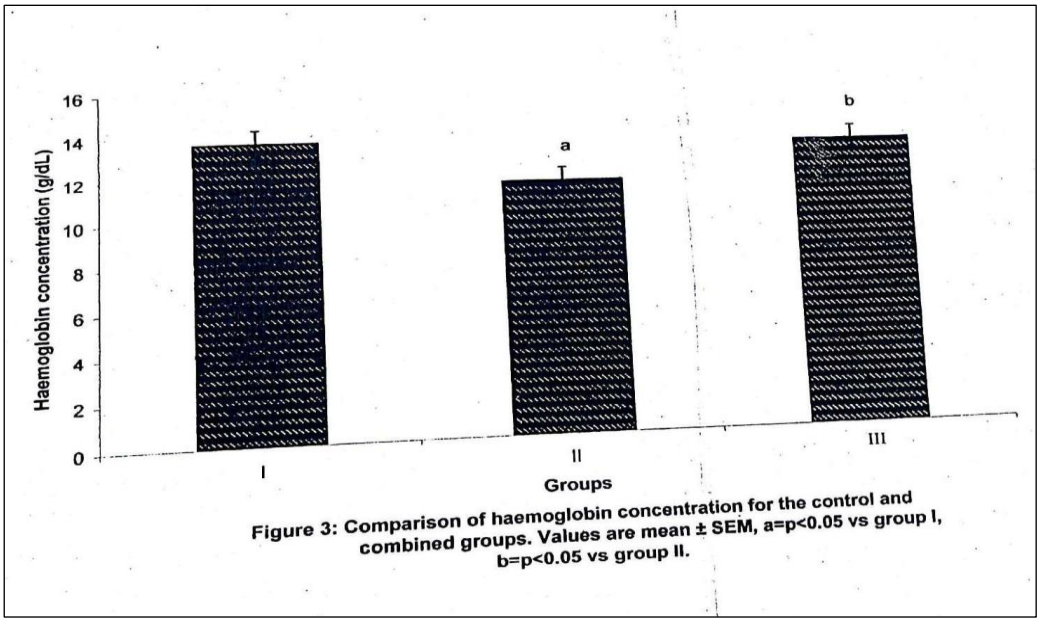

Figure 3: Comparison of haemoglobin concentration for the control and combined groups. Values are mean ± SEM, a=p<0.05 vs group I, b=p<0.05 vs group II.

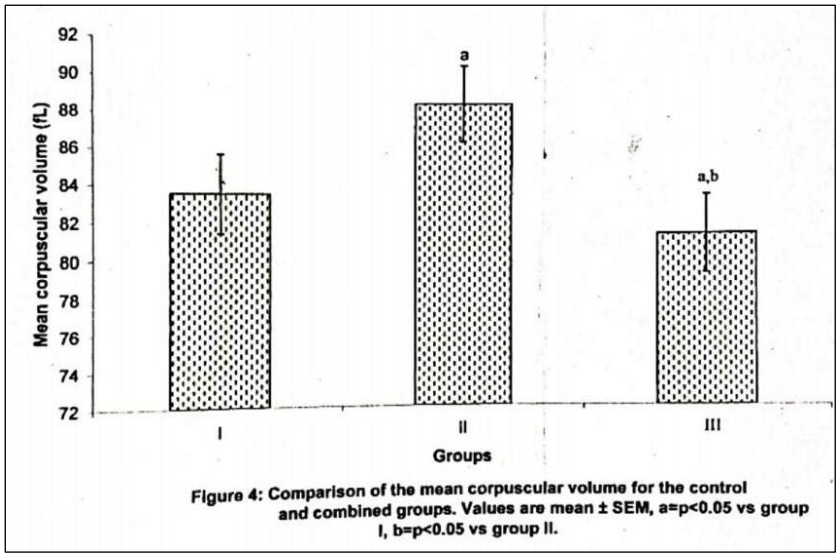

Figure 4: Comparison of the mean corpuscular volume for the control and combined groups. Values are mean ± SEM, a=p<0.05 vs group I, b=p<0.05 vs group II.

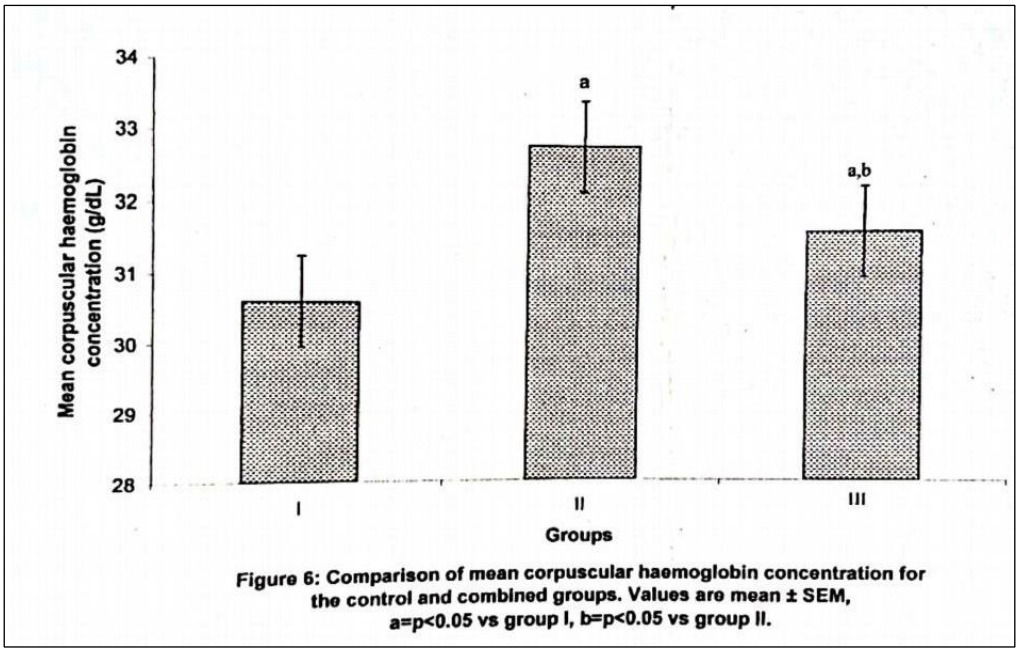

Figure 6: Comparison of mean corpuscular haemoglobin concentration for the control and combined groups. Values are mean ± SEM, a=p<0.05 vs group I, b=p<0.05 vs group II.

DISCUSSION

The relationship between combined oral, contraceptives therapy haematocrit, haemoglobin concentration and other erythrocyte parameters were evaluated in randomly selected women on two different combinations of combined oral contraceptives attending Family Planning Unit of the University of Port Harcourt Teaching Hospital. It was observed that both types of combined oral contraceptives significantly reduced erythrocyte count, this result contradict report of Lowe *et al.,* (1980) their observed increased haematocrit, it significantly lower the haemoglobin concentration.

The findings of this study on the haematocrit are comparable and consistent with previous reports which stipulated that oral contraceptives do not induced anaemia (Lowe *et al.,* 1980). The significant reductions in haemoglobin concentration rule out the possible haemolytic activity of the combined oral contraceptives, thus ruling out the possibility of developing anaemia.

Both low and high haematocrit have been observed to be related to risk of clinical and sub-clinical health challenges that are detrimental to health. Low haematocrit as seen in anaemia is associated with high risk of decreased activity, morbidity and mortality (Penninx *et al*., 2003). Increased mortality rate been documented for patients with anaemia, as well as those with ethrocytosis which may increase predilection for thrombosis through multiple mechanisms (Gagnon *et al*., 1994; Izaks *et al*., 1999; Elliott and Tefferi, 2005).

High hacmatocrit on the other hand is associated with an increased risk of death arising from cardiovascular-related disorders (Carter *et al*., 1983; Gagnon, *et al*., 1994). The present findings have shown that combined oral contraceptives have the potential to raise the haematocrit, a key determinant of blood viscosity and plasma viscosity (Akhigbe *et al*., 2008). This may suggest high erythropoietic activity instigated by combined oral contraceptive which may be regarded purely as a function of the progesterone content of the contraceptive.

This is in consonance with earlier findings that progeslogens raises haematocrit (Derham and Buchan, 1989). This assertion is in line with that of Bcsa (1994), this worker postulated that combined oral contraceptives could have regulatory effect on hematopoiesis by activating hematopoietic stem cells and stimulating erythropoietin production.

It was also observed that while combined oral contraceptive therapy caused the reduction in MCV value, MCHC was significantly raised. The significant increase in haematocrit value coupled with the concomitant reduction in haemoglobin concentration in circulation as reported in this study could be of great advantage in terms oxygen carrying and delivery capacity of red blood cells. This could result in efficient oxygen delivery to tissues which can lead to better performance and probably a better survival rate of an individual (Boross *et al*., 2012). The normal range of haematocrit for women is 37-48% (Purves *et al*., 2004), and high haematocrit is reported to be associated with the frequency of major cardiovascular-related conditions (Carter *et al*., 1983; Wannamethee *et al*., 1994; Gagnon *et al*., 1994). These findings should be of great concern particularly to users with history and risk of developing cardiovascular-related disorders associated with slow blood flow on the account of high haematocrit levels.

The present study has demonstrated that combined oral contraceptive with either high estrogen content as in oestrogen or low estrogen content as in

norgesterol-estradiol do not alter the physiology of erythrocyte membrane significantly as indicated in their median corpuscular fragility. The integrity of the erythrocyte membrane is important because this membrane envelops and protect/keep the content of the erythrocyte intact especially the haemoglobin may not induce Results from this study shows that oral hormonal contraceptives have no significant effect on the erythrocyte membrane and perhaps anaemia by haemolysis.

CONCLUSION

The following conclusions are drawn from the findings of the present study:

i. That norgesterol-estradiol oral contraceptives could be of advantage to users because of its tendency to raise the haematocrit.

ii. That combined oral hormonal contraceptives, be it oestrogen or norgesterol-estradiol do not show the capacity to significantly alter the integrity of red blood cell membrane, hence cannot induce anaemia in users.

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