



Chronic Use of Hormonal Contraceptives and Its Impact on Cardiovascular Risk

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Authors' contributions

This work was carried out in collaboration between all authors. Author SS obtained samples, analyzed the data and drafted the manuscript. Author BA obtained samples and analyzed the data. Author RAN designed, supervised and drafted the manuscript. Author JKA was involved in sample collection. Author MA analyzed the data. Author BYA drafted the manuscript. Author GAA conceptualized, supervised the study and wrote the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The purpose of the study was to observe if hormonal contraceptive use increases CV risk in women from Ghana through increasing CV RF.

Study Design: The study was longitudinal and purposive random sampling was done.

Place and Duration of Study: A community in the Upper West region of Ghana was selected. The Reproductive Healthcare Clinic which administers contraceptives was used for the study from January 2013 to January 2014.

Methodology: Seventy- one (71) cases were recruited (20-40 years). Twenty-three (23) were on an injectable contraceptive (IC), 43 on an oral contraceptive (OC), 5 on a sub-dermal implant contraceptive (IMP) and 4 switched methods from OC to IC or to IMP. After 12 months, a total of 42 remained in the study. Twenty-three (23) remained on IC, 11 on OC and 4 on IMP. Anthropometry [Body mass Index (BMI), Diastolic and Systolic Blood Pressure (DBP,SBP)], Lipid profile [Total Cholesterol (TC), High Density Lipoprotein Cholesterol (HDL), Low Density Lipoprotein (LDL), Triglycerides (TG), Very Low Density Lipoprotein (VLDL), Apolipoprotein A-1(ApoA-1), Apolipoprotein B(Apo B) and cardiovascular risk indices [Castelli index I = TC/HDL; Castelli index II = LDL/HDL; Atherosclerotic risk = (TC-HDL)/HDL; Atherogenic index of plasma = Log TG/HDL] were determined and statistically analyzed.

Results: Comparison of the studied groups showed that OC users had significantly increased DBP, BMI, TC, LDL, TG and Apo B ($p < 0.001$, all cases). IC user also had significantly increased BP, BMI, TC, LDL, TG and Apo B ($p < 0.001$), whilst HDL and Apo A-1 reduced significantly ($p < 0.001$). IMP users had significantly increased BP, TC and Apo B ($p < 0.05$). Castelli index I, atherosclerotic risk, atherogenic index of plasma, Apo B/Apo A-1 (a better predictor of coronary risk) increased significantly ($p < 0.001$, respectively), for the OC and IC groups.

Conclusion: Chronic use of hormonal contraceptives amongst women has the tendency to cause weight gain, increase BP and dyslipidaemia. IC had the greatest cardiovascular risk.

Keywords: Oral; injectable; implant; cholesterol; body mass index; lipid profile.

1. INTRODUCTION

Obesity is considered an emerging epidemic worldwide. It has been predicted that by 2030 half of the world's population will be obese [1]. While emerging economies are thought to be population groups that will be worse hit by this epidemic, lifestyle changes as well have been implicated in the etiology of obesity [2]. Additionally, migration and urbanization seem to be the catalyst for lifestyle changes [3]. Urban cities have therefore recorded a high incidence of obesity than other areas [4]. To curb urbanization and population explosion, population control vis a vis economic growth is a challenge. In order to alleviate poverty and economic difficulties, family planning methods are encouraged globally as part of the millennium development goals [5]. However, the preferred choice of family planning seems to be the use of contraceptives [6].

Hormonal contraceptives (HC) have gained popularity not only for family planning purposes but also for pregnancy prevention [7-9]. This appears convenient because of migration to cities, urbanization, and the pressure of rising up the cooperate ladder for singles and young couples [10]. Oral contraceptives give anonymity to most users since they can easily be purchased off the counter. Injectables and implant contraceptives are often clinic and hospital based-administered and are the preference of married women [10]. Whether oral or injectable,

these reproductive health choices have impact on weight gain and obesity.

In a 5-year follow-up study of women on contraceptives in the USA and South America, women gained weight at an average of 1.1 kg per year [11]. The possibility that this is an unsuspected window for obesity in emerging economies is beginning to surface. While concern is on obesity, of even greater concern is the effect of obesity on cardiovascular risk [12-14]. Hormonal contraceptives are said to affect the cardiovascular system through its impact on cardiovascular risk factors such as the lipid profile, blood pressure and body mass index (BMI) in a cross-sectional study of a cohort of Ghanaian women [15]. The effect of the chronic use of hormonal contraceptives by Ghanaian women which has never been determined was examined for its impact on cardiovascular risk factors.

2. METHODOLOGY

1. A community in the Upper West region of Ghana was selected. Women in the community patronize the Reproductive Healthcare Clinic which administers contraceptives. The inclusion criteria were as follows: women between the ages of 20 and 40 years; women on Oral contraceptive (OC), Injectable contraceptive (IC), and sub-dermal implant (IMP) contraceptives; and women without

predisposing factors or conditions to CV disease prior to contraceptive use. None of the participants smoked or used alcohol, none of them had high blood pressure, dyslipidaemia and none of them was overweight at the onset of the cross-sectional study. As part of the guidelines for the administration of hormonal contraceptives. It is not recommended for women with risk factors to the development of cardiovascular disease.

Types of contraceptives used by participants were oral contraceptives (low dose pill made up of 35 ug ethinyl estradiol and norgestrel) and the progesterone only pill (35 ug norethindrone), injectable [Depo provera (150 mg medroxyprogesterone acetate) and implant (68 mg etornogestrel). The Helsinki Declaration of 1964, with revision in October 2008 was observed. In all, 71 cases attending the clinic who had used contraceptives for less than 12 months were sampled. After this first sampling, cases were followed for 12 months for the second sampling. A purposive random sampling method was employed whereby all women patronizing the clinic and who met the inclusion criteria of this study were sampled. The follow-up period was 12 months. Ethics approval was obtained from the University of Ghana Medical School Ethics and Protocol Review Committee (MS-ET/M.3-P 3.3/2013-2014).

2.1 Data and Blood Sample Collection

To obtain basic information including age, duration of drug use and contraceptive type, a questionnaire was administered by clinic staff to subjects who had begun contraceptive use. The study was explained to them in their own dialect and opportunity was given to them to ask questions before the commencement of the exercise.

Anthropometric measurement was obtained by measuring height using a portable Seca stadiometer (Hamburg, Germany). Height was recorded to the nearest 0.1 cm, with subjects barefooted. Weight was measured using a Seca 770 floor digital scale to the nearest 0.1 kg, with subjects in minimum clothing. BMI was computed [weight (kg)/height (m)²]. BP was measured three times on the left arm with a 5-minute break in between using the Omron 705 CP oscillometric monitor (Kyoto, Japan). The mean of the three

measurements was used. Three milliliters (3 mls) blood samples was taken from each subject after an overnight fast of 12 – 14 hours into gel separator tubes. After clotting, blood samples were centrifuged for 10 minutes at 3,000 rpm. Serum was aliquoted into Eppendorf tubes and stored at –20°C until use. This procedure was repeated after 12 months follow-up.

2.2 Laboratory Analysis

Total cholesterol (TC), high density lipoprotein cholesterol (HDL), low density lipoprotein cholesterol (LDL), Triglyceride (TG), very-low-density lipoprotein cholesterol (VLDL), apo-lipoprotein A and B tests were performed using BioSystem kits on an A25 BioSystem autoanalyzer (Barcelona, Spain). However, the following were calculated: $LDL = TC - (HDL + TG/2.2)$ mmol/L; Castelli index I = TC/HDL ; Castelli index II = LDL/HDL ; Atherosclerotic risk = $(TC-HDL)/HDL$; Atherogenic index of plasma = $\log TG/HDL$ and ApoB/ApoA.

2.3 Statistical Analysis

SPSS software (v20.0; IBM Corporation, Armonk, NY, USA) was used for statistical analysis. The results were expressed as mean \pm SD. Differences in continuous data were compared using Student's t-test (two groups) and one-way ANOVA (three or more groups) followed by the Bonferroni post-hoc test. Relationships between variables were ascertained by Spearman's correlation coefficient. All results were considered significant at $p < 0.05$.

3. RESULTS

Seventy one (71) cases were recruited. Twenty-three (23) were on IC, 43 were on OC and 5 on IMP. After 12 months, forty-two (42) ($\approx 59\%$) remained in the study. Twenty-three (23) of these women were still on IC, 11 still on OC, and 4 on IMP. The remaining 4 switched methods, from using OC to IC or to IMP (Mixed methods). This last category was excluded from the data analysis. The high rate of attrition among the OC users was due to the fact that users could purchase it off the counter and did not have to use the clinic for their supply. Migration, marriage and the need to have children also accounted for the attrition. The mean age of the sample was 29.25 ± 8.09 years.

Table 1. A table showing the reference intervals for all the measured parameters

Parameters	Normal	Increased	Decreased
SBP (mmHg)	≤120	140 – 159	≤ 90
DBP (mmHg)	≤ 80	90 – 99	≤ 60
BMI (kg/m ²)	18.5 – 24.9	25.0 – 29.9	< 18.5
TC (mmol/L)	3.2 – 5. 2	≥6.3	< 3.2
HDL (mmol/L)	≤1.52		< 1.04
LDL (mmol/L)	2.6 – 4.16	≥ 4.16	≤ 2.6
TG (mmol/L)	3.9 – 5.2	>5.2	< 3.9
Apo A-I (mmol/L)	2.86 – 5.46	>5.46	<2.86
Apo B (mmol/L)	1.43 – 3.64	>3.64	<1.43

Table 2. A Table showing Blood Pressure [systolic blood pressure (SBP), diastolic blood pressure (DBP)] profile, BMI, Lipid profile [Total cholesterol (TC), high density lipoprotein cholesterol (HDL), low density lipoprotein cholesterol (LDL), triglyceride (TG)] apolipoprotein A and B of the Oral Contraceptive (OC) group for the baseline and one year

Parameters	Baseline Mean ±SD	One year Mean ±SD	P- value
SBP (mmHg)	113.89±12.11	117.89±14.5	.0008*
DBP (mmHg)	74.56±13.16	88.00±12.98	.0001*
BMI (kg/m ²)	21.76±2.79	26.14±3.09	.0041*
TC (mmol/L)	3.53±0.51	4.64±0.79	.0008*
HDL (mmol/L)	1.32±0.35	1.28±0.67	.0911
LDL (mmol/L)	1.87±0.36	2.59±0.57	.0022*
TG (mmol/L)	0.95±0.11	1.28±0.2	.0029*
Apo A-I (mmol/L)	1.53±0.21	1.29±0.21	.13
Apo B (mmol/L)	0.26±0.05	0.37±0.06	.0035*

*Significant N = 11

For OC users, systolic blood pressure (SBP) increased significantly after one year although it was still normal. The diastolic blood pressure (DBP) increased from within the same period. BMI also increased by 4.38 kg/m². TC, LDL, TG and Apo B increased significantly However, HDL and Apo A decreased but insignificantly (Table 2)

Table 3. Table showing Blood Pressure [systolic blood pressure (SBP), diastolic blood pressure (DBP)] profile, BMI, Lipid profile [Total cholesterol (TC), high density lipoprotein cholesterol (HDL), low density lipoprotein cholesterol (LDL), triglyceride (TG)] apolipoprotein A and B of the Injectable Contraceptive (IC) group for the baseline and one year

Parameters	Baseline Mean ±SD	One year Mean ±SD	P- value
SBP (mmHg)	115.39±5.03	130.52±5.56	.0003*
DBP (mmHg)	72.70±3.47	88.22±4.32	.0001*
BMI (kg/m ²)	23.07±0.98	25.43±1.34	.0007*
TC (mmol/L)	3.46±0.31	4.48±0.34	.0001*
HDL (mmol/L)	1.27±0.17	1.04±0.13	.030*
LDL (mmol/L)	2.10±0.41	2.84±0.38	.0023*
TG (mmol/L)	1.06±0.17	1.38±0.28	.0012*
Apo A-I (mmol/L)	1.58±0.07	1.23±0.1	.0001*
Apo B (mmol/L)	0.26±0.03	0.42±0.04	.0001*

* Significant N = 23

In the (IC) group, both systolic and diastolic blood pressure increased after one year. Levels were above the normal values. BMI increased by 2.36 kg/m². TC, LDL, TG and Apo B increased significantly. Furthermore, HDL and Apo A-1 reduced significantly (Table 3)

Table 4. Table showing Blood Pressure [systolic blood pressure (SBP), diastolic blood pressure (DBP)] profile, BMI, Lipid profile [Total cholesterol (TC), high density lipoprotein cholesterol (HDL), low density lipoprotein cholesterol (LDL), triglyceride (TG)] apolipoprotein A and B of the sub-dermal contraceptive implant (IMP) group for the baseline and one year

Parameters	Baseline Mean ±SD	One year Mean ±SD	P- value
SBP (mmHg)	119.00±20.54	129.00±22.3	.0477*
DBP (mmHg)	74.56±13.16	88.00±12.98	.0001*
BMI (kg/m ²)	21.50±2.25	26.80±12.54	.2008
TC (mmol/L)	4.24±1.84	5.23±1.63	.0271*
HDL (mmol/L)	1.37±0.42	1.02±0.21	.082
LDL (mmol/L)	2.31±1.57	3.19±1.78	.182
TG (mmol/L)	1.22±0.65	1.85±1	.0604
Apo A-I (mmol/L)	1.40±0.29	1.19±0.25	.22
Apo B (mmol/L)	0.25±0.07	0.43±0.2	.0204*

* Significant N = 4

For the IMP users, both systolic and diastolic BP increased significantly. Values were above the normal range (Table 3). Although BMI increased, this was not significant. TC, LDL, TG and Apo B increased. However, only TC and Apo B increased significantly. On the contrary, HDL and Apo A decreased insignificantly (Table 4)

Table 5. A table showing the various cardiovascular disease risk ratios for the combined oral contraceptives (OC) group

Parameters	Baseline	One year	P-value
TC/HDL (Castelli index I)	4.32	2.98	.0138*
LDL/HDL (Castelli index II)	2.35	1.56	.0140*
APOB/A-1 (Atherogenic index of plasma)	0.295	0.186	.0040*
LOG (TG/HDL) (Atherogenic index of plasma)	0.052	-0.085	.0001*

* Significant

All CV risk ratios examined [TC/HDL, LDL/HDL, Apo B/Apo A-1, Log (TG/HDL)] increased significantly for the OC and INJ groups. P values were significant for the OC group (Table 5) and more highly significant for the INJ group (Table 5). However, risk was not calculated for implant group because of the small sample size

Table 6. A table showing the various cardiovascular disease risk ratios for the Injectable Contraceptives (IC) group

Parameters	Baseline	One year	P-value
TC/HDL (Castelli index I)	4.57	2.92	.0001*
LDL/HDL (Castelli index II)	2.87	1.758	.0001*
APOB/A-1 (Atherogenic index of plasma)	0.348	0.167	.0001*
LOG (TG/HDL)(Atherogenic index of plasma)	0.107	0.107	.0001*

* Significant

The percentage change of analyte levels was substantial with as much as 72% for Apo B (IMP) and over 35% across all groups for LDL (Table 6)

4. DISCUSSION

In this study, the effects of OC, IC and IMP were evaluated on BMI, BP, lipid profile patterns and cardiovascular risk in females aged 20-40 years. This age limit was ideal because women in this group were married or in union, sexually active, regular clients of the family planning clinic and much more opened to discussing their contraceptive habits. In Ghana, approximately 16.6% of married women between 15-49 years use modern methods of contraception.

Furthermore, oral contraceptive users accounted for 39.8% while 60.2% were on injectable or implant contraceptives [16].

After a 12-months duration of follow-up, the OC, IC and IMP groups recorded significant differences in all the CV risk markers assessed except for Apo A-1 and HDL which did not record significant differences in the OC and IMP groups. The BMI also did not record a significant difference in the IMP group only. However, there was a 24.7% overall increase. Although the

differences in HDL and Apo A-1 after the 12 months were not statistically significant, there was a 3% and 15.7% decrease in HDL and Apo A, respectively, in the OC group and a 25.5% and 15% decrease, respectively, in the implant group (Table 7).

Table 7. A table showing the percentage changes from the baseline to 1 year of the various cardiovascular risk markers

Parameters	OC %	IC %	IMP %
SBP (mmHg)	3.5	13.0	8.4
DBP (mmHg)	18.0	21.3	18.0
BMI (kg/m ²)	20.0	10.2	24.7
TC (mmol/L)	31.4	29.5	23.3
HDL (mmol/L)	3.0*	18.1*	25.5*
LDL (mmol/L)	38.5	35.2	38.1
TG (mmol/L)	34.7	30.2	51.6
Apo A-I (mmol/L)	15.7*	22.2*	15.0*
Apo B (mmol/L)	42.0	61.5	72.0

*Signifies a decrease in the parameter

The BMI results obtained from this study are consistent with literature. In one Iraqi study, waist circumference, body weight and BMI were significantly higher in contraceptive users than in the non-contraceptive users [17]. Similarly, one control trial reported 30% of women on OC to have gained approximately 2 kg body weight [18]. In another study, 50% of adolescents and providers believed OC use increased appetite and 60% of the adolescents in that study also believed that OCs caused weight gain [19]. However in another study, OC users were reported not to have gained more weight than non-hormonal contraceptive users but increase in percent body fat and decrease in total lean body mass was reported [20]. These findings agree with the findings of our study, further demonstrating that OC use causes increase in body weight. The type of OC, the formulation and dosing and the duration of use may all be determinants of how much weight is gained amongst users.

Women using IC were shown to have a significantly greater increase in all measures of fatness (body weight, fat mass, and the ratio of central to peripheral fat mass) than women using non-hormonal methods of contraception [21]. A study carried out over a 36 month period showed that injectable contraceptive users increased their weight (5.1 kg), body fat (4.1 kg), percent body fat (3.4%), and central-to-peripheral fat ratio (0.1) significantly more than did OC and non-hormonal users [22]. In a 5-year follow-up of

adult injectable contraceptive users, users gained 4.3 kg over the period. An even greater increase was found in Indian women, who gained more than 7 kg over a 2-year period compared with non-hormonal contraceptive users who gained just under 2 kg [23]. A WHO multicenter, Phase III comparative trial that investigated side effects and reasons for discontinuation of injectable intra-muscular (DMPA-IM) found that adult women gained a mean of 1.9 kg in the first year of DMPA-IM [16]

These findings from literature and our study support the belief that injectable contraceptive use increases body weight of users. However, the BMI findings of our study for the IMP group differed from the results of other studies. It has been shown that women experience slight weight gain when using the implant [24]. The average increase in body weight in some studies was < 2.25 kg (5 pounds) over 2 years [25-27]. In one international multi-centered study, the mean BMI of participants increased by 3.5% over 2 years, although 20% of women experienced an increase of over 10% in BMI [28]. In the USA, mean weight-gain in Implanon users was approximately 1 kg after 1 year and between 1–2 kg after 2 years [28]. A study comparing adolescent Norplant and OC users in the USA found that Norplant users gained 4 kg compared with 2 kg in the OC group [29].

The variation in the findings of our BMI results for the IMP group from literature could be due to the small sample size in this study of the implant group. Although our findings were not statistically significant, there was a 24.7% increase.

There are several possible mechanisms by which weight gain could occur as a result of hormonal contraceptive use. Increased appetite could result from a suppression of serum cholecystokinin [30]. It is also believed that estrogen in hormonal contraceptives may cause fluid-retention weight gain by direct stimulation of the renin-angiotensin system, which leads to water retention [31].

Similar to the blood pressure findings of this study, most studies have reported a steady increase in SBP and DBP among users of third-generation OCs containing estrogen and progestin. However, the magnitude of the increase varies among populations and also with the duration of OC use. Case - control studies using 24-hr ambulatory BP monitoring indicate a higher SBP and DBP in OC users than in non-

users [32,33]. Also, a prospective study of approximately 18,000 US women reported an increase in SBP and DBP in white women [33]. Another study conducted by WHO reported women on OCs to have increased SBP and DBP by 3.6 - 5.0 mmHg and 1.9 - 2.7 mmHg, respectively, compared with those using an intrauterine device [34]. In a similar study among German women, OC users had significantly higher levels of SBP and DBP than non-users [35]. However, SBP increased by only 2 mmHg and no change was found in DBP in British women between the ages of 18 and 30 years [36].

The use of injectable contraceptives (IC) is also associated with increases in blood pressure. However work done on the relationship between injectable contraceptive use and high blood pressure has yielded conflicting results. A one year longitudinal study revealed a significant increase in systolic and diastolic blood pressure in IC users [37]. Also a cross sectional study on 64 Pakistani women between the ages of 20 and 35 yrs revealed mild increases in systolic and diastolic blood pressure [38]. Yet another study reported that the effect of long-term use of injectable contraceptives did not reveal any unfavourable effect on BP [39]. Additionally, a study carried out at the University of Nairobi, Kenya failed to reveal differences in systolic and diastolic blood pressure between IC users and non-users [40]. Our findings agree with findings of other studies that demonstrated an increase in blood pressure following IC-use.

Hormonal contraceptive therapy consistently leads to an increase in plasma renin substrate [41,42]. Renin released from the juxtaglomerular cells of the kidney reacts with an alpha-2-globulin fraction of plasma ('renin substrate') to form a decapeptide, angiotensin I, which is further split to an active octapeptide, angiotensin II, by a converting enzyme. Angiotensin II may act on peripheral blood vessels as a vasopressor, directly on the kidney, and on the adrenal cortex to stimulate aldosterone secretion.

The elevation in the lipid biomarkers observed in hormonal contraceptive users in this study agrees with finding from other studies. A study carried out in Nigeria on women using low dose oral contraceptives (lo-feminal) reported the mean of plasma TC, LDL, Apo B and Lp(a) to be significantly higher in women using contraceptives than the controls [43]. In a similar study in the Czech Republic, a three-month

treatment of middle-aged women with combined hormonal contraceptives resulted in statistically significant increases in the concentrations of TG, TC, HDL, LDL, Apo A1 and B [44]. Furthermore, the Nurses' Health Study found no increase risk to cardiovascular disease with past users of OC. However, among current OC users in that study there was a 2.5 relative increased risk of adverse cardiovascular events, including cardiovascular death, nonfatal myocardial infarction, and stroke [45].

A study carried out on 30 Egyptian women using IC also revealed significant dyslipidaemia in women using the contraceptive for a period of about 15 months [46]. Another study reported impaired arterial responsiveness to increased blood flow as a result of endothelial cell abnormality in women using injectable contraceptives. In a clinical trial conducted in three centres to assess the effects of long-term use of DMPA on lipid metabolism, findings differed among centres. Compared to their own centre controls, DMPA users in Bangkok had higher LDL-cholesterol levels; those in Christchurch had lower HDL-cholesterol, apolipoprotein (apo) AI and apo AI/B ratio and higher apo B levels; and those in Mexico City had a lower apo AI/B ratio [47]. These regional differences emphasizes the need for various populations to examine various contraceptive use and its impact on health.

From literature however, the IMP seems to have little effect on serum lipids. Several studies carried out to assess dyslipidaemia in subdermal contraceptive users did not reveal statistically significant results [48]. In a 2-year open randomized study of 80 implant acceptors, the serum lipid pattern in the Implanon users was not significantly different from that of the Norplant users. There was a slight decrease in HDL levels in both groups but there were no significant changes in the HDL/TC ratio and the HDL/LDL ratio. Although it was statistically significant, the magnitude of decrease in HDL from pre-insertion levels in Implanon users was only 5.8% at the end of 2 years [49]. In Turkey, a study carried out did not reveal unhealthy alterations in serum lipids with etonogestrel implant use [50]. Another study also revealed favorable effects of IMP on serum lipids [51].

In this study however, LDL, TC, Apo B showed significant increase after the 12 months duration, whilst HDL and Apo A decreased by 3% and 15.7% respectively. These findings differ from

other studies and could be due to differences in the duration of IMP use and racial variations.

Overall, there were alterations in lipid profile biomarkers with hormonal contraceptive use. Hormonal contraceptives are believed to alter the lipid profile via the genomic pathway in which estrogen receptor (ER) alterations affect hepatic apolipoprotein up-regulation [52] leading to dyslipidaemia. The relationship between abnormal lipid levels and risk for coronary heart disease (CHD) and myocardial infarction (MI) in all regions of the world has been established [53]. In this study, the atherogenic risk index, Coronary risk also known as Castelli risk index I (TC/HDL) and II or Atherosclerotic risk (LDL/HDL) all of which are cardiovascular risk indices, were significant in the OC and IC groups. The IC group however demonstrated significant cardiovascular risk indices suggesting that it may carry a stronger cardiovascular risk compared to the other contraceptive groups.

At the end of this study, injectable contraceptives posed the highest risk with all nine (9) cardiovascular risk factors showing significant increases. Almost all the risk factors of the oral contraceptive group also showed significant increases with contraceptive use except for HDL and APO A. The subdermal contraceptive group had only three risk factors namely SBP, DBP and APO B showing significant increases. We will assume that the cumulative risk will be dependent on the accumulation of individual risk factors.

There was a clear significant difference from the baseline to the 12 months. This indicates that given a longer duration of contraceptive use as is the case with most women, the impact of the use of contraceptives will be more pronounced.

5. CONCLUSION

From the data gathered, it is concluded that chronic use (more than a year) of hormonal contraceptives (OC, IC, IMP) amongst women aged between 20 and 40 years have a tendency to cause weight gain, increase BP and dyslipidaemia amongst users. Obesity, high blood pressure and dyslipidaemia are precursors to the development of cardiovascular disease. Therefore, population growth control, lifestyle changes, socioeconomic reasons for reduced family sizes, and family planning, must be re-examined against future health implications. With

all the afore-mentioned, we suggest alternative birth control methods be examined for use.

CONSENT

All authors declare that written informed consent was obtained from the patients for publication of this paper.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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