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Lipid Profile of Women Using Oral Contraceptive Pills

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Abstract: Oral Contraceptives (OCs) are the most popular type of birth control pills. The study was designed to examine the biochemical changes which occur due to the use of oral contraceptive pills (OCs). The study was based on the questionnaire for having the information of any reproductive history fasting, age, health, nature of menstrual cycle, bleeding, disease etc and blood profiling for biochemical analysis of the women includes High Density Lipoprotein Cholesterol (HDL-C), Low Density Lipoprotein Cholesterol (LDL-C), Total Cholesterol (TC) and Triglycerides (TG). Lipid profiling was carried out by using a commercially available diagnostic test kits. SPSS was used to analyze the data. The results showed statistically significant differences among users of OCs compared to non-users. Total cholesterol (242.92±2.842 mg dL^{-1}), HDL-C (58.65±1.098 mg dL^{-1}), LDL-C (115.84±1.266 mg dL^{-1}) and triglycerides (105.56±2.341 mg dL^{-1}) were significantly higher compared to the Non-users (Total cholesterol 218.49±1.762, HDL-C 48.17±0.543, LDL-C 100.32±0.951 and triglycerides 83.77±2.299 mg dL^{-1}). The result suggests that OCs increase the level of High Density Lipoprotein Cholesterol (HDL-C), Low Density Lipoprotein Cholesterol (LDL-C), Total Cholesterol (TC) and Triglycerides (TG).

Key words: Oral contraceptives, healthy women, biochemical parameters

INTRODUCTION

From the last few decades, world is facing the most serious problem that is population explosion. Contraception method is used worldwide for over birth control or unwanted pregnancies. Many workers have suggested that the use of contraceptives is beneficial but also have some side effects too. The researchers believe that the widespread use of hormonal contraceptive provides an opportunity for assessing the influence of estrogens and progesterone on various biochemical parameters among users. Synthetic progestins not only have genotoxic potential (Siddique and Afzal, 2004; 2005a; Siddique *et al*., 2005a, b; 2006a, b) but are also vulnerable to various types of cancer (Siddique and Afzal, 2008; Siddique and Afzal, 2005b). It was found that the bone formation was significantly decreased in women taking oral contraceptive pills (Garnero *et al*., 1995). Some remarkable findings are well documented by workers which showed that oral contraceptives are involved in many diseases such as, myocardiac infraction and carcinogenicity (Obisesan *et al*., 2002; Tzankova *et al*., 2010; Naz *et al*., 2012). An increase in the risk for ischemic stroke in women taking oral contraceptives has been reported (Thorvaldsen *et al*., 1995; Vessey *et al*., 1984; WHO, 1996) and other studies showed that oral contraceptives also increases the risk for venous thromboembolism (Farmer and Lawrenson, 1998; Weiss, 1999; Westhoff, 1998; Rosing and Tans, 1999; Kemmeren *et al*., 2001). The relationship between oral contraceptive users and the risk for breast cancer remains controversial. Most studies suggests no overall risk or a slight increased risk of breast cancer in women using oral contraceptives (Anonymous 1986; Marchbanks *et al*., 2002; Brinton *et al*., 1998; Hankinson *et al*., 1997). It has been reported that the serum total cholesterol is significantly higher among oral contraceptive users as compared to non users (Nawrot *et al*., 2003). The mode of action depends upon the formulation of pills. The pills possibly inhibits ovulation by the formation of pituitary luteinizing hormone that renders the cervical mucus hostile to sperm penetration. The oral contraceptive pills are the combination of different concentrations of estrogen and progestin. In our present study the composition of the oral contraceptive taken by the women was: Ethinyl Estradiol (EE_2) (0.03 mg) and Levonorgestrel (0.15 mg). In the present study an attempt has been made to

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investigate the possible effects of Oral Contraceptives (OCs) among users on High Density Lipoprotein Cholesterol (HDL-C), Low Density Lipoprotein Cholesterol (LDL-C), Total Cholesterol (TC) and Triglycerides (TG).

MATERIALS AND METHODS

Sample size: The subjects for the study were married women of low income group to a total of 100 participants from Malkhan Singh Hospital and Jawahar lal Nehru medical college of Aligarh city, who were of 21 to 40 years of age, from which 55 women were taking combined oral contraceptives preferring after 8-10 days of withdrawl period and 45 non-users healthy married women who were not taking any oral contraceptive. A random sampling were performed and the women taking the oral contraceptive continuous for the three months were included for the comparison to non-users. A written consent was obtained from the subjects for taking their blood samples. The detailed questionnaire included some issues about fasting, age, health history, nature of menstrual cycle, bleeding, disease, etc.

Blood sampling and processing: In morning as overnight fasting of user and non-user women, about 4 mL blood was collected in vacutainer tube with clot activator from each women in study sample. The serum samples were obtained by centrifugation at 3000 rpm for 15 min and the sera were stored at -20°C and analyzed within three days.

Blood parameters analysis: The analysis of lipid profile of High-Density Lipoprotein (HDL-C), Low-Density Lipoprotein LDL-C, cholesterol and triglycerides were carried out using a commercially available diagnostic system test kits (Crest Biosystems kits, India).

Statistical analysis: The obtained data were analyzed by using a software statistical package SPSS version 16.0. Students t- test was also used to differentiate between two numerical data.

RESULTS AND DISCUSSION

The results of the present study suggest that the oral contraceptive users have higher level of total Cholesterol, HDL-C, LDL-C and triglycerides as compared to non-users. As shown in the Table 1, the mean values of Cholesterol (242.92±2.842), HDL-C (58.65±1.098), LDL-C (115.84±1.266) and triglycerides (105.56±2.341 mg dL^{-1}) were significantly higher among users as compared to the non-users (total Cholesterol 218.49±1.762, HDL-C 48.17±0.543, LDL-C 100.32±0.951 and triglycerides 83.77±2.299 mg dL^{-1}) (Fig. 1).

It has been observed that the LDL-C and HDL-C increase is prone to have stroke and myocardial infarction in women taking oral contraceptives (Wynn *et al*., 1966). The present study supports the earlier studies on lipid profiles on cholesterol (Emokpae *et al*., 2010; Abdel-Barry *et al*., 2011). Elevated serum levels of lipids are probably the most important biochemical risk factors for atherosclerosis. In the liver triglyceride synthesis is enhanced by estrogen and inhibited by androgen and these triglycerides are partly brought into the circulation as low-density lipoproteins. When a contraceptive pill containing an estrogen and a progestogen is introduced, the resultant effect is not predictable. The clinical significance of this observation is supported by the fact that atherosclerosis begins early in life and is accelerated in the presence of high cholesterol and serum triglycerides (Newman *et al*., 1991). Contraceptive steroids having a combination of an estrogen and progestin or only progestin are effective and reversibly regulate fertility. Combined oral contraceptives affects a variety of metabolic factors including hemostatic variables and estrogen-sensitive liver proteins and these effects can be modulated by the type of estrogen and progestin in a given combination (Sitruk-Ware and Nath, 2011). The estrogen component of OCs has been reported to increase the production of Very Low Density Lipoprotein (VLDL) and High Density Lipoprotein (HDL) but reduce the level of low density lipoprotein (Sitruk-Ware, 2006). The reduction in the doses of Levonorgestrel/ethinyl estradiol containing contraceptives from 30-20 μg (EE) and that of 150-100 μg

Table 1: Lipid profile of oral contraceptive (OC) users and non-users women

Lipid profile (mg dL^{-1})	OC users (n = 55)	Non-users (n = 45)
Cholesterol	242.92±2.842[a]	218.49±1.762
HDL-C	58.65±1.098[a]	48.17±0.543
LDL-C	115.84±1.266[a]	100.32±0.951
Triglycerides	105.56±2.341[a]	83.77±2.299

Values are as Mean±SE, [a]$p<0.05$ significant with respect to non-users

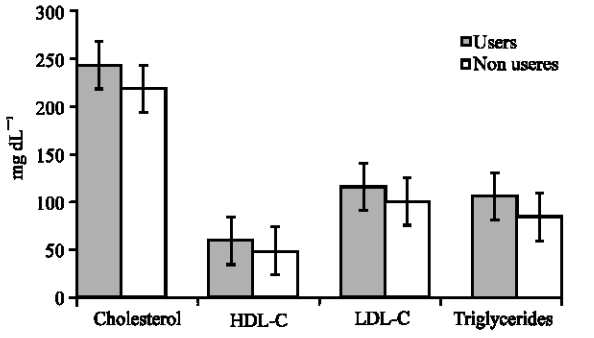

Fig. 1: Lipid profile of oral contraceptive users and non-users

(levonorgestrel) resulted in the less adverse effect on the lipid profile and have been suggested to lower the incidence of thrombosis as compared to other EE based contraceptives (Skouby *et al*., 2005). OCs containing levonorgestrel was associated with an almost four times higher risk of venous thrombosis as compared to non-users (Van Hylckama Vlieg *et al*., 2009). The intake of 100 μg levonorgestrel with 20 μg ethinyl estradiol to 28 women whom were at the risk of pregnancy shows a little change in lipid profile as compared to higher dose oral contraceptive preparation (Young and DelConte, 1999). Despite the changes in lipid profile among users of higher dose oral contraceptive agents, there is little and no effect on the long term risk artherogenic cardiovascular disease (Stampfer *et al*., 1990). The status of elevated serum triglyceride level may be an independent predictor of coronary heart disease as ethinyl estradiol increases hepatic secretion of triglyceride rich lipoprotein (Avins *et al*., 1989; Schaefer *et al*., 1983). The progestin component of the OC may oppose this increase. The injectable oral contraceptives have also been reported to increase the levels of triglycerides, total cholesterol, High Density Lipoprotein (HDL) cholesterol in the serum (Godsland *et al*., 1990).

CONCLUSION

The lipid profile depends on the brand of OCs or duration of their use. The users in our present study were taking OCs of ethinyl estradiol (0.03 μg), levonorgestrel (0.5 μg). The increase in the lipid profile may be attributed to their responsiveness to the drug. However, the long term effects were not taken into account in the present study, but still there is a need of a detailed study taking the various life style factors into the consideration.

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