

STATUS OF SERUM CALCIUM AND MAGNESIUM IN WOMEN TAKING ORAL CONTRACEPTIVE

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ABSTRACT

The oral contraceptive pill fulfills the great human need for birth control with unrivalled effectiveness. The pill can effectively prevent pregnancy and alleviate menstrual disorder when used correctly. Many biochemical profiles of women taking oral contraceptives are disturbed due to metabolic alterations induced by its hormone content. The study was carried out in the Department of Biochemistry, Mymensingh Medical College, Mymensingh, during the period of July 2016 to June 2017 to evaluate the status of serum calcium and magnesium in oral contraceptive user women. For this study, 120 age-matched women were selected and grouped as 60 oral contraceptive user women and 60 non-oral contraceptive user women. Data were analyzed with the help of SPSS version 21. Mean \pm SD level of serum calcium and magnesium were 9.50 ± 0.70 mg/dl and 1.81 ± 0.13 mg/dl in oral contraceptive user women, while in normal healthy women the levels were 9.03 ± 1.69 mg/dl and 2.10 ± 0.17 mg/dl respectively. No significant difference of serum calcium between two groups was observed ($p>0.05$). Serum magnesium significantly reduced in oral contraceptive users when compared with non-oral contraceptive users ($p<0.001$). The study showed no significant difference in serum calcium level in contraceptive group when compared with non-contraceptive user group and serum magnesium level was significantly reduced in oral contraceptive users when compared to normal healthy group.

Key Words: Oral contraceptives, Serum Calcium and Serum Magnesium.

Introduction

Contraceptives are devices or techniques that permit sexual union without resultant pregnancy¹. In Bangladesh among the available modern methods of contraceptives, about 30% couples use oral contraceptives². Combined oral contraceptives are highly effective, reversible and popular one³. Available and heavily used contraceptive in Bangladesh has been the oral pill (Sukhi) containing estrogen and progestin⁴. Oral contraceptive pill stops ovulation by preventing the ovaries from releasing ovum. They also

thicken cervical mucus making it harder for sperm to enter the uterus⁵. The major side effects were found to be dreaded conditions like malignancy and thromboembolic cardiovascular disease. Among the cardiovascular disorders, hypertension, myocardial infarction, hemorrhagic or ischemic strokes and venous thromboembolic conditions were mentionable⁶. There has been interest in recent years about alterations in various metabolic processes and trace elements profiles associated with the use of

contraceptives. Changes in life style, environmental factors, dietary habits and active ingredients of hormonal agents have been known to affect status of micronutrients in humans⁷. Changes in tissue level or bioavailability of those elements could play a significant role in health risk and the pathogenesis of some disorders such as cardiovascular complications, the aging process, and certain cancers have been associated with the use of contraceptives⁸.

Calcium is the most abundant mineral in the body. About 98% of calcium in the adult is in the form of hydroxyapatite in the skeleton⁹. Calcium, regulated by parathormone and thyrocalcitonin, has been implicated in virtually every metabolic function and is of major importance in bone formation, the blood clotting mechanisms and in the activation of certain enzyme systems, e.g. adenylyl cyclase¹⁰. There is association between oral contraceptives with serum calcium level, which may lead to osteoporosis¹¹.

Magnesium is an essential element in biological systems. Mg is a cofactor in more than 300 enzyme systems that regulate various biochemical reactions in the body, including protein synthesis, muscle and nerve functions, contributes to the structural development of bone¹². Serum magnesium levels might be reduced by oral contraceptive use¹¹. Reduction in serum magnesium levels may be the one of the reason for increased risk of thrombosis while using oral contraceptives in users¹³.

Materials and Methods

This cross-sectional study was carried out in the Department of Biochemistry, Mymensingh Medical College, and the subjects were collected from the Model Family Planning Clinic of Mymensingh Medical College Hospital during the period of July 2016 to June 2017. For this 60 apparently healthy married women with age ranging from 20 to 35 years taking no hormonal

contraceptives for at least one year selected as controls (Group-A) and age- matched 60 married women taking oral contraceptive pill for last 03 months were taken as cases (Group-B). Subjects having systemic illness like diabetes mellitus, hypertension, tuberculosis, kala-azar were excluded from the study. Apparently looking obese, taking other hormonal contraceptive pill other than combined estrogen progesterone preparation and subject taking drugs containing calcium and magnesium for last 6 months were also excluded. Informed written consent was taken from each study subject and ethical approval for the study was obtained from the Ethical Committee of Mymensingh Medical College and Hospital.

Height, Body weight and Blood pressure were measured and Body Mass Index (BMI) was calculated. Serum calcium and magnesium were measured by colorimetric method using the test kit. Data was analyzed with the help of SPSS version 21. Quantitative data were expressed as mean and standard deviation and comparison between groups was done by Student's unpaired 't' test.

Results

In this study, mean(\pm SD) age of controls (Gr-A) and cases (Gr-B) were 28.0 ± 4.50 years and 28.10 ± 4.52 years respectively, which showed no significant difference ($p > 0.05$). Mean(\pm SD) BMI of controls and cases were 21.63 ± 2.11 kg/m² and 21.67 ± 2.11 kg/m² respectively, which showed no significant difference ($p > 0.05$) as shown in table I:

Table-I: Demographic features of study subjects.

Demographic features	Group-A (control) Mean \pm SD	Group-B (case) Mean \pm SD	p value
Age years	28.00 \pm 4.50	28.10 \pm 4.52	0.904 ^{ns}
BMI (kg/m ²)	21.63 \pm 2.11	21.67 \pm 2.11	1.000 ^{ns}

Data were expressed as mean and standard deviation and comparison between groups was done by Student's unpaired 't' test.

Table II shows the level of serum calcium and magnesium in study subjects. The study revealed that mean(\pm SD) of serum calcium level (mg/dl) in controls and cases were 9.03 ± 1.69 and 9.50 ± 0.70 respectively which showed no significant difference. Mean \pm SD of serum magnesium (mg/dl) were 2.10 ± 0.17 and 1.81 ± 0.13 in controls and cases respectively which was significantly lower in cases ($p < 0.001$).

Table-II: Serum calcium and magnesium levels of the study subjects.

Biochemical parameters	Group-A (control)	Group-B (case)	p value
	Mean \pm SD	Mean \pm SD	
Calcium (mg/dl)	9.03 ± 1.69	9.50 ± 0.70	<0.065 ns
Magnesium (mg/dl)	2.10 ± 0.17	1.81 ± 0.13	<0.001**

Data were expressed as mean and standard deviation and comparison between groups was done by Student's unpaired 't' test.

Discussion

The oral contraceptive pill fulfills the great human need for birth control with unrivalled effectiveness¹⁴. The pill can effectively prevent pregnancy and alleviate menstrual disorder while used correctly¹⁵. Many biochemical parameters of women taking oral contraceptives are disturbed due to metabolic alterations induced by its hormone content. Researches had been continuing for many decades to explore risk versus benefits of different contraceptive methods. The present study was designed to observe some biochemical alterations in women taking combined oral contraceptives containing 30- μ gm ethinyl estradiol and 150- μ gm levonorgestrel. Combined oral contraceptives (Sukhi) is the mostly used brand in rural community as it is distributed free of cost¹⁶. Therefore, metabolic alteration might be initiated earlier that go on silently without developing any overt clinical abnormality. On the contrary, long time use of hormones such as

oral contraceptives can affect various metabolic pathways to such an extent that would cause detectable clinical abnormality¹⁷.

In our study there was no significant difference of serum calcium level in oral contraceptive user women when compared with non oral contraceptive user women which is in agreement with several other studies^{18,19}.

Calcium regulated by parathormone and thyrocalcitonin, has been implicated in virtually every metabolic function and is of major importance in bone formation¹⁰. The bone remodeling cycle involves sequential steps with a highly complex regulation in which sex steroids play a pivotal role. Estrogens are major determinants of bone mass, effecting the acquisition of peak bone mass during adolescence and young adult age and modulating bone mineral density (BMD) and the risk of osteoporosis later in life²⁰. Combined oral contraceptives (OCs) induce a reduction of the endogenous production of estrogen by the ovaries, and a suppression of that of progesterone. In women taking those hormonal contraceptives, circulating levels of sex steroids are mainly determined by the dosages present in the contraceptive formulation. Akinloye *et al.* (2011) reported that serum calcium showed no significant correlation with the duration of contraception in the combined contraceptive pill users. Dietary habit, socio-economic conditions, free from any disease condition, dosages and formulation of contraceptives may be responsible for these findings.

Increase level of serum calcium was found in other studies in oral contraceptive user women compared to non oral contraceptive user women, which is conducted in Indian and European population^{1,20}. It is possible that the use of oral contraceptives is most often associated with increase absorption of calcium. Apart from increase absorption of calcium, it probably plays a role in calcium homeostasis, which brings about

a net effect of increased calcium mobilizations from the bone leading to bone demineralization. This may predispose individuals on these contraceptives to osteoporosis²¹.

In our study, we found highly significant decrease in serum magnesium level in oral contraceptive user women when compared with non oral contraceptive user women, which is in agreement with European and Indian study^{1,12}. It seems that reduced level of serum magnesium after oral contraceptive therapy may be the results of estrogen activity. Estrogen inhibits bone resorption and may also prevent magnesium release from osseous sites²¹. This implies that, oral contraceptive may play some role either at the level of absorption, distribution or metabolism of magnesium which may be the causes of hypomagnesemia in oral contraceptive user women¹.

In conclusion, the study showed that serum calcium level did not differ significant by and but serum magnesium level was significantly reduced in contraceptive users group when compared to normal healthy control group. Considering the side effects, close biochemical monitoring and follow up must be emphasized for women on oral contraceptive. Dietary supplements may be necessary, especially where levels are significantly reduced the clinician and gynecologist to keep an eye should serum calcium and magnesium level for better management of various medical problems in OCP user women in Bangladesh. A large-scale prospective study with the application of modern sophisticated technology to elucidate alteration in biochemical parameters including other trace elements is recommended.

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