

The Relationship between Hormonal Contraceptives and Metabolic Syndrome

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Abstract

Original Research Article

Background: Metabolic syndrome (MS) in women using hormonal contraceptives (HCs) are common health hazards all over the world than that of contraceptives non users. **Objective:** To observe the relationship of hormonal contraceptives with metabolic syndrome. **Method:** This cross-sectional study was carried out in the Department of Physiology, Dhaka Medical College Hospital, Dhaka, during the period from January to 31 December, 2011. Two hundred women age ranged 20-35 years using hormonal contraceptives were included in this study group. The study group was subdivided into oral contraceptive users (Group B) and injectable contraceptive users (Group C). All the women using hormonal contraceptive were selected from Model clinic and Medicine ward in DMC and also from different areas of Dhaka city. **Results:** In this study, the BMI value in both oral and injectable contraceptives users were significantly ($P<0.001$) higher than that of contraceptive non users. Within the study groups, the BMI in oral and injectable contraceptives users for 1-5 years were significantly lower ($P<0.001$) than that of oral contraceptive users for 6-10 years. The waist circumference (WC) in all oral and injectable contraceptives users for 1-5 years and 6-10 years were significantly ($P<0.001$) higher than that of contraceptive non users. **Conclusion:** Percentage of distribution of subjects having metabolic syndrome was higher in women using hormonal contraceptives and increase duration of hormonal contraceptives use progressively increase the level of parameters of metabolic syndrome. So, it may be concluded that women using hormonal contraceptives are more prone to develop metabolic syndrome.

Keywords: Metabolic syndrome, hormonal contraceptive, triglycerides.

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INTRODUCTION

The metabolic syndrome is a group of risk factors for cardiovascular diseases, including high blood pressure, dyslipidaemia with low levels of high density lipoprotein or raised triglycerides, altered glucose metabolism or insulin resistance and obesity. These factors together increase the risk of development of heart disease and type 2 diabetes mellitus [1]. According to IDF (international Diabetes Federation), criteria's for diagnosis of metabolic syndrome include central obesity plus any two of the following four factors such as raised triglycerides (TG) level, reduced high density lipoprotein cholesterol (HDL), raised blood pressure, raised fasting plasma glucose level [2].

Obese women who use hormonal contraceptives have increased risk of cardiovascular

diseases and diabetes mellitus than non-obese women [3].

Oral contraceptives that contain progesterone induce various metabolic effects such as hypertension, decrease HDL-C, increase blood glucose level which accelerate myocardial infarction (MI) and stroke [4].

The oral contraceptive pill is associated with threefold increase in the relative risk of venous thromboembolism (VTE). But the risk returns to normal within three months of stopping the pill. Myocardial infarction, stroke cardiovascular disease is also the side effects of hormonal contraceptives. Hypertension is also common in hormonal contraceptives users but stopping the pill, results return of blood pressure normal within three months. The other metabolic effects of oral contraceptive pill include decreased glucose tolerance result in glycosuria and hyperlipidaemia. Injectable hormonal contraceptives cause irregular menstrual

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cycle which is the most common side effect. In long term use, there are increased risk of breast and ovarian cancer [5].

Hormonal contraceptives cause an increase in the cardiovascular mortality and morbidity. They also cause central obesity, dyslipidaemia, hypertriglyceridaemia, glucose intolerance, hypertension [6].

OBJECTIVE

General Objective

To observe the relationship of hormonal contraceptives with metabolic syndrome

Specific Objectives

1. To measure waist circumference and calculate BMI in women using hormonal contraceptives in order to observe the status of their obesity.
2. To measure the fasting blood glucose level in the same group of women to observe their glucose level.
3. To estimate serum TC, TG, LDL-C, HDL-C levels in women using hormonal contraceptives to observe their lipid profile.

METHODOLOGY

Study type : Cross sectional study.

Study period : From January 2011 to December 2011.

Study place : Department of Physiology, Dhaka Medical College.

Sample size : Total number of 300 female subjects with age ranging from 20-35 years.

Study population

A total number of 200 women using hormonal contraceptives for one to ten years. They were selected from Model clinic and Medicine ward of Dhaka medical college and also from different areas of Dhaka city.

SELECTION CRITERIA

INCLUSION CRITERIA

For both groups: a. Age ranged from 20 to 35 years

For study group: a. women using hormonal contraceptives for one year.

For control group: Apparently healthy women who do not use hormonal contraceptives.

EXCLUSION CRITERIA

For both groups

- a) Women with age more than 35 years and less than 20 years.
- b) Women with heart, liver, kidney diseases, and any endocrine diseases like thyroid diseases and

any other chronic diseases like Tuberculosis and malignancy

- c) Women smoker and alcohol user.

Study procedure

After selection of the subjects, the objectives, nature, purpose and benefit of the study were explain to the subjects in details. Ethical permission was taken from ethical committee of DMC. Detail medical history, menstrual history was taken. Anthropometric measurement of the subjects were taken and recorded in a predesign data collection form. Then with all aseptic precaution 5 ml of fasting blood sample were collected from all study subjects for estimation of serum glucose and lipid profile.

Sampling technique

With all aseptic precautions 5 ml blood from each study subject was collected after an overnight fast (at least 12 hours) from median cubital vein by disposable plastic syringe. The needle was detached from the nozzle and blood was transferred into a dry, clean and plain test tube with a gentle push to avoid haemolysis. The test tube was kept in standing position till formation of clot. Then blood was centrifused at a rate of 3000 rmp for 15 minutes.

DATA ANALYSIS

All parametric variables were expressed as mean± SD (standard deviation). Comparison between two groups were done by unpaired Student's t' test and Chi- Square test accordingly applicable. Correlation analysis was done by Pearson's correlation (r) test. P value <0.05 was considered as significant. Analysis was performed by using a computer based statistical programme SPSS (statistical package for social science) version 12.

RESULTS

Table-I: BMI and WC in different groups

Groups	n	BMI (kg/m ²) (Mean±SD)	WC (cm) (Mean±SD)
A	100	24.65±1.44	79.10±3.20
B1	74	27.46±2.22	88.36±6.11
B2	26	29.63±2.42	88.40±5.67
C1	69	27.58±2.53	86.96±6.37
C2	31	30.32±3.21	88.65±5.87
Statistical Analysis			
Groups	BMI (p value)	WC (p value)	
A vs B ₁	0.0001***	0.0001***	
A vs B ₂	0.0001***	0.0001***	
A vs C ₁	0.0001***	0.0001***	
A vs C ₂	0.0001***	0.0001***	
B ₁ vs B ₂	0.0001***	0.9730 ^{ns}	
B ₁ vs C ₁	0.758 ^{ns}	0.152 ^{ns}	
B ₂ vs C ₂	0.374 ^{ns}	0.876 ^{ns}	

C ₁ vs C ₂	0.0001***	0.213 ^{ns}
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The results of BMI in different groups are shown in Table- I

The mean (\pm SD) BMI were 26.65 \pm 1.44, 27.46 \pm 2.22, 29.63 \pm 2.42,

27.58 \pm 2.53 & \pm 3.21 kg/m² in group A, B1, B2, C1 & C2 respectively. The BMI in group B1, group B2, group C1 and group C2 were higher than that of

group A which was statistically highly significant ($p < 0.001$). The results of WC in different groups are shown in Table-I.

The mean (\pm SD) WC were 79.10 \pm 3.20, 88.36 \pm 6.11, 88.40 \pm 5.67, 86.96 \pm 6.37 & 88.65 \pm 5.87 kg/m² in group A, B1, B2, C1 & C2 respectively.

The WC in group B₁ and group B₂, in group C1 and group C2 were higher than that of group A which was statistically highly significant ($p < 0.001$).

Table-II: Systolic and diastolic blood pressure in different groups

Groups	n	Systolic blood Pressure (mmHg) (Mean \pm SD)	Diastolic blood Pressure (mmHg) (Mean \pm SD)
A	100	110.30 \pm 10.00	74.70 \pm 7.17
B1	74	124.59 \pm 19.94	84.53 \pm 11.11
B2	26	127.69 \pm 22.86	87.31 \pm 9.08
C1	69	131.74 \pm 22.55	87.75 \pm 10.06
C2	31	126.13 \pm 24.18	84.35 \pm 12.57
Statistical Analysis			
AvsB ₁	0.0001***		0.0001***
AvsB ₂	0.0001***		0.0001***
AvsC ₁	0.0001***		0.0001***
AvsC ₂	0.0001***		0.0001***
B ₁ vsB ₂	0.514 ^{ns}		0.254 ^{ns}
B ₁ vsC ₁	0.046*		0.071 ^{ns}
B ₂ vsC ₂	0.804 ^{ns}		0.322 ^{ns}
C ₁ vsC ₂	0.263 ^{ns}		0.1s2 ^{ns}

The results of SBP were shown in Table II

The mean (\pm SD) SBP were 110.30 \pm 10.00, 124.59 \pm 19.94, 127.69 \pm 22.86, 131.74 \pm 22.55 & 126.13 \pm 24.18 mm of Hg in group A, B₁, B₂, C₁, & C₂ respectively.

The SBP in group B1 and group B2, in group C1 and group C2 were higher than that of group A which was statistically highly significant ($p < 0.001$).

Within the study groups, the DBP in group B1 were lower than that of group B2 and in group C1 which was statistically non-significant. But, the DBP in group B2 were higher than that of group C1. Both values were statistically non-significant.

Table-III: Serum TC, TG, HDL-C, LDL-C levels in different groups

Groups n	TC (mg/dl) (Mean \pm SD)	TG (mg/dl) (Mean \pm SD)	HDL-C (mg/dl) (Mean \pm SD)	LDL-C (mg/dl) (Mean \pm SD)
A 100	169.14 \pm 27.94	101.93 \pm 42.65	50.95 \pm 5.67	82.67 \pm 15.49
B1 74	191.92 \pm 53.58	113.20 \pm 49.24	38.57 \pm 9.33	110.03 \pm 20.02
B2 26	204.92 \pm 57.82	127.85 \pm 57.59	39.42 \pm 7.37	120.23 \pm 14.91
C1 69	189.64 \pm 50.44	116.23 \pm 47.30	36.65 \pm 8.22	106.04 \pm 16.17
C2 31	236.29 \pm 41.48	135.97 \pm 52.66	36.97 \pm 6.32	105.84 \pm 16.75
Statistical analysis				
Groups	TC (p value)	TG (p value)	HDL-C (p value)	LDL-C (p value)
AvsB1	0.0001***	0.018 ^{ns}	0.0001***	0.0001***
AvsB2	0.0001***	0.012*	0.0001***	0.0001***
AvsC1	0.0001***	0.042*	0.0001***	0.0001***
AvsC2	0.0001***	0.0001***	0.0001***	0.0001***
B1 vs B2	0.300 ^{ns}	0.215 ^{ns}	0.673 ^{ns}	0.020 ^{ns}
B1 vs C1	0.794 ^{ns}	0.708 ^{ns}	0.196 ^{ns}	0.195 ^{ns}
B2 vs C2	0.021*	0.581 ^{ns}	0.181 ^{ns}	0.001**
C1 vs C2	0.0001***	0.065 ^{ns}	0.850 ^{ns}	0.954 ^{ns}

The results of LDL are shown in Table IV
The mean (+SD) LDL levels were 82.67±15.49, 110.03±20.02, 120.23±14.91, 106.04±16.17, 105.84±16.75 respectively.

The LDL levels in group B1, B2, C1 & C2 were higher than that of group A. All of these values were statistically highly significant (P<0.001). Within

the study groups, the LDL in group B1 were lower than that of group B2 which was statistically significant (P<0.05). In group Bi, LDL levels were higher than that of group C₁ which was statistically non-significant. The LDL in group B2 were higher than that of group C₂ which was statistically significant (P<0.0 I). In group Ci, the LDL value was higher than that of group C2 which was statistically non-significant.

Table-IV: Distribution of subjects of metabolic syndrome in different groups

Groups	Positive (n=185) No. (%)		Negative (n=115) No. (%)		p value
	A	21	(11.4)	79	
B1	65	(35.1)	9	(7.8)	
B2	19	(10.3)	7	(6.1)	
C1	55	(29.7)	14	(12.2)	
C2	25	(13.5)	6	(5.2)	

Distribution of subjects having metabolic syndrome in different groups are shown in Table -IV

Out of 200 study subjects, three and more than three components were present in 65(35.1%) subjects of group Bi, 19(10.3%) subjects of group B₂, 55(29.7%) subjects of group Ci, 25(13.5%) subjects of group C₂.

DISCUSSION

In this study, 200 women using hormonal contraceptives with age ranging from 20 to 35 years were considered as study group and 100 apparently healthy women who do not use contraceptives with age ranging from 20 to 35 years were included as control group for comparison.

In our study to observe the status of obesity waist circumference was measured and basal metabolic index was calculated in women using contraceptives. In the same group of women fasting blood glucose level was measured to observe their status. Again to observe their lipid profile total cholesterol, triglycerides, high density lipoprotein cholesterol and low density lipoprotein cholesterol were estimated. Furthermore, BP was measured in women using contraceptives to observe some aspects of cardiovascular status.

In the present study, all the parameters of metabolic syndrome in healthy women who do not use contraceptives were within reference values, which were also reported by different investigators of other country [7].

In the present study both SBP and DBP were significantly (P<0.001) higher in both the oral and injectable contraceptives users than that of contraceptives non users. These results were consistent with the results of other study. In the present study, serum TC TG LDL-C levels were increased and serum HDL-C level was decreased in

women using contraceptives than that of contraceptives non users. These findings were in agreement with the study of many researchers [9]. Similar type of study was done by Odmark *et al*. but they did not find any significant difference in serum TC level between contraceptives users and contraceptives non users. This inconsistency of result may be due to long time follow up of the study subjects in their study [9].

However, in this study, serum HDL-C level was significantly lower (P<0.001) in women using contraceptives than that of contraceptives nonusers. This result was consistent with the results of other study [10-12].

Again, serum LDL-C levels showed positive correlation in oral and injectables. Contraceptives users for 1-5 years and injectables contraceptives users for 6-10 years group and showed negative correlation in oral contraceptives users for 1-5 years group which was statistically significant in oral contraceptives users for 1-5 years group (P<0.001).

CONCLUSION

In the present study, central obesity, dyslipidaemia hypertension and hyperglycemia are present in women using hormonal contraceptives. Furthermore, percentage of distribution of subjects having metabolic syndrome was also higher in women using hormonal contraceptives and increase duration of hormonal contraceptives use progressively increase the level of parameters of metabolic syndrome. So, it may be concluded that women using hormonal contraceptives are more prone to develop metabolic syndrome.

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