

Research Article

Metabolic Syndrome among a Sample of Women using Contraceptives

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Abstract

Background: Metabolic Syndrome (MS) is a disorder defined by interconnected obesity-related risk factors that increase the risk of cardiovascular diseases, and diabetes mellitus in addition to several diseases. Several medications may increase the risk of MS by affecting lipid or glucose metabolism as well as weight gain or insulin resistance.

Objective: The present study aimed to investigate the effects of hormonal contraceptives on the prevalence and clinical patterns of MS among a sample of Yemeni women.

Methods: A cross-sectional study was conducted on a total of 183 women using contraceptives. The study was performed between the February 1st, 2018 and March 30th, 2018 in some government health facilities, private health facilities, and community pharmacies in IBB city, Yemen. Blood pressure, waist circumference, serum glucose, serum triglycerides, and HDL cholesterol were measured. MS was diagnosed according to the criteria of the US National Cholesterol Education Program (NCEP).

Results: The prevalence of metabolic syndrome among women using hormonal contraceptives was 41%. All measured parameters were elevated in the contraceptive users. These parameters have also been found increased with increasing age.

Conclusion: The hormonal contraceptives can induce metabolic syndrome in women who used it by their effects on blood pressure, abdominal obesity, lipid profile, serum glucose, and insulin resistance.

Keywords: Metabolic Syndrome; NCEP; Hormonal Contraceptives

Introduction

Metabolic Syndrome (MS) represents an important challenge health problem worldwide because of the significant changes to lifestyle, environment, and social behavior brought by advances in science and technology. Metabolic syndrome is a group of metabolic risk factors that predispose an individual to develop several diseases including cardiovascular diseases and type 2 diabetes mellitus. These factors include: abdominal obesity, elevated blood pressure, insulin resistance, low High Density Lipoproteins (HDL) levels, and elevated blood Triglycerides (TGs) [1]. The diagnosis of metabolic syndrome can be achieved according to the criteria of the US National Cholesterol Educational Program Adult Treatment Panel (NCEP III), the International Diabetes Foundation (IDF) criteria, and the WHO criteria.

Chronic use of certain medications such as glucocorticoid hormones, contraceptives, diuretics, beta-blockers, and

antipsychotics may increase the risk of the metabolic syndrome by either promoting weight gain or altering lipid or glucose metabolism and insulin resistance [2]. Many previous studies reported the deleterious effects of hormonal contraceptives on blood pressure, lipid profile, body weight and serum glucose concentrations [3-5]. Elevated blood pressure has been contraceptives reported by women and health providers, and represents one of the most frequent reasons for contraceptive discontinuation [6].

Khat (*Catha edulis*) is a plant grown on the eastern coast of Africa as well as in Yemen. Its leaves are chewed by the local people for their for its pleasant stimulant effect on physical activity, consciousness, motor and mental functions as well as its anti-fatigue action. Khat habituation is common and has a deep-rooted social and cultural tradition in populations in these regions; several millions are regular khat chewers [7].

Thus, the aim of present study was to investigate the effects of hormonal contraceptives on the prevalence and the clinical patterns of metabolic syndrome among a sample of Yemeni women. Smoking and khat-habituation have also been explored.

Methods

The study was a cross-sectional study conducted on a sample of 183 women using contraceptives recruited from different health facilities in IBB city, a centrally-located city in Yemen, during the period between March 1st, and April 30th, 2018. Health facilities were classified into government health facilities, private health facilities, and community pharmacies. Patients with diabetes mellitus,

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secondary hypertension, Cushing syndrome, and hypothyroidism were excluded from the study.

Weight was measured with electronic balance and expressed in kg. Height was measured by a ruler attached to the wall and expressed in cm. Body mass index was then calculated. Waist circumference was measured at the trochanter level. Blood pressure was measured using digital automatic blood pressure monitor after 10 mins of resting in a sitting position. Both systolic and diastolic blood pressures were recorded. Fasting blood samples from the antebrachial vein were taken after an overnight fast. Biochemical assessments were fasting blood sugar, serum high density lipoproteins, and serum triglycerides.

Smoking and khat chewing habits were assessed by a questionnaire. Khat (*Catha edulis*) is a plant grown on the eastern coast of Africa as well as in Yemen. Its leaves are chewed by the local people for their for its pleasant stimulant effect on physical activity, consciousness, motor and mental functions as well as its anti-fatigue action. Khat habituation is common and has a deep-rooted social and cultural tradition in populations in these regions; several millions are regular khat chewers.

Metabolic syndrome was diagnosed according to criteria made by the US National Cholesterol Education Program Adult treatment Panel III (NCEP ATP III, [8]) which requires at least three of the following: waist circumference >102 cm (in male) or >88 cm (in female); blood pressure \geq 130/85 mmHg or on anti-hypertensive therapy; fasting blood glucose \geq 100 mg/dl or on hypoglycemic therapy; triglycerides \geq 150 mg/dl or on therapy for this abnormal lipid; HDL-cholesterol <40 mg/dl (in male) or <50 mg/dl (in female).

Statistical analysis was performed using Statistical Package for Social Science Software (SPSS, version 15) and Microsoft office Excel 2010 was used for data processing and statistical analysis. The chi-squared test was used for the assessment of association between the variables studied. The p-value of less than 0.05 was significant statistically.

Results

The total number of the study sample was 183 women taken from different health facilities. Socioeconomic characteristics of the included sample are represented in Table 1. High proportions of participant women (33.9%) were found current smokers. However, smoking habit was less prevalent than khat habituation which was in about 76.5% of the participant women.

Majority of the participant women (74.3%) were using hormonal contraception methods while 25.7% of the participant women were on non-hormonal contraceptive methods. Hormonal combined oral contraceptives were the most common method (44.3%) used by participant women followed by intrauterine device insertion (24%) and progestin only contraceptives “minipills” (21.3%). Other less common contraceptive methods were injectable progestin (6.6%), implants (1.6%), and patches (0.5%). Women who have been using natural method of contraception “schedule” about 1.6% (Table 2).

Metabolic syndrome was established in about 41% of the participant women using contraceptives. The prevalence was increasing with increasing age from 28.4% in women less than 27 years old, reaching 100% in women over 48 years old (Table 3 and Figure 1).

The components of metabolic syndrome were calculated (Table 4 and Figure 2). First, insulin resistance was estimated by measuring

Table 1: Demographic characteristics of the participant women.

Characteristic	Frequency (n)	Percent (%)
Hospital		
Government health facility	115	62.8
Private health facility	49	26.8
Community pharmacy	19	10.4
Age		
18-27 years	67	36.6
28-37 years	91	49.7
38-47 years	24	13.1
>48 years	1	0.5
Occupation		
Housewife	174	95.1
Teacher	7	3.8
Nurse	2	1.1
Body mass index		
<18.5 = underweight	4	2.2
18.5-24.9 = normal	65	35.5
25-29.9 = overweight	61	33.3
30-34.9 = obese	38	20.8
>35 = very obese	15	8.2
Smoking		
No	121	66.1
Yes	62	33.9
Khat habituation		
No	43	23.5
Yes	140	76.5
Total	183	100.0

Table 2: Types of contraceptives used participant women.

Age	Frequency (n)	Percent (%)
COCs	81	44.3
Minipills	39	21.3
Injectable progestin	12	6.6
IUD	44	24.0
Patches	1	0.5
Implant	3	1.6
Schedule	3	1.6
Total	183	100.0

Table 3: Prevalence of metabolic syndrome among women using contraceptives (%).

Metabolic syndrome	Age categories				Total
	18-27 yrs	28-37 yrs	38-47 yrs	>48 yrs	
Not established MS	71.6%	54.9%	41.7%	0%	59.0%
Established MS	28.4%	45.1%	58.3%	100.0%	41.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

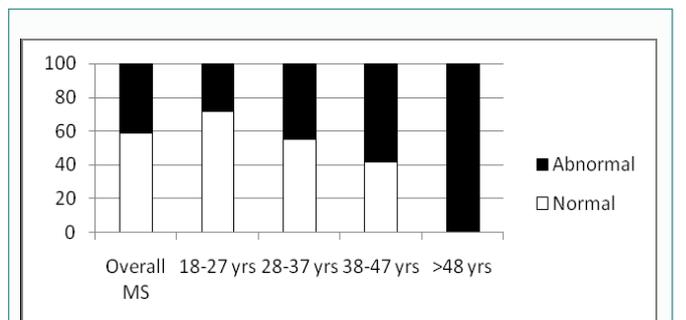


Figure 1: Overall prevalence of metabolic syndrome and according to age categories (%).

Table 4: Prevalence of components of metabolic syndrome (%).

	Age categories				Total
	18-27 yrs	28-37 yrs	38-47 yrs	>48 yrs	
Insulin resistance					
FBG<100 mg/dL, not using hypoglycemic drugs	44.8%	45.1%	16.7%	0%	41.0%
FBG>100 mg/dL, or using hypoglycemic drugs	55.2%	54.9%	83.3%	100.0%	59.0%
Abdominal obesity					
female waist circumference <88 cm	65.7%	28.6%	16.7%	0%	40.4%
female waist circumference >88 cm	34.3%	71.4%	83.3%	100.0%	59.6%
TGs dyslipidemia					
TGsv<150 mg/dL; not using hypolipemic drugs	73.1%	51.6%	50.0%	0%	59.0%
TGs>150 mg/dL; or using hypolipemic drugs	26.9%	48.4%	50.0%	100.0%	41.0%
HDL dyslipidemia					
HDL <50 mg/dL in female; not using hypolipemic drugs	89.6%	86.8%	83.3%	100.0%	87.4%
HDL >50 mg/dL in female; using hypolipemic drugs	10.4%	13.2%	16.7%	0%	12.6%
Blood pressure					
SBP<130 mmHg, DBP<85 mmHg, or not using antihypertensive drugs	37.3%	46.2%	54.2%	0%	43.7%
SBP>130 mmHg, DBP>85 mmHg, or using antihypertensive drugs	62.7%	53.8%	45.8%	100.0%	56.3%

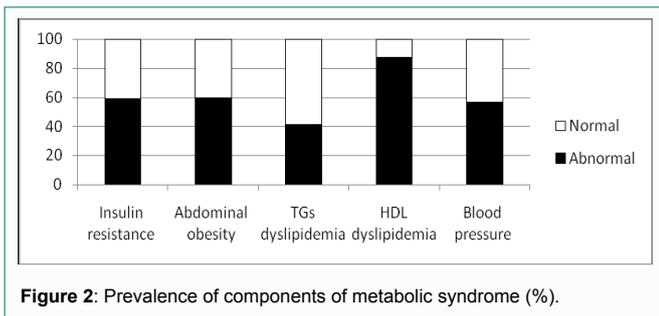


Figure 2: Prevalence of components of metabolic syndrome (%).

fasting blood glucose. Insulin resistance among participant women was assigned as normal if the fasting blood glucose was less than 100 mg/dL. The results showed increased insulin resistance (59%) among participant women using contraceptives. The results also showed that increased insulin resistance was increasing with age. Impaired fasting blood glucose was 51.9% among women less than 27 years old, reaching 100% in women over 48 years old.

In addition, abdominal obesity among participant women was assigned as normal if the waist circumference was less than 88 cm. Abdominal obesity were established in about 59.6% of participant women taking contraceptives. Similarly, the results showed that abdominal obesity among participant women was increased with age. Abdominal girth was 34.3% among women under 27 years old and reached 100% in women over 48 years old.

Moreover, hypertriglyceridemia was estimated by measuring fasting blood triglycerides. Hypertriglyceridemia among participant women was assigned as normal if the fasting triglycerides level was less than 150 mg/dL. The results revealed that fasting triglycerides were increased in about 41% of the participant women as compared with 59% who had normal serum triglycerides. In contrast, the results showed levels of serum triglycerides among participant women using

contraceptives were increasing with age. Elevated serum triglycerides levels were 26.9% among women under 27 years old and reached 100% among women over 48 years old [9].

Furthermore, High Density Lipoproteins (HDL) levels were significantly decreased among 87.4% of the participant women taking contraceptives. The levels were assigned as abnormal if the fasting HDL level was less than 50 mg/dL, and normal if level more than this value. HDL levels were not linked significantly with age. Low HDL levels were about 87.4% among women aged between 38-47 years old and reached 100% among women over 48 years old.

Finally, blood pressure among participant women was assigned as normal if the level of systolic blood pressure was less than 130 mmHg and diastolic blood pressure less than 85 mmHg. The results showed high blood pressure in about 56.3% of participant women taking contraceptives. The results showed similar levels of blood pressure among participant women; however, elevated pressure was most predominant among older age. Elevated blood pressure was found in 45.8% among women aged between 38-47 years old and reached 100% in women over 48 years old.

Discussion

In the present study, women using contraceptives were taken from different health facilities including government and private health facilities as well as community pharmacies. Majority of the participants were aged between 18 and 37 years, while minority was above 38 years old. This indicates that the age period between 18-37 years is the most fertile period of life in which women seeks family planning methods. Tribal community habits were prevalent in Yemen; this fact could be reflected by the results of our study which showed that most women (95.1%) were non-employed (housewife), and these data also express the high prevalent of un-employment among females in one of the poorest developing countries, Yemen. The results expressed more than sixty two percent of the respondents were overweight or obese; these data go in line with previous studies [10].

Contradictory results of insulin resistance had been reported in the literature. High insulin resistance was manifested by elevated serum glucose among women using contraceptives were observed in the present study (59.6%); these results had also been observed by previous study [11]. Other study also reported no significant changes in glucose levels after oral contraceptives [12]. The mechanism by which hormonal contraceptives causes an increase in glucose levels could be attributed to weight gain associated with contraceptive use or the glucocorticoid-like activity of progestin [12].

In the present study, abdominal obesity, body mass index, fasting blood sugar, triglycerides, and blood pressure were increased among contraceptive using women. In the other hand, HDL-cholesterol levels were significantly reduced. It has been reported that the use of certain medications may increase the risk of the metabolic syndrome by either promoting weight gain or altering lipid or glucose metabolism [2]. For example, previous study demonstrated that women using depot medroxyprogesterone acetate had a greater increase in all measures of fatness (body weight, fat mass, and the ratio of central to peripheral fat mass) than women using no hormonal method of contraception [13]. Another study showed that both depot medroxyprogesterone acetate and oral contraceptives increased body weight, body fat and central to peripheral fat ratio [14].

Triglycerides dyslipidemia was observed among 41% of contraceptive using women. These findings are in agreement with previous studies [15,16]. Combining estrogen and progestin in oral contraceptives is primarily responsible for the contraceptive action, but it has been implicated as a risk factor for coronary heart disease, perhaps through the promotion of potentially adverse changes in lipid and carbohydrate metabolism [17].

In the present study, blood pressure was elevated in about 56.3% of the contraceptive using women. This was in agreement with other studies which reported higher blood pressure among the contraceptive users [15,18]. The etiology of hypertension due to hormonal contraceptives may involve an increase in plasma rennin activity, the sympathetic nervous system, the alteration of prostaglandin synthesis, changes in the pituitary adrenal axis and genetic predisposition [19].

The effects of hormonal contraceptives on the measured parameters obtained in the present study and the presence of metabolic syndrome cases among women using contraceptives support the previous studies that stated that the use of certain medications may increase the risk for development of metabolic syndrome by either promoting weight gain or altering lipid or glucose metabolism [20].

Conclusion

Hormonal contraceptives use increases the risk of metabolic syndrome in women who used it by their effects on abdominal obesity, body weight, lipid profile, and serum glucose concentrations.

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