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Prevalence of metabolic syndrome in a sample of population in Erbil city, Iraq

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Abstract

Background and objective: There has been a recent concern about chronic non-communicable diseases in Iraq. The country is undergoing an epidemiological transition with an increasing burden of chronic non-communicable diseases with two-thirds of the people aged 25-65 years old are overweight and one-third are obese. This study aimed to estimate the prevalence of metabolic syndrome with their associated risk factors among a sample of peoples in Erbil city.

Methods: This cross-sectional analytic study was carried out in Erbil city and involved a convenience sample of 566 apparently healthy subjects. A structured direct interview using interviewer administered questionnaire was applied. Anthropometric measures, random blood sugar, cholesterol level, triglyceride level, low-density lipoprotein and high-density lipoprotein were investigated.

Results: The prevalence of metabolic syndrome in the studied sample was 30.6%. The prevalence was higher in females (45.5%) than males (16.3%). Variables like gender (P <0.001), age (P = 0.008), education and marriage (P = 0.001), family history of diabetes mellitus (P = 0.029), hyperlipidemia (P <0.001), hypertension (P = 0.047) and obesity (P = 0.005) were found to be factors that significantly associated with metabolic syndrome.

Conclusions: Metabolic syndrome is prevalent among the studied population. Female gender, old age, marriage, family history of diabetes mellitus, hyperlipidemia, hypertension and obesity may be regarded as risk factors for metabolic syndrome.

Keywords: Metabolic syndrome; Diabetes mellitus; Obesity; Hyperlipidemia; Erbil.

Introduction

fatty deposition occurs under the skin in the anterior abdominal wall, buttocks, in the arterial wall, inside the liver (causing fatty liver) and other parts of the body. Metabolic syndrome is a cluster of abnormalities that tend to occur together in some individuals.[1] These include abdominal obesity, insulin resistance, glucose intolerance, dyslipidemia, and high blood pressure. This syndrome is associated with diabetes, cardiovascular disease, and death.[2] Multiple diagnostic criteria have been proposed for detecting MetS.[3] Abdominal obesity is defined as having a waist measurement of at least 40 inches for men and 35 inches for women. Insulin resistance is the inability of the body to use the hormone insulin effectively to regulate sugars and carbohydrates properly. Insulin resistance results in a fasting blood glucose level of 106 mg/dL or higher. High blood pressure is loosely defined as a consistent reading of 130/84 mm Hg or higher. There are often no other signs and symptoms of insulin resistance and high blood pressure for years until complications occur.[4] Hypercholesterolemia or hyperlipidemia is a high level of total cholesterol in the blood. A blood level of triglycerides of 150 mg/dL or higher or a blood level of HDL below 40 mg/dL is considered a symptom of MetS.[2] Modernization, economic development, and technological advances have brought rapid demographic and epidemiological

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changes to the Arab world including Iraq. There has been a recent concern about chronic non-communicable diseases (NCDs) in Iraq. The country is undergoing an epidemiological transition with an increasing burden of chronic NCDs. According to chronic non-communicable disease risk factor survey in 2006 in Iraq, two-thirds (66.9%) of the peoples from 25-65 years old were found to be overweight and one-third (32.9%) of them were found to be obese.[5-6] Erbil, the capital of Iraqi Kurdistan moving toward changes in the lifestyle similar to that of Western cultures, is likely to face increasing challenges of preventing chronic diseases including cardiovascular disease and diabetes. Little information exists on the prevalence of the MetS in Erbil, because Ministry of Health (MOH) / Iraq with support and cooperation of World Health Organization, conducted a non-communicable disease risk factor survey in 2006 covering all Iraqi governments except Erbil city, probably because of financial and or/ political reasons. There is inadequate information about accurate estimates of MetS, MOH statistics from hospital-based data and routinely collected information showed that such diseases represent most of the ten leading causes of mortality for the age groups of five years and over for the past years.[5]Such data are important for planning national chronic disease treatment and prevention programs. Based on these facts, authors hypothesize that MetS prevalence in Erbil city is high due to the above-mentioned causes. The authors, therefore, conducted the present study to estimate the prevalence of MetS with their associated risk factors among a sample of peoples in Erbil city between the periods from March 1st, 2013 to April 1st, 2014. More specifically, the main objectives of this study included determining the frequency of MetS with their associated risk factors such as cigarette smoking and alcohol consumption, estimating the prevalence of MetS by certain demographic features such as age groups, gender and occupation and finding out the association between MetS and different socio-demographic variables.

Methods

Design, setting and time of the study:
This cross-sectional analytic study was carried out in Erbil city, between the periods from March 1st, 2013 to April 1st, 2014.

Sample size and sample selection:
A convenience sample of 566 persons was selected for this study.

Participants:
This study included all adult participants of more than 18 years old in the following settings:

1. A sample of 313 medical staff from Rizgary Teaching Hospital, Rozh-Halat Emergency Hospital, Maternity Hospital, Rozh-awa Emergency Hospital, Nanakaly Hospital, Hawler Teaching Hospital and Malafandy Health Center.
2. A sample of 200 patients of surgical outpatients department of Rozh-Halat Emergency Hospital.
3. A sample of 53 peoples from Al-Hikma Education center for the Holy Quran studies.

Exclusion Criteria:
Participants with any acute, chronic diseases, malignant diseases or those who are on regular medication during the study (apart from hypertension, diabetes mellitus, and hyperlipidemia) were excluded from the study. Pregnant ladies and those operated upon recently were excluded from the study, too. Smoking habits were classified into smokers and non-smokers and ex-smokers were also excluded from the study.

Questionnaires:
A structured direct interview using interviewer-administered questionnaire methods was applied. The questionnaire contained questions on demographics, social and characteristics as well as questions regarding diagnostic criteria of MetS.

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Physical examination:

Weight and height, waist circumference, hip circumference, blood pressure, respiratory rate, and pulse rate were taken by the researcher. A patient was considered as "overweight or obese" according to Classification of the WHO and International Obesity Task Force.[7] The weight of patients was measured in kilograms using digital anthropometric scale; an average of one kilogram for patients was estimated to be deducted from patients' weight to replace their clothes. The height of patients was measured in centimeters using a plastic measuring tape which was fixed on the wall and the patients standing bare foots with backs against the wall and their heels touching the wall. The waist measurement was taken at the midpoint between the lowest rib and the top of the hip bone (iliac crest) in the mid-axillary line, while the hip circumference measurement was taken from the widest portion of the buttocks over the pubic area.[7] To classify underweight, overweight and obesity in adults, the body mass index (BMI) was calculated by the weight in kilograms divided by the square of the height in meters (kg/m2): underweight (BMI<18.6), normal weight (BMI: 18.6-24.9), overweight (BMI: 25-29.9), obese class I (BMI: 30-34.9), obese class II (BMI: 35-39.9) and obese class III (BMI: >40).[8]

Laboratory investigations:

Random blood sugar, cholesterol level, triglyceride level (TG), Low-Density Lipoprotein (LDL) and High-Density Lipoprotein (HDL) were investigated. Blood sample was taken by a trained health staff and was centrifuged directly after collection and the serum either immediately analyzed or stored at ≤ -20°C in the Medical Research Centre, a research center affiliated with Hawler Medical University. Serum total cholesterol (TC) high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), triglyceride (TG) and serum glucose were measured using the commercially available kits (Enzymatic colorimetric method used according to Trinder method by spectrophotometer machine SIEMENS German 2008), and serum glucose measured through laboratory long method.

Diagnostic criteria of MetS:

Definition of metabolic syndrome was based on the presence of the following criteria:[8-12]

1. Central obesity, defined as a waist circumference greater than 102 cm for men, and 88 cm for women.
2. Plus, any two of the following factors or history of prior treatment for this factor:

- Elevated fasting triglyceride level > 150 mg/dl. (1.7 mmol/L)
- Reduced HDL cholesterol < 40 mg/dl. (1.0 mmol/L) for men, or < 50 mg/dl. (1.3 mmol/L) for women
- Elevated blood pressure (BP): systolic BP > 130 or diastolic BP >85 mm Hg.
- Elevated fasting plasma glucose ≥ 100 mg/dl (5.6 mmol/L).
- Or patient receiving treatment for the above conditions.

Ethical consideration

All participants provided informed consent before participating in the study, and the research protocol was reviewed and approved by the Ethical Committee of the College of Medicine, Hawler Medical University. The anonymity of the participants was preserved.

Data entry and data analysis:

The statistical package of the social science software (version 19.1) was used for data entry and analysis. Mean (± SD) and statistical tests like Chi-square tests for both numerical and categorical variables were used, respectively. A *P* value ≤0.05 was regarded as statistically significant.

Results

Five hundred sixty-six participants have been recruited in this study, 289 (51.1%) male and 277 (48.9%) female. The minimum age was 19; the maximum age was 80, with mean (± SD) of 29.88 ± 13.33 years old. The majority of participants were married 448 (79.2%), from inside Erbil city

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482 (85.2%) and employed 402 (71.02%). Meanwhile housewives constituted 24.02%. Minimum BMI was 16.87, maximum was 47.06, mean (± SD) was 28.21 ± 5.50. The proportion of obese participants was 35.7%, and the proportion of overweight and obese was 68.7%. Females found to be more obese than males. The association between BMI and gender was statistically significant. Minimum waist circumference was 61, maximum was 140, mean (± SD) was 90.22 ± 13.16, 144 (25.4%). Females were found to have waist a circumference >88 cm compared to male waist circumference > 102 cm of 52 (9.2%) with significant statistical association between waist and gender (*P* <0.001) as shown in Table 1, 2 and 3.

Table 1: Descriptive statistics of some MetS variables.

Variables	Minimum	Maximum	Mean	SD
Anthropometric:				
Weight (Kg)	40	135	76.6	14.9
Height (Cm)	138	192	165.05	9.3
Waist Circumference (Cm)	61	140	90.2	13.1
Hip Circumference (Cm)	70	162	103.7	12.9
Body Mass Index	16.87	47.06	28.2	5.5
Clinical:				
Systolic Blood Pressure	70	183	134.4	24.8
Diastolic Blood Pressure	45	120	74.9	12.2
Laboratory:				
Blood Sugar	73	450	115.2	52.4
Serum Cholesterol	80	421	186.2	57.7
Low Density Lipoprotein	11	591	112.06	48.6
Triglyceride	26	897	186.8	116.5
HDL	16	127	39.8	10.8

Table 2: BMI category by gender

BMI Category	Gender						*P* value
	Male		Female		Total		
	No.	(%)	No.	(%)	No.	(%)	
Underweight (BMI<18.6)	6	(50)	6	(50)	12	(2.1)	
Normal weight (BMI:18.6-24.9)	85	(51.5)	80	(48.5)	165	(29.2)	
Overweight (BMI: 25-29.9)	118	(63.1)	69	(36.9)	187	(33)	
Obese Class I (BMI: 30-34.9)	62	(45.3)	75	(54.7)	137	(24.2)	<0.001
Obese Class II (BMI: 35-39.9)	15	(29.4)	36	(70.6)	51	(9)	
Obese Class III (BMI: >40)	3	(21.4)	11	(78.6)	14	(2.5)	
Total	289	(51.1)	277	(48.9)	566	(100)	

Table 3: Prevalence of MetS by waist.

Waist		MetS		No MetS		Total
		No.	%	No.	%	
Male	<102	0	(0)	237	(100)	237
	>102	47	(90.4)	5	(9.6)	52
Female	<88	0	(0)	133	(100)	133
	>88	126	(87.5)	18	(12.5)	144
Grand total		173	(30.6)	393	(69.4)	566

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Prevalence of MetS: The prevalence of MetS in the studied sample was 173 (30.6%); females prevalence was outstanding126 (45.5%) males prevalence 47 (16.3%) with a significant association between prevalence of MetS and gender (Table 4). Table 5 shows that the older the participant, the higher the prevalence of MetS with a significant association between prevalence of MetS and their age. Regarding educational status, it's found that prevalence of MetS ranges from illiterates 97/215 (45.1%) to university level 27/144 (18.7%) with a statistically significant association between MetS and educational status (*P* <0.001). Married persons outnumber 158/448 (35.3%) singles 15/118 (12.7%) with significant association (P <0.001). No significant association was found between urban 139/482 (28.8%) and rural 34/84 (40.5%) with (*P* =0.1) and between smokers 23/58 (39.7%) and nonsmokers 150/508 (29.5%) with (*P* =0.11) as shown in Table 6.

Table 4: MetS by gender.

Gender	MetS		No MetS		Total	*P* value
	No.	(%)	No.	(%)		
Male	47	(16.3)	242	(83.7)	289	
Female	126	(45.5)	151	(54.5)	277	<0.001
Total	173	(30.6)	393	(69.4)	566	

Table 5: Age groups by MetS.

Age Category	MetS		No MetS		Total	*P* value
	No.	(%)	No.	(%)		
<20	15	(22.4)	52	(77.6)	67	
20-40	95	(27.9)	246	(72.1)	341	0.008
>40	63	(39.9)	95	(60.1)	158	
Total	173	(30.6)	393	(69.4)	566	

Table 6: Demographic and social variables by MetS.

Demographic and social Variables		MetS		No MetS		Total	*P* value
		No.	(%)	No.	(%)		
Education	Illiterate	97	(45.1)	118	(54.9)	215	
	Primary	9	(29)	22	(71)	31	
	Secondary	23	(27.7)	60	(72.3)	83	<0.001
	Institute	17	(18.3)	76	(81.7)	93	
	University	26	(18.7)	113	(81.3)	139	
	Postgraduate	1	(20)	4	(80)	5	
Marital status	Married	158	(35.3)	290	(64.7)	448	<0.001
	Single	15	(12.7)	103	(87.3)	118	
Residence	Urban	135	(28.8)	334	(71.2)	469	
	Rural	34	(40.5)	50	(59.5)	84	
	Other city	4	(30.8)	9	(69.2)	13	0.1
Cigarette smoking	Non smoker	150	(29.5)	358	(70.5)	508	
	Smoker	23	(39.7)	35	(60.3)	58	
	Total	173	(30.6)	393	(69.4)	566	
Occupation	Employed	86	(22.2)	302	(77.8)	388	
	Unemployed	9	(32.1)	19	(67.9)	28	
	Student	5	(35.7)	9	(64.3)	14	<0.001
	Housewife	73	(53.7)	63	(46.3)	136	
Total		173	(30.6)	393	(69.4)	566	

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Family history (FH) and MetS:
FH of DM 74/174 (30.1%), FH of hyperlipidemia (FHL) 38/112 (33.9%), FH of hypertension (HTN) 111/328 (33.8%) and FH of obesity 99/274 (36.1%) were significantly associated with prevalence of MetS (P = 0.029, P <0.001, P = 0. and P = 0.005, respectively) as shown in Table 7.

Discussion

The aim of this study was to estimate the prevalence of MetS among a sample of peoples in Erbil city. MOH figures about MetS risk factors, especially obesity, DM and cardiovascular complications following untreated MetS are increasing in our country.[5] This change in prevalence is probably due to urbanization, economic growth, westernization of our diet, physical inactivity, irregular meal time and increased stress.[13] This study showed that the proportion of obesity among participants was 35.7% having BMI ≥30 kg/m^2 and the proportion of overweight and obesity was 68.7%. According to the International Diabetes Federation (IDF) classification of MetS, the prevalence of MetS in this study was 30.6% which is similar to the prevalence of MetS in Iran 32.1%,[14] but higher than that of USA 25% while it is much lower than that of Saudi Arabia 39.3%.[15] This difference in prevalence may be due to differences in the prevalence of obesity as mentioned earlier, sedentary lifestyle and physical inactivity. The frequency of MetS was three times more common among females than males, obesity (higher BMI), larger waist circumferences, higher systolic blood pressure, was higher among female participants as compared to male participants. A similar finding with the study of Lohsoonthorn et al. was noted.[6] These may be related to hormonal changes, mainly progesterone which is increased during pregnancy, breastfeeding which increase the desire for taking sweets and more sedentary life among housewife females that constitute one-fourth of the participants in this study and found to constitute more than half of MetS prevalence with significant association between occupation and MetS.[2] In this study, increasing age was associated with increasing of the prevalence of MetS with. A similar finding to Ervin et al.[16] study which stated that age is an important independent risk factor for Mets.

Table 7: Family history by MetS.

Family history (FH)		MetS		No MetS		Total	*P* value
		No.	(%)	No.	(%)		
FH DM	Yes	74	(30.1)	100	(69.9)	174	0.029
	No	108	(19.7)	284	(80.3)	392	
	Total	182	(22.9)	384	(77.1)	566	
FHL	Yes	38	(33.9)	74	(66.1)	112	<0.001
	No	46	(18)	209	(82)	255	
	Total	84	(22.9)	283	(77.1)	367	
FH Obesity	Yes	99	(36.1)	175	(63.9)	274	0.005
	No	74	(25.3)	218	(74.7)	292	
	Total	173	(30.6)	393	(69.4)	566	
FH HTN	Yes	111	(33.8)	217	(66.2)	328	0.047
	No	62	(26.1)	176	(73.9)	238	
	Total	173	(30.6)	393	(69.4)	566	

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There is an argue surrounding the etiology and pathogenesis of MetS, a single uniform mechanism needed to be discovered.[2] However, multiple factors like hormonal, genetic and environmental (nutrition, body composition and stress hormones) factors play a key role in this contest.[1] In this study, we have shown that family history of certain cardiovascular risk factors was associated with MetS including family history of DM, hyperlipidemia, of obesity and hypertension, the results found to be similar to Katzmaryk et al.[17] An INTERHEART study showed that cigarette smoking 59.9% associated with MetS in South Asia,[18] but in our study no relation between cigarette smoking and MetS was found, possibly the frequency of smokers in this study was low 58/566 (10%). Marital status was significantly associated with MetS, a figure similar to Thomas et al.[19] and this may be due as stated above, the more advance in age the more prevalence of MetS. Education status from illiterate to university decreased the proportion of MetS, which is in line with Wamala et al.,[20] because education possibly makes the population more aware of their health.

Conclusions

Metabolic syndrome is prevalent among the studied population. Female gender, old age, family history of DM, HL, hypertension and obesity may be regarded as risk factors for MetS. People with these risk factors should be assessed for MetS and educated about the risks and possible consequences in the future.

Conflicts of interest

The authors report no conflicts of interest.

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