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Metabolic Factors and Risk of Ischemic Heart Disease Among Adults in Mysan, Iraq

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Abstract

Background: It is estimated that around 20-25 percent of the world's adult population have the metabolic syndrome and they are as twice as likely to die from and three times as likely to have a heart attack or stroke compared with people without the syndrome. Objectives: To estimate metabolic factors among adult patients of Ischemic Heart Disease in Mysan, Iraq. *Methodology:* A group matched case–control was chosen in Maysan province, Iraq. Cases were selected from patients with MI admitted to the medical unit at Al-Sadr teaching hospital. Their ages are ranged from 30 to 78 years old, while controls were patients complaining of acute illnesses attending the same hospital seeking medical care and should be free from MI. Convenient sample was used of 200 cases and 200 controls. *Results:* Raised blood pressure was reported in 114 cases (57%) and 62 controls (31%) and it's significantly higher among cases than controls. Elevated fasting blood glucose was reported in 132 cases (66%) and 82 controls (41%), and it's significantly higher among cases than controls. High serum level of triglycerides was detected in 97 cases (48.5%) and 68 controls (34%) MI cases were about 1.8 folds more likely to have high triglycerides levels than controls. Low concentration of HDL cholesterol was found in 81(40.5%) cases and 38 controls (19%), it had been significantly found that low HDL level were more frequent among MI cases than controls. Twelve MI cases (6%) and 7 controls (3.5%) had Proteinuria although this finding was clinically significant, it was statistically not significant. *Conclusions:* Metabolic Disorders were reported to be higher in patients with MI. FBG was the most predictor for MI followed by HDL. The most associated cofounder was BMI. There is a need to establish a health facility based screening system for early detection of MS.

Keywords

Ischemic Heart Disease, Metabolic Factors, Iraq, Adults

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1. Introduction

Cardiovascular diseases (CVDs) is among the world's leading causes of death, with nearly 80% of deaths occurring in developing countries.(1) Although CV death rates have significantly declined in most developed countries in the past decades, rates have grown in developing countries(2), such that 25–45% of total deaths in these countries can be explained by CVDs (3). Furthermore, it seems that people in developing countries experience Ischemic heart disease (IHD) at a younger age than those in Western countries (4). Each year, more than 2 million Americans have a heart attack or stroke, and more than 800,000 of them die; CVD is the leading cause of death in the US and the largest cause of

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lower life expectancy among blacks.

Related medical costs and productivity losses approach 450 billion $ annually, and inflation-adjusted direct medical costs are projected to triple over the next two decades if present trends continue [5].

Metabolism is the breaking down of food to its simpler components: proteins, carbohydrates (or sugars), and fats. Metabolic disorders occur when these normal processes become disrupted [6]. It is estimated that around 20-25 percent of the world's adult population have the metabolic syndrome (MS) and they are as twice as likely to die from and three times as likely to have a heart attack or stroke compared with people without the syndrome.[7]

There are different guideline definitions for MS (Third Report of the Adult Treatment Panel National Cholesterol Education Program [NCEP-ATP III]), World Health Organization (WHO) criteria and International Diabetic Federation (IDF) criteria. Unique diagnostic criteria still do not exist .The definition most frequently accepted in clinical practice was first described in 2001 and updated in 2005 by (NCEP APIII). This definition establishes that three or more of the following Risk factors should be met to diagnose Metabolic Syndrome [8].1. Fasting blood glucose (FBG) ≥100 mg/dl. 2. Triglycerides (TG) ≥150 mg/dl. 3. Low high-density lipoprotein cholesterol (HDL-c) (<40 mg/dl in males, <50 mg/dl in females). 4. Hypertension ≥130/85 mmHg or under hypertension treatment. 5. Abdominal obesity detected using waist circumference (WC) (>102 cm for males and >88 cm for females).

WHO proposed a formal definition of MS, according to this, a person must have either glucose intolerance or insulin resistance along with two of the following four criteria: central obesity, hypertension dyslipidemia and albuminuria [9]. NCEP and WHO have established definitions of MS which are fairly similar but ATP III differ slightly from WHO which posits that insulin resistance is a required component for diagnosis, It is generally assumed that the NCEP criteria are more suitable for use in daily practice, whereas the WHO criteria are convenient for research purposes[10]. The involvement of urinary excretion of albumin (in WHO criteria) reflects the growing awareness that this risk factor is not only associated with nephropathy but should also be considered a sensitive criterion for CVD in general. The IDF reviewed the criteria for MS during 2005 and central obesity was considered an essential element in this definition, with different WC thresholds set for different race/ethnicity group: Central obesity (WC, Male ≥94 cm and Female ≥ 80 cm. (Eastern Mediterranean and middle east (Arab) populations Use European data until more specific data are available), plus any two of the following four factors:- Raised triglyceride ≥150 mg/dl (1.7 mmol/l) or drug treatment for high triglyceride. Reduced High density lipoprotein (HDL) cholesterol <40 mg/dl (1.03 mmol/l) in males ,<50 mg/dl (1.29 mmol/l) in females or drug treatment for low HDL. Raised blood pressure: - Systolic BP≥ 130 mmHg or Diastolic BP≥ 85 mmHg or treatment of previously diagnosed hypertension. Raised fasting plasma glucose ≥ 100 mg/dl (5.6 mmol/l) or previously diagnosed T2 diabetes [11]. The clustering of CVD risk factors that typifies the MS is now considered to be the driving force for a new CVD epidemic [12]. More than 80% of the nearly 1.2 million MS that occurred in the US in 2006 were the result of coronary atherosclerosis [13]. Almost 50 million American adults (about one in four) have the MS, which puts them at increased risk for development of DM& CVDs [14]. Patients with MS and/or T2DM represent a population with a significantly elevated burden of CVD, the leading cause of death in the US and globally. It is estimated that the total direct and indirect cost of IHD and heart failure exceeded 140 billion dollars in the US in 2010.[15] Patients with insulin resistance and MS have a greater risk for acute coronary syndrome (ACS).[16]

2. Objectives

To estimate metabolic factors among adult patients of Ischemic Heart Disease in Al-Maysan, Iraq.

3. Methodology

A group matched case–control was chosen in Maysan province, Iraq. Cases were selected from patients with MI admitted to the medical unit at Al-Sadr teaching hospital. Their ages are ranged from 30 to 78 years old, while control group Patients complaining of acute illnesses attending the same hospital seeking medical care; must be free from MI. And was age and sex matched with the cases. The cases included any person (male or female) with a confirmed diagnosis of MI (on the base of clinical features, electrocardiography (ECG) and/or coronary angiography) and diagnosis of MS according to WHO definition of MS, a person must have either glucose intolerance or insulin resistance along with two of the following four criteria: central obesity, hypertension, dyslipidemia and albuminuria [8].The age groups 30-78 years. Yet exclusion includes the following : Any patient below or above this age group. Any patient with congenital heart disease. Inherited metabolic disorders (inborn errors of metabolism). Advanced liver, renal disease and TI DM. Any patient with heart failure due to chronic obstructive pulmonary disease.6- Any patient who have major psychiatric illness or dementia. Convenient sample was used. It was decided to have patients and their controls falling within a pre-selected age and gender

categories. According to the estimated sample size, an equal number of cases and controls (200cases and 200 controls) were selected from the attending patients to Al-Sader teaching hospital. -These 200 cases and 200 controls have equal number of male and female to modify the confounder of gender, also have same age group to modify the confounder of age.

The sample size for the study was calculated using the Epi-Info statistical software. This gave an estimated sample size of 397 participants, which was approximated to 400. An extra 20% of the estimated sample size was added for incomplete or unreliable answers and to reduce sample bias, giving a final sample size of 400 patients.

Verbal informed consent was obtained from all participants. They were informed that the participation is voluntary and they can withdraw from the study after having agreed to participate. They were also free to refuse any question that is asked in the questionnaire.

4. Results

Raised blood pressure (systolic ≥ 130 mmHg and diastolic ≥ 85) was reported in 114 cases (57%) and 62 controls (31%) while the remaining cases and controls had normal blood pressure, however, it had been significantly found that raised blood pressure were more likely to be reported among cases rather than controls, (OR= 2.95, 95%CI [1.96 – 4.45], P<0.001), (Table 1).

Table 1. Distribution of blood pressure among study groups, in Al-Sadr teaching hospital, Mysan , Iraq 2013.

Blood pressure	Case		Control		Total		Odds ratio
	No.	%	No.	%	No.	%	[95%CI] & P. value
Raised (≥130/≥85) mmHg	114	57.0	62	31.0	176	44.5	2.95 [1.96-4.45]
Not raised	86	43.0	138	69.0	244	56.5	P<0.001
Total	200	100.0	200	100.0	400	100.0	

Table 2. Distribution of fasting blood glucose among study groups, in Al-Sadr teaching hospital, Mysan, Iraq 2013.

Fasting blood glucose	Case		Control		Total		Odds ratio [95%CI] & P.value
	No.	%	No.	%	No.	%	
≥ 100 mg/dl	132	66.0	82	41.0	214	53.5	2.79 [1.86 – 4.2]
< 100 mg/dl	68	34.0	118	59.0	186	46.5	P<0.001
Total	200	100.0	200	100.0	400	100.0	

Table 3. Distribution of Triglycerides levels among study groups, in Al-Sadr teaching hospital, Mysan , Iraq 2013.

Triglycerides	Case		Control		Total		Odds ratio
	No.	%	No.	%	No.	%	[95% CI] and P. value
≥ 150 mg/dl	97	48.5	68	34.0	165	41.3	1.83 [1.22-2.74]
< 150 mg/dl	103	51.5	132	66.0	235	58.8	P = 0.004
Total	200	100.0	200	100.0	400	100.0	

Table 4. Distribution of serum HDL cholesterol levels among study groups, in Al-Sadr teaching hospital, Mysan , Iraq 2013.

HDL level	Case		Control		Total		Odds ratio
	No.	%	No.	%	No.	%	[95% CI] and P. value
Low HDL	81	40.5	38	19.0	189	47.3	2.9 [1.85- 4.6]
High HDL	119	59.5	162	81.0	211	52.8	P <0.001
Total	200	100.0	200	100.0	400	100.0	

Table 5. Distribution of Proteinuria among study groups, in Al-Sadr teaching hospital, Mysan , Iraq 2013.

Proteinuria (≥ 30 mg/dl)	Case		Control		Total		Odds ratio
	No.	%	No.	%	No.	%	[95% CI] and P. value
Yes	12	6.0	7	3.5	19	4.8	1.76 [0.68 - 4.57]
No	188	94.0	193	96.5	381	95.3	P = 0.34
Total	200	100.0	200	100.0	400	100.0	

Table 6. Distribution of metabolic disorder among study groups, in Al-Sadr teaching hospital, Mysan , Iraq 2013.

Metabolic disorder	Case		Control		Total		Odds ratio
	No.	%	No.	%	No.	%	[95CI]
Present	137	68.5	91	45.5	225	56.3	2.6 [1.73-3.9] P < 0.001
Absent	63	31.5	109	54.5	175	43.8	
Total	200	100.0	200	100.0	400	100.0	

Elevated fasting blood glucose (≥ 100 mg/dl) was reported in 132 cases (66%) and 82 controls (41%), it had been significantly that cases were more likely to have elevated fasting blood glucose rather than controls, (OR= 2.79, 95%CI [1.86 – 4.2], P<0.001), (Table 2).

High serum level of triglycerides (>150 mg/dl) was detected in 97 cases (48.5%) and 68 controls (34%) while the other cases and controls had normal levels of triglycerides, however, MI cases were about 1.8 folds more likely to have high triglycerides levels than controls, (OR=1.83, 95% CI [1.22 – 2.74], P=0.004), (Table 3).

Low concentration of HDL cholesterol (< 40 mg/dl in males and < 50 mg/dl in females) was found in 81(40.5%) cases and 38 controls (19%), it had been significantly found that low HDL level were more frequent among MI cases than controls, (OR=2.9, 95% CI[1.85-4.6], P<0.001), (Table 4).

Twelve MI cases (6%) and 7 controls (3.5%) had Proteinuria (≥ 30 mg/dl), although this finding was clinically significant, it was statistically not significant, (OR=1.76, 95% CI [0.68-4.57], P=0.34], (Table 5).

According to the previous findings, higher proportion of the MI cases had at least one of the metabolic disorders as compared to controls; 68.5% vs. 45.5%, respectively, from other point of view, Metabolic disorders were more frequent among MI cases than controls with a highly significant correlation between MI and the presence of these disorders, (OR=2.6, 95% CI [1.73-3.9], P<0.001), (Table 6).

5. Multiple Logistic Analysis

The multiple logistic regression analysis was conducted on the bases of the following assumption: MI as an outcome and the 9 variables which were significantly associated with the outcome in the univariate analysis as predictors.

The multiple logistic regression testing revealed all these variables except the age had been significantly associated with the outcome, on the other hand, FBG was the more predictor for MI followed by HDL, the odds ratio was (2.51 and 2.39, respectively, (Table 7)

Table 7. Results of multiple logistic regression analysis of factors associated with MI.

Variables	β	S.E.	*P*	Exp (β)	95% CI
Age	0.11	0.50	0.16	1.12	0.87 – 2.27
BMI	0.60	0.27	0.030	1.82	1.06-3.14
Education	- 0.21	0.09	0.038	1.23	1.02-2.31
Smoking	0.27	0.11	0.027	1.31	1.1 – 2.70
Physical activity	- 0.13	0.01	0.003	1.14	1.08 – 4.18
Blood pressure	0.78	0.13	<0.001	2.18	1.70-2.84
FBG	0.92	0.74	0.001	2.51	1.6 – 5.42
TG	0.69	0.28	0.014	2.00	1.15-3.47
HDL	- 0.87	0.50	0.010	2.39	1.85-6.17
Constant	1.6	0.68	<0.001	4.59	2.1 – 8.42

6. Discussion

In this study high proportion of ACS patients with MS had high fasting blood sugar, same results were obtained by the study conducted in France[17] (1997), that described a strong association between high fasting glucose level and risk of development of CHD, also this conclusion was reached by study in Oman[18] (2011), and Six Middle Eastern Countries (2010).[19] Hyperglycemia has the strong relation to increase the incidence of IHD and congestive heart failure in patient with MS given the ever- increasing prevalence of MS worldwide, this finding has important clinical implication and confirms the importance of evaluating glycemic control during the acute phase of ACS.[20]

Studies conducted in Spain (2007),[21] regarding lipid profile analysis revealed that high TG and low HDL has a strong association with MS this consistent with the current study. Study conducted in Taiwan (2011) [22] found that the association in the same patient of increased triglyceride levels and low HDL concentrations is usually associated with an increase in small dense LDL particles, and these are considered to be highly atherogenic.

Studies conducted in UK [23] (2006), this profile, known as atherogenic dyslipidemia, is very common in patients with MS and T2DM. This was consistent with the study in Spain [24] (2006) that demonstrated the high prevalence of low HDL levels in patients with ACS. Study in US [25](2007) that demonstrated both in diabetic and non-diabetic patients and there was increasing evidence that treatment of patients with MS and/or T2DM, Should not be exclusively aimed at lowering LDL levels, but should also aim to increase HDL levels'. Because low HDL is the commonest type of dyslipidemia found in patients with coronary artery disease. Oman study [18] (2011), six Middle Eastern Countries study [19] (2010), On comparing the prevalence of factors contributing to MS among patients with and without MS all

the factors (Increased WS, Increased Triglycerides, Decreased HDL, Increased Blood Pressure both Systolic and Diastolic and Increased Fasting Glucose level) were higher among patients with MS than those without MS and all with statistical significant association this was consistent.

In this study hyperglycemia and low HDL levels were the most prevalent components of MS, followed by hypertension. In another study (2010).[26] this was also the most frequent combination observed in patients with IHD. Other studies. J Amer Coll Cardiol (2003)[27] have shown that the combination of DM and hypertension sharply increases CV risk.

Limitations: the effect of non-randomized nature and unmeasured confounding factors. Small sample size and short study period. Information bias may be present such as recall bias and selection bias of the risk factors.

7. Conclusion

Metabolic Disorders were reported to be higher in patients with MI. FBG was the most predictor for MI followed by HDL. The most associated cofounder was BMI. There is a need to establish a health facility based screening system for early detection of MS.

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