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Evaluation of Prevalence of the Metabolic Syndrome: In The Kirkuk Hospitals Reviewers from Employees Associated with H. Pylori AB Test as a Case Study

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Abstract

The metabolic syndrome (MetS) or insulin resistance syndrome is widespread and multi-factorial disorder. This article aims to assess and observe samples with the MetS to start efforts to take the proper treatments to minimize the risk of cardiovascular diseases. Additionally, we evaluate the association of Helicobacter pylori (H. Pylori) Ab tests with MetS. To meet this goal, 350 reviewers of K1 Hospital are participated in this work for six months from October 2016 to March 2017. The patients (N=350) are divided into two groups, a group subjects with MetS (N=109), whereas the latter is without MetS (N=241). A venous blood sample is taken after 8 hours of fasting to measure fasting blood glucose, H. Pylori Ab test and other required biochemical assays. Additionally, blood pressure (BP), Body Mass Index (BMI) (i.e. weight and height), and waist circumference are measured. The assays revealed that the frequency of MetS is 31.1% as per the modified National Cholesterol Education Program Adult Treatment Panel III (NCEP: ATPIII) criteria. Furthermore, a statistically significant age ($p=0.02$) corresponded higher rate of MetS cases is larger than 40 years old (i.e. 69%). Moreover, BMI recorded as (27.6 ± 4.4 vs 31.4 ± 4.5, $p < 0.001$), height (169 ± 8.4 vs 168.1 ± 8.5, $p \leq 0.11$), weight (78.8 ± 12.3 vs 88.6 ± 13.2, $p<0.01$) and waist circumference (83.3 ± 16.1 vs 96.3 ± 11.6, $p<0.001$). Besides, BP showed positively correlation with systolic (120.3 ± 10.6 vs 130.6 ± 10.8, $p<0.04$) and diastolic (70.9 ± 0.9 vs 80.8 ± 10, $p<0.01$). The biochemical assays for employees with and without MetS are mean values of fasting serum glucose (5.3 ± 1.4 vs 7.5 ± 3.2, $p \leq 0.001$). The highest average total cholesterol recorded as (4.3 ± 1.3 vs 4.9 ± 1.3, $p \leq 0.001$), serum triglyceride (2 ± 1.5 vs 2.8 ± 1.2, $p \leq 0.001$) and lower HDL levels (1.2 ± 0.5 vs 0.8 ± 0.1, $p \leq 0.001$). Accordingly, the results showed that H. Pylori infection is associated significantly with metabolic syndrome. In consequence, the outcome demonstrated high rates of obesity and overweight in MetS cases.

Keywords: Metabolic syndrome; Helicobacter pylori; H pylori; Ab Test; K1 Hospital

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Introduction

Recently, a large number of organizations have argued that the MetS be introduced into clinical practice as a multidimensional risk concern for both type-2 diabetes and atherosclerotic cardiovascular disease (ASCVD) [1]. It is a severe issue that can lead to fatal consequences if not identified and treated. Nowadays, clinical laboratories (lab) are crucial in identifying MetS. The available technologies enable these labs to provide clinical trial sponsors and healthcare providers the accurate outcomes to aid treatments and prevention as well [2]. Haller and Hanefeld [3] coined the term metabolic syndrome. MetS is defined as a combination of underlying risk that culminate in adverse results when occurring together. These include cardiovascular disease, type 2 diabetes mellitus [4] and in consequence six-fold increase in death rates [5]. Developing MetS leads to main risks such as a diet high in carbohydrates and fats, and physical inactivity. Accordingly, two central clinical features are likely to occur which are insulin resistance and central obesity. Obesity is considered from the essential elements of MeTS which may precede the emergence of risk factors in MetS [6]. MetS is a constellation of cardiovascular risk factors in one individual that anticipates about two-fold increased risk of cardiovascular events and three-fold increased risk for new-onset type 2 diabetes.

Different definitions of MetS have been proposed by various organizations (Table 1), but systemic hypertension and central obesity remain common to all [7]. In the USA, about a third of adults 20 to 74 years of age are overweight (BMI 25.0 to 29.9), and another third are obese (BMI $\geq$ 30) [8]. Also, according to new statistics, centers for disease control and prevention released that the number of obese American adults (approximately 34%) now outnumber those who are overweight (approximately 33%) [9].

As mentioned earlier, MetS components are related separately to features in our lifestyle, such as physical activity, weight control and diet [10]. Additionally, factors such as, a fatty liver are not uncommon,

Table 1. Definitions of MetS in adults [7,13].

World Health Organisation criteria (1998)	European for the Study of Insulin Resistance criteria (1999)	National Cholesterol Education Program Adult Treatment Panel III criteria (NCEP: ATPIII) (2001)	International Diabetes Federation (IDF) criteria (2005)	Consensus definition (incorporating IDF and AHA/NHLBI definitions)
Insulin resistance (T2DM/IGT/IFG), plus 2 of the following: • Abdominal obesity: WHR>0.85 in females or >0.9 in males, or BMI >30 Kg/m^2. • TG ≥ 150 mg/dl and/or HDL-C<50 mg/dl in females, and<40 mg/dl in males. • BP ≥ 140/90 mmHg or taking antihypertensive drugs. • Microalbuminuria: urinary albumin secretion rate ≥ 20 µg/min, or albumin-to-creatinine ration 30 mg/g.	Insulin resistance (insulin levels>75th percentile patients), plus 2 of the following: • Waist circumference>80 cm in females, and >94 cm in males. • TG ≥ 150 mg/dl and/or HDL-C<39 mg/dl in males or females. • BP ≥ 140/90 mmHg or taking antihypertensive drugs. • Fasting glucose ≥ 110 mg/dl.	Any 3 (or more) of the following: • Waist circumference>88 cm in females, and >102 cm in males. • TG ≥ 150 mg/dl. • HDL-C<50 mg/dl in females, and <40 mg/dl in males. • BP ≥ 130/85 mmHg. • Fasting glucose ≥ 110 mg/dl. In 2003, ADA modified the criteria for IFG tolerance to 100 mg/dl/from 110 mg/dl.	Central obesity (ethnicity-specific values; can be assumed if IBM>30 kg/m^2, plus 2 of the following: • TG ≥ 150 mg/dl. • HDL-C<50 mg/dl in females, and<40 mg/dl in males. • BP ≥ 130/85 mmHg. • Fasting glucose ≥ 100 mg/dl.	Any 3 of the following: • Elevated waist circumference (population and country-specific definitions). • TG ≥ 150 mg/dl. • HDL-C<50 mg/dl in females, and<40 mg/dl in males. • BP ≥ 130/85 mmHg. • Fasting glucose ≥ 100 mg/dl.

high levels of uric acid, inflammatory status and impaired fibrinolysis [11]. For a long time, the clustering of these factors has been known as a syndrome with various names [12]. Therefore, MetS is considered a worldwide epidemic, considered as a complex disorder with high socioeconomic cost [13].

The components of MetS are connected separately to our lifestyles, for example, diet, weight control and physical activity [14,15]. Most of the researches that investigate on MetS and diet risk factors concerned of: i) not food-based; ii) analyses, iii) nutrient-based, iv) evaluate not with risk clusters, and v) examine the connection with individual risk factors [16]. It is worthy of mention that these studies have carried out with older and middle-aged adults. In the literature, the amount of energy can be metabolized per volume of food is defined as Dietary Energy Density (DED) [17]. Obviously, in persons who burn more calories, the high energy density of a given volume of food consumed Will inevitably lead in increasing of weight gain and energy intake. For Americans, dietary patterns that are consistent with the Dietary Guidelines achieve lower energy density diets. DED can be minimized by increasing vegetable intake and fruit. In the same time, they limit intake of saturated foods and trans fats such as fried vegetables and baked goods [18].

Large of articles have been conducted to study the relationship between MetS and H. pylori infection. For example, one meta-analysis and two large Japanese populations study [19]. Since the discovery of gram-negative bacilli, H. Pylori by “Varan” and “Marshall” in 1984, worldwide distribution of this bacterium has been shown [20]. The infection in acute condition induces a polymorphonuclear cell infiltration in the gastric mucosa. In the case of non-efficiently cleaned infection, a chronic infiltration of mononuclear cells can be replaced. Being replaced by mononuclear cells can cause the local production of proinflammatory cytokines that are responsible for the remote tissues and organic system complications of this bacteria [21]. Besides gastric involvement, HP can also cause extra digestive problems. Although the present information has not still completely proven the relationship between HP with these complications, but it cannot be ruled out [22]. These complications include endocrine disorders, such as diabetes mellitus, osteoporosis, hyperparathyroidism, obesity, autoimmune thyroid disease, and hyperlipidemia [23]. These factors have not been included in order to avoid overestimation of MetS prevalence [24].

Basically, the discordance of the outcomes leads to determine the methodology, the quality, and the main structure of the studies. Therefore, we summarize the analysis of main elements in the studies as follows [24]:

- The kind of the selected population (healthy and not).
- The participants (subjects) with a particular disease could be conscious or not with a healthy lifestyle.
- The number of subjects must enough able to determine clear outcomes.
- The priority of the subjects properties (confounding factors) such as sex, age, physical activity, BMI, smoking, medication and supplements.
- The length of the follow-up period where short-term tests must be enough to obtain correct results.
- The criteria used to diagnose studies’ disease (e.g. MetS).
- Lastly, the methods that can be implement to calculate adherence to the Mediterranean diet.

Methodology

Reviewers K1 Hospital/Kirkuk from employees of the North Oil Company, during the period October 2016 to March 2017**.** We selected 350 (i.e. N=350) subjects in our present study classified into two groups: (i) Subjects (N=241) without MetS, and (ii) subjects (N=109) with MetS. According to the (NCEP: ATPIII) (Table 1), three or more components are with MetS, one to two components are without MetS. In the beginning, we took a Venous blood sample after tourniquet application following fasting for 8-hours to check fasting blood glucose and other biochemical assays (use biochemical analyzer EON100, Italy). It is a quick one-step check for the qualitative detection of antibodies to H. pylori in serum. After that, we measured the weight with simple clothes (nearest 0.1 Kg) in an upright position. Waist circumference was measured the lower costal margin and the iliac crest to the nearest 0.5 cm halfway. Then, height was measured without shoes with a standard height rule to the nearest 0.1 cm. Accordingly, BMI was calculated as weight (measured in kg) divided by the height (measured in m) squared. Then, BP measurement was performed following 5 minutes of relaxation in the sitting position. Subjects on antihypertensive medications or those with diastolic or systolic BP higher than 90 and 140 mmHg, respectively, were systolic or diastolic BP of higher than 140 and 90 mmHg, respectively, were deemed hypertensive. Patients with systemic diseases, for example, DM, we obtained their required information using a questionnaire that includes comprehensive alcohol consumption, smoking, medication history, family history and physical activity. The past drug history of H. pylori eradication survey has performed following the serum IgG anti H. pylori test. Lastly, Statistical analysis like the Fisher's exact test or Chi-square test are applied. Furthermore, all statistical tests were 2-tailed, and P<0.05 was considered to represent statistical significance. It is worth mentioning that the statistical analyses were calculated using SPSS (Version 14.0, USA).

Results and Discussion

As mention earlier, all subjects are (N=350) divided into: with MetS (N 109, i.e. 31.2%) and without MetS (N=241, i.e. 68.8%). We have chosen the rate of MetS as 31.3% to assess and overview the reviewers with MetS to start endeavours to implement appropriate treatments. This rate (31.3%) has been anticipated by the modified NCEP ATP III guidelines which link with the occurrence rate (25, 26, 27, 28 and 29) have determined growth in MetS rate with 38% in Turkey, and 39.1% in Finland. These contradictions may lead to differences in the definitions of the syndrome and its components. Additionally, it may contribute to differences in the characteristics of the studied population. In our investigations, we paid more attention to the employees in north oil company who are ageing population. The prevalence of MetS was higher among male (68.8%) than female (31.2%) which is nearly 31.2% of all adults. Additionally, our study proposes that the separation has remained stable overall because of awareness of the MetS and its consequences. This awareness may lead to optimizing the treatment of risk factors such as diabetes and hypertension (Table 2).

Additionally, Table 2 illustrates other MetS associated factors: family history, physical activity, job title, alcohol and smoking. The results demonstrated that the prevalence of MetS in positive family history is 44.8% at a statistically significant p ≤ 0.001. It also showed a predisposition to MetS comparing with a negative family history which agrees with [30]. It is worth mentioning that the authors in [30] approved that MetS plays an essential role towards the aggregation of early occurrence of cardiovascular disease (CVD) independently of other classical cardiovascular risk factors. Similarly, the occurrence of MetS in inadequate physical activity was 42.2%, whereas it was 46.8% in without MetS 46.8%. This finding led to a lower rate of MetS than adequate physical activity with MetS (42.2%) and with statistically significant at p ≤ 0.013. We classified the subjects based on job title into three categories: group A (1 to a degree), group B (4 to 5 degree) and group C (6 to 8 degree). These groups have diagnosed frequently as 24.4%, 41.1% and 34.5% respectively in without MetS, whereas they determined as 36.6%, 43.1% and 20.3% respectively, in with MetS. Similarly, the samples with all alcohol consumption 8.3% has obtained as 4.1% in without MetS than 17.5% in with MetS, and high a statistically significant at p ≤ 0.001. Consequently, this study showed that alcohol consumption (8.3%) had played an important role to prevent the occurrence of MetS.

Similarly, our work agrees with [31] in case of a favourable impact of mild to alleviate the compensation of alcohol on lipids. Nevertheless, the smoking rate 33.7% (31.5% with MetS vs 38.5% without MetS,%, p ≤ 0.023) restrain us to analyze it relation with the disease. Additionally, no statistically significant p ≤ 0.104 relation was reported. In the case of education, subjects with MetS have shown as 43.6%, 37%, 13.2% and 6.2% in graduation, secondary, primary and no/little educations respectively. Whereas, in the same categories, the values are as 8.2%, 14.6%, 37.6% and 39.6%, in subjects with MetS respectively. Accordingly, these findings demonstrate an inverse association

Table 2. Correlation between parameter and Metabolic Syndrome.

Parameters		Total N=350 (100%)	Without MetS N=241 (68.8%)	With MetS N=109 (31.2%)	P-value
Gender	Female	109 (31.2)	76 (31.5)	33 (30.2)	0.912
	Male	241 (68.8)	165 (68.5)	76 (68.8)	
Family history	Positive	157 (44.8)	92 (38.1)	65 (59.6)	0.001
	Negative	193 (55.2)	149 (61.9)	44 (40.4)	
Physical activity	Adequate	148 (42.2)	113 (46.8)	35(32.1)	0.013
	Inadequate	202 (57.8)	128 (53.2)	74 (67.9)	
Job title	A. 1 to 3 degree	99 (28.3)	59 (24.4)	40 (36.6)	0.783
	B. 4 to 5 degree	153 (43.7)	99 (41.1)	47 (43.1)	
	C. 6 to 8 degree	98 (28)	83 (34.5)	22 (20.3)	
Alcohol	Yes	29 (8.3)	10(4.1)	19 (17.5)	0.001
	No	321 (91.3)	231 (95.9)	90 (82.5)	
Smoking	Current	118 (33.7)	76 (31.5)	42 (38.5)	0.023
	Ex/Never	232 (66.3)	165 (68.5)	67 (61.5)	
Education	No/Little	24 (6.8)	15 (6.2)	9 (8.2)	0.104
	Primary	48 (13.8)	32 (13.2)	16 (14.6)	
	Secondary	130 (37.2)	89 (37)	41 (37.6)	
	Graduation	148 (42.2)	105 (43.6)	43 (39.6)	
Body Mass Index (Kg/m^2)	Weight (Kg)		78.8 ± 12.3	88.6 ± 13.2	0.001
	Height (cm)		169 ± 8.4	168.1 ± 8.5	0.450
	BMI (Kg/m^2)		28.6 ± 4.4	30.2 ± 4.5	0.011
Waist Circumference (cm)			83.3 ± 16.1	96.3 ± 11.6	0.001
Blood pressure (mmHg)	Systolic		120.3 ± 10.6	130.6 ± 10.8	0.04
	Diastolic		70.9 ± 0.9	85.8 ± 10	0.01
Fasting Blood Glucose (mmol/L)			5.3 ± 1.4	7.5 ± 3.2	0.001
Sr. Triglyceride (mmol/L)			2 ± 1.5	2.8 ± 1.2	0.001
Sr. Cholesterol (mmol/L)			4.3 ± 1.3	4.9 ± 1.3	0.001
Sr. HDL (mmol/L)			1.2 ± 0.5	0.8 ± 0.1	0.001

(*) Statistic Significant at ≤ 0.05.

(**) High Significant at ≤ 0.01.

between MetS and education. Furthermore, the table shows BMI with and without MetS is negatively correlated with height (169 ± 8.4 vs 168.1 ± 8.5, p ≤ 0.450) and positively correlated with weight (78.8 ± 12.3 vs 88.6 ± 13.2, p ≤ 0.001). Our work in high significant BMI (28.6 ± 4.4 vs 30.2 ± 4.5, p<0.011) appeared to be consistent with obesity studies as in [32] and [27]. It is worth mentioning that in [33] metabolically obese normal weight persons were suggested to have an abnormal body mass distribution with an elevated fat mass of >30%, in consequence, it may predispose them to the MetS. Turning to Waist Circumference (WC), it was highly significant (83.3 ± 16.1 vs 96.3 ± 11.6, p< 0.001). It is well known that WS insulin levels and fasting related with lower prevalence of MetS. It has been noticed that heavy drinking association with increasing of MetS risk by influencing its components [34]. Besides, BP was positively correlated with systolic (120.3 ± 10.6 vs 130.6 ± 10.8, p<0.04) and diastolic (70.9 ± 0.9 vs 80.8 ± 10, p<0.01).

Additionally, we noticed that a statistically significant (p< 0.01) highest prevalence of followed hypertension. Similarly, we obtained hypertension as the most essential component in males and females which followed by central obesity, hyperglycemia and dyslipidemia according to NCEP ATP III. These findings agree totally with [35]. Additionally, similar to [36] we noticed that an independent association of elevated level of plasma glucose, hypertension, dyslipidemia, treatment with oral hypoglycemic agents. Moreover, we found the presence of endocrine disorders with MetS. According to NCEP ATP III criteria, the biochemical for employees without and with MetS has higher mean values of fasting serum glucose (5.3 ± 1.4 vs 7.5 ± 3.2, p ≤ 0.001). It has shown highest average total cholesterol (4.3 ± 1.3 vs 4.9 ± 1.3, p ≤ 0.001) and serum triglyceride (2 ± 1.5 vs 2.8 ± 1.2, p ≤ 0.001) and lower HDL levels (1.2 ± 0.5 vs 0.8 ± 0.1, p ≤ 0.001). The parameters we evaluated included high serum glucose, cholesterol and lower HDL cholesterol and triglycerides. These findings agree with recent studies in [37] and [38] expression of dyslipidemias in response to obesity and/or insulin resistance changes apparently. It is the same holds for BP regulation. Additionally, glucose levels depend on insulin sensitivity and insulin-secretory capacity. It is essential mentioning that this variation in distal regulation cannot be ignored as a necessary factor in the causation of MetS (Table 3) [40].

As listed Table 3, H. Pylori Ab tests of 350 reviewers K1 Hospital with dyspeptic were examined, and it was determined that 118 from 241(49%) Without MetS reviewers were H. Pylori (+), whereas 88 from 109(80%) with MetS reviewers were H. Pylori (+). Consequently, the prevalence of H. Pylori positivity was found to be 49% (118/241) and 80% (88/109) in without MetS and With MetS respectively. Lastly, Comparing H. Pylori (+) in terms of demographic characteristics, it was observed as (68 (57.7%) vs 50 (56.8%)) males and (50 (42.3%) vs 38 (43.2%)) females. It has not statistic significant at p ≤ 0.979, of the reviewers in the H. Pylori (+) between MetS groups.

Conclusion

In this article, we assessed samples with the MetS to begin endeavors to obtain an appropriate treatment to reduce the disease. Additionally, we examined the association of Helicobacter pylori (H. Pylori) Ab tests with MetS. To meet this goal, we selected 350 reviewers of Kirkuk Hospital during six months divided into two groups, a group subjects with MetS (N = 109), whereas the latter is without MetS (N=241). The results showed that there are many employees in North oil company in Kirkuk which may be crucial to increase the risk of developing cardiovascular disease. The experiments demonstrated that

Table 3 Correlation demographic characteristics between H. pylori Ab Positive test and Metabolic Syndrome.

Demographic characteristics		**Without MetS H. pylori Ab Positive test N=118 (%)**	**With MetS H. pylori Ab Positive test N=118 (%)**	**P-Value**
Gender	Female	50 (42.3)	38(43.2)	0.979
	Male	68 (57.7)	50(56.8)	
Family history	Positive	70 (59.3)	52(59)	0.912
	Negative	48 (40.7)	36(41)	
Physical activity	Adequate	44 (37.3)	33(37.5)	0.909
	Inadequate	74 (62.7)	55(62.5)	
Job title	A. 1 to 3 degree	30 (25.6)	24(27.2)	0.783
	B. 4 to 5 degree	61 (51.9)	45(51.2)	
	C. 6 to 8 degree	27 (22.5)	19(21.5)	
Alcohol	Yes	10 (8.4)	13(14.7)	0.232
	No	108 (91.6)	75(85.3)	
Smoking	Current	38 (32.2)	35(39.7)	0.329
	Ex/Never	80 (67.8)	53(60.3)	
Education	No/Little	35 (29.6)	24(27.2)	0.910
	Primary	33 (28.2)	23(26.3)	
	Secondary	29 (24.5)	22(25)	
	Graduation	21 (17.7)	19(21.5)	
Body Mass Index (Kg/m^2)	Weight (Kg)	82.8 ± 12.3	83.5±12.2	0.686
	Height (cm)	170 ± 8.4	171.1±8.5	0.356
	BMI (Kg/m^2)	28.5 ± 4.6	28.7±4.8	0.762
Waist Circumference (cm)		83.3 ± 14.1	84.3±13.6	0.610
Blood pressure (mmHg)	Systolic	121 ± 9.5	130.6±10.8	0.013
	Diastolic	70.9 ± 9	85.8±10	0.001
Fasting Blood Glucose (mmol/L)		5.1 ± 1.2	6.1±2.4	0.001
Sr. Triglyceride (mmol/L)		2.2 ± 1.4	2.3±1.8	0.654
Sr. Cholesterol (mmol/L)		4.3 ± 1.3	4.4±1.5	0.610
Sr. HDL (mmol/L)		1.2 ± 0.5	0.9±0.8	0.001

the University degree holders are essential to MetS prevalence. This outcome has demonstrated by the high rates of obesity and overweight obtained subjects with MetS.

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