Metabolic Syndrome; Comparing the Results of Three Definition Criteria in an Iraqi Sample

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ABSTRACT

Background: Different diagnostic definition and criteria have been recommended by different expert groups for the diagnosis of metabolic syndrome, however, it's prevalence in the same population could differ depending on the definition used yielding different results. In Iraq, there is a lack of research comparing these different diagnostic definitions.

Objective: To find out the most suitable metabolic syndrome definition to be used for Iraqi people.

Methods: 320 participants were recruited for this study, 53.4% men and 46.6% women, aged between 25-85 years, visiting Baghdad Teaching Hospital, the prevalence of metabolic syndrome according to different definitions were compared and the agreement was assessed by the Kappa statistic.

Results: Metabolic syndrome was diagnosed in 37.8%, 40.6% and 46.9% participants respectively for the National Cholesterol Education Programme Adult Treatment Panel III 2005, International Diabetes Federation 2005 and the recently (2009) revised International Diabetes Federation definition. The prevalence was higher in women than in men, independent of the criteria used. The Kappa statistics suggested that the agreement between the three definitions ranged from good-to-very good,

Conclusion: Metabolic syndrome was high in this Iraqi cohort regardless of the definition used. The recently (2009) revised International Diabetes Federation definition may be more suitable in diagnosis of metabolic syndrome in Iraq.

Keywords: Metabolic syndrome, Iraq, Prevalence, Comparison,

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INTRODUCTION

Metabolic syndrome (MetS) is an aggregation of biochemical and physical conditions that presage the development of atherosclerotic cardiovascular disease (CVD), type 2 diabetes, and nonalcoholic fatty liver disease [(1-2)]. The different components of MetS were initially described by Reaven in 1988 under the term of "syndrome X" [(3)]. These include obesity (abnormal weight or weight distribution), higher-than-optimal blood pressure, disorders of glucose metabolism and abnormal lipid profile[(4)], since then, other metabolic abnormalities have been considered as part of the MetS, like inflammation, microalbuminuria, hyperuricemia, sleep apnea, abnormalities of fibrinolysis and coagulation [(5)], adding a further complexity to its definition and pathogenesis [(6)]. Therefore over the last decade, several sets of criteria and definitions have been suggested for the diagnosis of MetS, Table (1).

Table (1): Summary of different MetS definitions.

Organization	Comments
WHO definition [I]	This was the first attempt in (1998).
EGIR definition [II]	Announced in 1999.
NCEP:ATPIII definition [III]	Announced in 2001
AACE definition [IV]	Announced in 2003
AHA/NHLBI definition (modified ATPIII) or (NCEP-R)[V]	Announced in 2005
IDF definition [VI]	Announced in 2005
Revised IDF2005 [VII]	Announced in 2009

(I)-World Health Organization definition [7]. (II)-European Group for the Study of Insulin Resistance definition [(8)]. (III)- National Cholesterol Education Program Adult Treatment Panel III [(9)]. (IV)- American Association of Clinical Endocrinology definition [(10)]. (V)-modified National Cholesterol Education *Programme Adult* Treatment Panel III 2005 [11]. (VI)- International Diabetes Federation (IDF)

definition [12)] (VII) - Recently (2009) revised International Diabetes Federation definition [13].

All these criteria share a common ground in the sense that they all acknowledge disorders of glucose metabolism, hypertension, dyslipidemia and obesity as components of metabolic syndrome. They also have areas of inconsistencies, particularly regarding the threshold levels for defining the abnormalities and how these should be combined to define metabolic syndrome. Therefore these inconsistencies may result in, that different criteria yield significantly different results in the same population. This can have potentially undesirable consequences for risk stratification, prioritization of patients for preventive treatment, allocating health care and research resources.

Currently, the two most widely used definitions are those of the modified National Cholesterol Education Programme Adult Treatment Panel III 2005 (M ATP III 2005) and the International Diabetes Federation 2005 criteria (IDF 2005), they provided simple criteria for detection of the metabolic syndrome which could be easily used even in the developing countries [14].

Aim of this study was to compare the prevalence of the MetS diagnosed by the most commonly used definitions, the M ATP III 2005, and the IDF 2005, and compare the results with the recently (2009) revised International Diabetes Federation criteria (R IDF 2005), then assess the agreement between these three sets of definitions in the same group of Iraqi individuals.

2. PATIENTS AND METHODS

2.1 Study population

This was a cross-sectional study, in which a group of 320 Iraqi individuals, 171 men and 149 women, aged 25-85, visiting Baghdad Teaching Hospital (patients. Patient companions and patient visitors), who accepted to take part in this study was recruited.

2.2 Data Collection

Data was collected over one and a half year (July 2011- March 2013) in the Medical City/Baghdad Teaching Hospital. Each patient data was collected using a pre-designed data collection form including age, sex, past medical and drug history. Measurements included waist circumference, systolic and diastolic blood pressure, fasting blood glucose and fasting lipid profile.

The waist circumferences were measured with non-stretchable measuring tape. The waist was defined as the point midway between the iliac crest and the costal margin (lower rib) [15].

Blood pressure, using a mercury sphygmomanometer monitor was measured according to the new AHA recommendations for blood pressure measurement [16]

Lipid profile and fasting blood glucose was obtained after 12 hours fasting [17] and sent for laboratory tests at Medical city laboratory department.

2.3 Definition of Metabolic Syndrome

The definitions of Metabolic Syndrome used in this study is explained in table (2):

Table (2): The definitions of Metabolic Syndrome used in this study

Risk factors	IDF 2005 (I)	M ATP III 2005	R IDF 2005 (I)
Obesity/abdominal obesity	Waist circumference ≥94 cm (male), ≥80 cm (female)	Waist circumference ≥102 cm (males), ≥88 cm (females)	Waist circumference ≥94 cm (male), ≥80 cm(female)
Blood pressure	Systolic Bp ≥130 or diastolic ≥85 mmHg (III)	Systolic Bp ≥130 or diastolic ≥85 mmHg (III)	Systolic Bp ≥130 or diastolic ≥85 mmHg (III)
Fasting Plasma glucose	≥ 100 mg/dL (5.6 mmol/L)	≥ 100 mg/dL (5.6 mmol/L)	≥ 100 mg/dL (5.6 mmol/L)
Raised Triglycerides	≥ 150 mg/dL	≥ 150 mg/dL	≥ 150 mg/dL
Reduce HDL cholesterol	< 40 mg/dL (males) < 50 mg/dL (females)	< 40 mg/dL (males) < 50 mg/dL (females)	< 40 mg/dL (males) < 50 mg/dL (females)
Metabolic syndrome – definition	Abdominal obesity (Prerequisite) plus two or more risk factors	At least any three risk factors	At least any three risk factors

IDF uses waist circumference with ethnic specific values, for the Middle East (Arab) populations they Use European data until more specific data are available, also the R IDF 2005 dropped the waist circumference risk factor as a prerequisite for diagnosis but that it is 1 of 5 criteria [13].

2.4 Data Analysis

Data of all participants were transferred into a computerized statistical package for social sciences (SPSS) software for windows; v. 18.

Descriptive statistics for continuous variables were presented as (mean ± standard deviation), as frequencies and proportions (percentages) for categories. Prevalence of Metabolic syndrome and its individual components (risk factors), was calculated according to the three definitions protocols used in this study (M ATP III 2005, the IDF 2005, and the R IDF 2005). Odds ratio and the 95% confidence interval of the odds, were calculated for comparison of the prevalence of metabolic syndrome in between both genders.

Agreement percent among the three definition protocols was calculated using Cohen's Kappa statistics, levels of agreement were considered as, no Agreement, poor Agreement, Slight Agreement, fair Agreement, good Agreement, very good Agreement, Excellent Agreement with k = <0.00 / 0.01 – 0.20 / 0.21–0.40 / 0.41–0.60 / 0.61–0.80 / 0.81 – 0.92 and 0.93 – 1.00, respectively. Level of significance (P.value) ≤ 0.05 was considered as significant, When the P.value so small it presented as (<0.001) which indicated a highly significant difference.

RESULTS

A total of 320 Iraqi's participated in this study with 171(53.4%) males and 149 (46.6%), the clinical and metabolic parameters description according to the gender of those who participated are summarized in table (3).

MetS was diagnosed in 121 (37.8%) of the participants by the M ATP III 2005, 130 (40.6%) of the participants by the IDF 2005, while the R IDF 2005 diagnosed 150 (46.9%) of the participants figure (1).

Table (3): Clinical & metabolic parameters according to gender.

Variable		Gender		
		Male	**Female**	**Total**
Number n (%)		171 (53.4%)	149 (46.6%)	320 (100.0)
Age	Mean ±SD	54.2 ± 11.2	53.4 ±11.4	53.8 ± 11.3
	Range	25 - 85	25- 85	25-85
Waist circumference	Mean ±SD	98.7 ± 11.5	95.5 ±12.9	97.2 ± 12.3
	Range	74- 126	66- 130	66-130
SBP (mmHg)	Mean ±SD	134.6 ± 18.2	128.1 ± 13.7	131.5 ± 16.6
	Range	90 -180	90 -155	90 - 180
DBP (mmHg)	Mean ±SD	86.2 ± 10.2	84.4 ± 9.2	85.4 ± 13.1
	Range	60 -155	60 -110	60- 155
FBS (mg\dl)	Mean ±SD	112.7 ± 27.2	131.2 ± 63.5	121.3 ± 48.5
	Range	65- 310	55- 350	55- 350
TG (mg\dl)	Mean ±SD	143.2 ± 71.7	134.2 ± 30.8	139 ± 56.5
	Range	45- 622	64- 350	45 - 622
HDL (mg\dl)	Mean ±SD	50.2 ± 10.5	52.1± 9.3	51.1± 10
	Range	23- 60	19 - 75	19 - 75

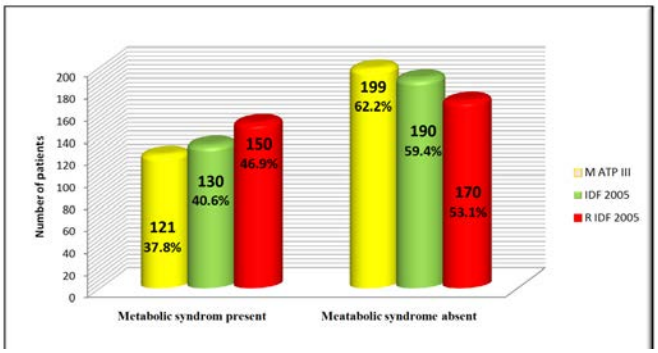

Figure 1: Prevalence of metabolic syndrome according to the three definitions among study population

The prevalence of MetS among males and females diagnosed by each definition was as follows, 57 (33.3%) males and 64 (43.0%) females by the M ATP III 2005, 62 (36.3%) males and 68 (45.6%) females by the IDF 2005, while the prevalence by the R IDF 2005 was 75 (43.9%) males and 75 (50.3%) females, table (4)

Table (4): Prevalence of metabolic syndrome according to the three definition protocols among study population by gender.

Definition	MetS	Male	Female	Total	Odds ratio	P
M ATP III 2005	Present	57	64	121	0.664 (0.42-1.1)	0.077
		33.3%	43.0%	37.8%		
	Absent	114	85	199		
		66.7%	57.0%	62.2%		
IDF 2005	Present	62	68	130	0.68 (0.43-1.6)	0.088
		36.3%	45.6%	40.6%		
	Absent	109	81	190		
		63.7%	54.4%	59.4%		
R IDF 2005	Present	75	75	150	0.77 (0.5-1.2)	0.24
		43.9%	50.3%	46.9%		
	Absent	96	74	170		
		56.1%	49.7%	53.1%		

Table (5): kappa (%Agreement) between different definitions of the metabolic syndrome by gender

	ATP-IDF2005	IDF2005-IDF2009	ATP-IDF2009
	kappa (%Agreement)	kappa (%Agreement)	kappa (%Agreement)
All	0.68 (84.7%)	0.87(93%)	0.82(91%)
Men	0.61 (81.9%)	0.84(92.4%)	0.78(89.5%)
Women	0.75 (87.9%)	0.91(95.3%)	0.85(92.6%)

The agreement between the clinical definitions in identifying participants with MetS was between 84.7%– 93%. The highest levels of agreement were observed between IDF2005 and R IDF 2005 [k (% agreement) = 0.87(93%)] and the lowest levels of agreement were observed between M ATP III 2005 and IDF2005 [k (%agreement) = 0.68 (84.7%)], while the levels of agreement between M ATP III IDF 2005 was [k (% agreement) = 0.82(91%)], table (5).

Specific agreement among those diagnosed to have Metabolic Syndrome was, 101 (31.6%) of participants were identified equally by all three criteria, 29 (9.1%) of participants were identified only by the IDF 2005 and the R IDF 2005, while 20 (6.2%) of participants were identified only by the M ATPIII 2005 and the R IDF 2005,

Specific disagreement for each pair comparison is as follows, the M ATPIII 2005 missed 9 (2.8%) of the participants that were identified by the IDF 2005 and 29 (9.1%) of the participants that were identified by the R IDF2005.

The IDF 2005 missed 20 (6.25%) of the participants that were identified by the new R IDF2005.

While the R IDF 2005 didn't miss any participants and diagnosed 20 (6.25%) more participants to have MetS than the IDF 2005 and 29 (9.1%) more than the M ATPIII 2005, diagram (2).

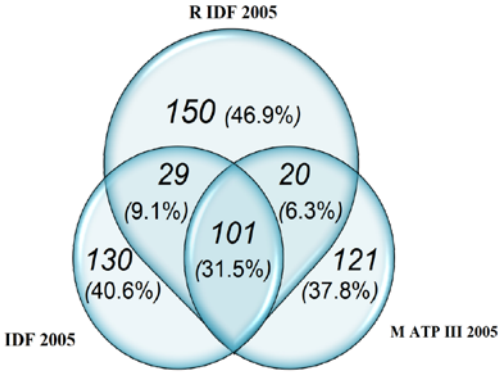

Figure 2: Showing the overlapping of subjects with metabolic syndrome based on the three definitions

DISCUSSION

In this study we have provided to our best knowledge the first assessment of the prevalence of MetS, in an Iraqi sample, using the R IDF 2005, and comparing it to the prevalence of the more traditional M ATPIII 2005 and IDF 2005.

The overall prevalence of Metabolic Syndrome in this cohort was high regardless of any criteria used. Our results showed that the M ATPIII 2005 diagnosed 37.8% of participants as having MetS, the IDF 2005 diagnosed 40.6%, while the R IDF 2005 diagnosed 46.9%, table (4).

The prevalence of MetS was higher in women than in men; independent of the criteria used, and was highest using R IDF 2005 than the IDF 2005 and least in the M ATP III 2005, table (4).

The Kappa statistics suggested that the agreement between the three definitions ranged from good-to-very good overall, by gender, with the best agreement observed in women, table (5).

These similarities could be explained since the diagnosis of MetS is based on the same criteria according to the three definitions, except for the waist criteria.

The R IDF 2005, the M ATPIII 2005 and the IDF 2005 focus specifically on waist circumference, which is a surrogate measure of central obesity, the R IDF 2005 builds upon the M ATPIII 2005 and the IDF 2005, but differs in two key aspects from the M ATPIII 2005. First, the R IDF 2005 has lowered the threshold for waist circumference from the 102 cm.

Second, waist circumference is different according to ethnical characteristics.

While it differs in one key aspect from the IDF 2005 in that waist circumference is not a prerequisite although the cutoff point is equal.

Despite the above similarities and agreement in the diagnosis of MetS, these three definitions provided different prevalence estimates, identified and/or missed different individuals, figure (2) due to these waist circumference definition differences.

Regarding the IDF 2005 that used waist circumference as a prerequisite, it appears that making abdominal obesity as mandatory criteria may not improve identification of other risk clusters in subjects, and hence may not be an appropriate option. In particular, persons having other components of the metabolic syndrome but not having abdominal obesity would not be identified by the IDF 2005 definition but may still be at a greater future risk of T2DM or CVD by virtue of having clustering of other risk factors. [17]

Also there has been general agreement that the M ATP III- defined waist circumference criteria should not be used for Asians based on physiological and epidemiological data.[18]

While the R IDF 2005 has proposed new cutoffs for waist circumference in different ethnic groups and generally they has lower threshold than that of the M ATPIII, in addition they agreed that abdominal obesity should not be a prerequisite for diagnosis but that it is 1 of 5 criteria, so that the presence of any 3 of 5 risk factors constitutes a diagnosis of metabolic syndrome. [13]

Previous studies have shown that using a lower waist circumference threshold within the context of MetS increases the prevalence, but decreases the risk of mortality and type 2 diabetes [19,20] which is a very important achievement if accomplished.

Furthermore, with these modifications and simplicity of use, R IDF 2005 definition appears to be applicable across most ethnic groups, and all countries including developing countries.

In conclusion the metabolic syndrome is high in this Iraqi cohort, and in all other previous studies done in Iraq, regardless of the criteria used. The R IDF 2005 may be more suitable in diagnosis of metabolic syndrome in Iraq especially if we have our own national threshold of waist circumference. This analysis emphasized the importance of performing a nationwide study to determine the optimal definition of MetS for Iraqi population and to determine our own cut-off points for each of the risk factors of MetS.

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