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Research Article

Comparison of Metabolic Syndrome Prevalence between the Pre-crisis and Crisis Period in Syria

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Abstract

Background: The Syrian crisis has had a big impact on the country as a whole, including its health and economy. Since Metabolic Syndrome (MetS) has several risk factors, the aim of this study was to investigate the effect of the crisis on its prevalence.

Methods: A convenient sample of 1550 healthy subjects aged 18-82 years participated in this study from 2010 till 2015. MetS prevalence was compared between the pre-crisis period and crisis period.

Results: MetS prevalence was found to be significantly lower during the crisis period compared to the pre-crisis period, whereby it was 20.1% in 2010 compared to 11% in 2015.Still, when hospital admissions from cardiovascular disease (CVD) were compared between the pre-crisis and crisis periods, the latter was found to be significantly higher during the crisis as opposed to the pre-crisis period.

Conclusion: The lower prevalence of MetS in the crisis period could be attributed to the change in lifestyle (physical activity and dietary habits). Still, hospital admissions from CVD increased, which could be explained by the increase in psychological stress from the crisis. Thus, further studies need to investigate the effect of both MetS and stress on CVD.

Keywords: *Metabolic Syndrome; Crisis; Cardiovascular Disease; Stress*

Introduction

Metabolic Syndrome (MetS) has become a worldwide concern, due to its rapid increase and its correlation with cardiovascular morbidity and mortality [1-3].

MetS was found to increase the risk of cardiovascular disease [4-6]. Some studies have found that MetS increased the risk of CVD by two folds within five to 10 years, strokes by two to four folds, and myocardial infarction three to four folds. Furthermore, the mortality rate from CVD in patients with MetS doubled compared to patients without it [3,7]. However, Milan., *et al*. reported that MetS did not affect mortality, but rather increased strokes and non-fatal myocardial infarction [8].

Regarding MetS prevalence, it was found to vary according to race, gender, and the definition used [9-11]. As for the risk factors, the latter included socio-economic status, dietary habits, and physical activity [10,12,13].

In Syria, the crisis started at the beginning of the year 2011. It had a significantly negative impact on the country as a whole, including the deterioration in health, increase in unemployment and economic inflation [14,15] (Table 1). Furthermore, MetS prevalence in apparently healthy adults was found to be 28% using the International Diabetes Federation (IDF) definition, with a higher prevalence in males than in females [16].

Aim of the Study

The aim of this study was to investigate the effect of the crisis on the prevalence of MetS in the Syrian population, by comparing MetS prevalence in the pre-crisis and crisis periods. Furthermore, hospital admissions from CVD were also compared.

Component	2011	2012	2013	2014	2015
Foods and non-alcoholic beverages	3%	16%	45%	10%	14%
Housing, Water, Electricity and Gas	3%	11%	13%	4%	7%
Transportation	0%	2%	5%	1%	3%
Clothing and Shoes	0%	2%	5%	2%	3%
Household equipment and tools	3%	11%	13%	4%	7%

Table 1: *Rates of the economic inflation during the Syrian Crisis period 2011 - 2015 (considering 2010 = reference). The data was taken from the Damascus Center for Research and Studies (DCRS), MADAD.*

Materials and Methods

Study design

A secondary de-identified data was used in this study, collected as part of a cross-sectional surveys conducted in Al-Assad University Hospital (AUH), Damascus, Syria between 2010 and 2015 on apparently healthy participants [16-18]. The study was approved by the Damascus University Review Board (DURB).

Study population and sampling

Participants were recruited using a flyer advertising for the study at the Department of Internal Medicine. The participants who self-selected themselves into the study included AUH staff or their relatives and medical school students. Initially, 1577 volunteered to participate in the study. A series of laboratory measurements and tests were used to exclude participants who were suffering from any acute or chronic illness, impaired renal or liver function, and intestinal malabsorption. Pregnant and lactating women were also excluded. The final sample comprised of 1550 "healthy" participants, including 602 males and 948 females aged 18 - 82 years.

Data collection

A written informed consent was obtained from participants. Medical doctors in their final year of specializing in Endocrinology were responsible for collecting data from the participants, including conducting the face-to-face interviews, performing the laboratory examination and collecting morning fasting blood samples. All tests were performed in AUH clinical laboratory and analyzed immediately after collection by the same team of laboratory technicians. The same procedures were followed throughout the study period, using kits provided by the same manufacturer.

Data about general and cardiovascular admissions in 2010 and 2014 were obtained from the statistical department at the AUH.

Measures

High density lipoprotein (HDL), Triglycerides (TG), Glucose (Glu), Creatinine (Cr), and Alanine transaminase (ALT) were measured by standard colorimetric methods using Roche Hitachi 912 autoanalyzer (Roche Diagnostics, Mannheim, Germany).

Anthropometric measurements were performed using the same standardized techniques and calibrated digital scale (Seca, Germany). Body mass index (BMI) was calculated for all subjects wearing light clothing and no shoes, as weight in kilograms (kg) divided by squared height in meters (m).

MetS was defined based on the IDF as having central obesity along with two of the following: TG ≥ 150 mg/dL (1.7 mmol/L); reduced HDL cholesterol < 40 mg/dL (1.0 mmol/L) in males and < 50 mg/dL (1.3 mmol/L) in females; blood pressure(BP) systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg; raised fasting plasma glucose (FPG) ≥ 100 mg/dL (5.6 mmol/L) [19].

Statistical analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS, version 18). Descriptive statistics was reported as mean ± SD for continuous variables. Categorical variables were reported as frequencies and valid percentages. Chi square test was used to analyze group differences for categorical variables. As to compare means, t-test was used. A p-value of less than 0.05 was considered significant.

Results

Characteristics of the study population

The total number of the study population was 1550, whereby 61% were females. The mean age of the sample was 36.58 **±** 11.99, with no significant statistical difference between genders (reference our previous article).

The prevalence of MetS in the study population from 2010 till 2015 was found to be 28%, whereby males had a significantly higher prevalence (37.2%) compared to females (22.2%) (Table 2).

Characteristics	All (n = 1550)	Males (n = 602)	Females (n = 948)	P-value
Age (years)	36.58 ± 11.99	36.21 ± 11.38	36.81 ± 12.36	0.331
BMI (kg/m^2)	27.39 ± 5.55	27.87 ± 4.74	27.09 ± 5.99	< 0.001
WC (cm)	88.91 ± 14.06	95.49 ± 12.27	84.72 ± 13.52	< 0.001
Glucose (mg/dl)	87.30 ± 18.65	89.77 ± 18.77	85.73 ± 18.41	< 0.001
HDL (mg/dl)	50.30 ± 13.74	42.91 ± 10.76	55.00 ± 13.37	< 0.001
TG (mg/dl)	123.96 ± 81.79	147.79 ± 96.84	108.77 ± 66.28	< 0.001
SBP	118.21 ± 14.65	122.08 ± 13.50	115.75 ± 14.83	< 0.001
DBP	73.67 ± 10.48	76.05 ± 9.78	72.15 ± 10.63	< 0.001
MetS Prevalence (%)	28	37.2	22.2	< 0.001

Table 2: *Characteristics of the study population from 2010 till 2015.*

Comparison of MetS prevalence between 2010 and 2015

As shown in figure 1, the prevalence of MetS in 2010 (pre-crisis) is significantly higher than that in 2015 (during the crisis), whereby it was 20.1% in 2010 compared to 11% in 2015.

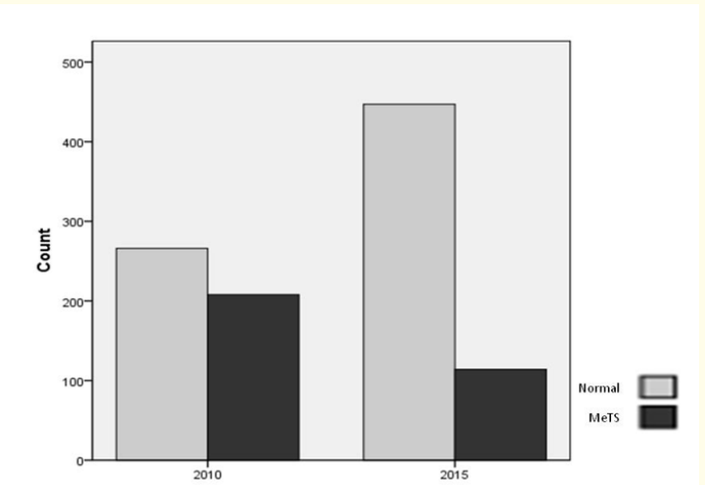

Figure 1: *Comparison of MetS prevalence between 2010 and 2015.*

Comparison of MetS components between the years 2010 and 2015

From table 3, it can be seen that the means of all MetS components, except for HDL, are significantly higher in 2010 than in 2015, which is in accordance with figure 1 which shows that the prevalence of MetS was higher in 2010 compared to 2015.

MetS Components		N	Mean	SD	P-value
Age (years)	2010	475	38.20	11.400	
	2015	561	38.51	13.278	0.9
Waist (cm)	2010	475	92.6505	14.99814	< 0.001
	2015	561	89.1569	13.05648	
SBP (mm Hg)	2010	475	122.53	13.213	< 0.001
	2015	561	115.58	14.871	
DBP (mm Hg)	2010	475	76.75	9.344	
	2015	561	72.01	11.415	< 0.001
Glucose (mg/dl)	2010	475	92.60	22.765	< 0.001
	2015	561	81.08	20.749	
TG (mg/dl)	2010	474	134.06	75.989	< 0.001
	2015	560	119.05	77.447	
HDL (mg/dl)	2010	475	49.17	13.078	
	2015	557	51.36	13.290	< 0.001
BMI (kg/m^2)	2010	475	28.9878	6.34373	
	2015	556	27.0422	5.62782	< 0.001

Table 3: *Comparison of MetS components between 2010 and 2015.*

Comparison between the hospital admittance in 2010 (pre-crisis) and in 2014 (crisis)

Table 4 shows the number of hospital admittance in 2010, which was before the Syrian crisis started, and 2014, which was during the crisis period.

Year	Total Admissions	Admissions for CVD	p-value	ER and ICU admissions from CVD	p-value
2010	20598	359 (1.7%)	<0.001	281 (1.36%)	0.027
2014	19159	462 (2.4%)		335 (1.74%)	

Table 4: *Comparison of hospital admissions at the ICU for cardiovascular cases between 2010 and 2014.*

In 2010, the number of hospitalizations due to CVD was 359 (1.7%), compared to 462 (2.4%) in 2014 (p-value < 0.001). Admittance to ICU due to CVD was also significantly higher in 2014 (335) than in 2010 (281) (p-value = 0.027).

Discussion

The results of this study suggest that MetS prevalence during the Syrian crisis period was significantly lower than before the crisis. In 2015, MetS prevalence was 11%, as opposed to 20.1% in 2010. This could be explained by the economic inflation as seen in table 1. Since transportation and food expenses increased, people took up walking and changed their dietary habits. Other studies have shown similar

results [20-23]. For example, in a study conducted by Damiri and her colleagues, it was shown that the incidence of MetS was 53% lower in those who walked more than an hour per day [23].

Still, while MetS prevalence decreased during the crisis, hospital admissions from CVD increased. When comparing admissions from CVD between 2010 and 2014, it was found that there was an approximate 2-fold increase in these admissions in 2014 compared to 2010 (p-value < 0.001). This might be explained by the effect of psychological stress on CVD. Several studies have supported this idea [24-26]. For example, in a study conducted in 2012, it was found that psychological stress increased the risk of coronary heart disease by 40 - 50% [27]. Thus, even if MetS components and MetS prevalence might have lowered, the effect of stress outweighed them with regards to CVD.

Limitations of this study include the convenient sampling method, which affects the generalizability of this study's results.

Still, Al-Assad hospital is a big public hospital where Syrians from different areas and cities go to. Furthermore, this is the first study, to our knowledge, that investigates the effect of a crisis on the prevalence of MetS and compares it to the changes is hospital admissions due to CVD. Worthy to mention were the strict inclusion criteria to ensure participants were healthy.

Consequently, further studies need to be done in order to investigate the effect of stress during the Syrian crisis on CVD and compare it to the effect of MetS on CVD.

Conclusion

The lower prevalence of MetS in the crisis period could be attributed to the change in lifestyle (physical activity and dietary habits). Still, hospital admissions from CVD increased, which could be explained by the increase in psychological stress from the crisis. Thus, further studies need to investigate the effect of both MetS and stress on CVD.

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