Prevalence of metabolic syndrome in patients with schizophrenia

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Introduction
This study was conducted to assess the prevalence of metabolic syndrome (MetS) and its association with sociodemographic and clinical variables among schizophrenic inpatients in Kuwait. In recent years, especially after the introduction of new generation antipsychotics, researchers have frequently discussed on the metabolic problems seen in patients with schizophrenia.

Methods
This was a cross-sectional observational study; 181 adult patients aged 18 years and above, admitted to Psychological Medicine Hospital, Kuwait in July, 2009, with a diagnosis of schizophrenia according to the *Diagnostic and Statistical manual of Mental disorders – text revised (DSM -IV-TR)* were invited to participate until 30 December 2009. The Third Adult Treatment Panel (ATP III) of The National Cholesterol Education Program, the American Heart Association (ATP-III-A), and International Diabetes Federation criteria were used to define MetS.

Results
The prevalence of MetS among schizophrenic patients is high. The prevalence rate by different definition was 27.1% ($n=49$) (three definitions of MetS were used), and the prevalence was 18.8, 23.2, and 24.9% according to The Third Adult Treatment Panel of The National Cholesterol Education Program, the ATP III-A, and International Diabetes Federation criteria, respectively. The prevalence of MetS increased with age, duration of illness and illness severity.

Conclusion
The prevalence of the MetS among schizophrenic patients is high (27.1%). Although this study found that the prevalence of MetS in schizophrenic patients was lower according to ATP III (18.8%), in comparison with similar studies, it is increased when ATP III-A (23.2%) and IDF (24.9%) were taken into account. Robust correlation of MetS with age, duration of illness, and illness severity were noted.

Keywords:
diabetes, metabolic syndrome, obesity, schizophrenia

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Introduction

During the last several years, there has been a growing interest in metabolic abnormalities in the general population and in schizophrenic patients [1]. The metabolic syndrome (MetS), a cluster of metabolic risk factors (central obesity, dyslipidemia, raised blood pressure, and fasting blood glucose) for type 2 diabetes mellitus and cardiovascular disease (CVD), is a commonly observed phenomenon in psychiatric practice all over the world [2]. In the absence of CVD or diabetes, the MetS is a predictor of these conditions. Once CVD or diabetes develops, the MetS is often present and the number of components of the syndrome contributes to disease progression and risk [3].

In recent years, especially after the introduction of new generation antipsychotics, researchers have frequently discussed on metabolic problems seen in patients with schizophrenia [4]. These metabolic abnormalities are of major clinical concern, not only because of their direct, somatic effects on morbidity and mortality, but also because of their association with psychiatric outcome, such as a higher prevalence of psychotic and depressive symptoms also a worse perceived physical health [5], has a small but measurable impact on psychiatric outcomes and associated with prolongation in length of hospital stay [6]. Body mass index (BMI) status and subjective distress from weight gain were predictors of noncompliance. Obese individuals were more than twice as likely as those with a normal BMI to report missing their medication [7].

MetS is associated with a four times higher risk of developing diabetes [8], three times higher risk of dying from coronary heart disease [9], three times higher risk of stroke, and six times more likely to be at risk of cardiovascular-related mortality [10].

There has been a number of MetS definitions presented over the last decade. The widely accepted ones are those proposed by (i) National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III)

[11]; (ii) American Heart Association/National Heart, Lung, and Blood Institute, AHA (updated ATP III) [12]; and (iii) International Diabetes Federation (IDF) [13]. Table 1 shows the similarities and differences among these definitions.

A major difference between the ATP and IDF diagnostic systems is the necessity of central obesity for making a diagnosis. The updated ATP III definition requires any three of five criteria for a diagnosis, whereas the IDF definition needs central obesity plus any other two abnormalities. Despite this difference, updated ATP III and IDF criteria still identify essentially the same individuals as having MetS. In addition, recommendations for clinical management are virtually identical in the updated ATP III and IDF reports [12]. Depending on the various definitions used, prevalent studies of MetS in large sample sizes of schizophrenic patients showed rates of MetS between 28.4 and 44.7%. In 240 Canadian patients with schizophrenia or schizoaffective disorder, 45.5% (42.6% of men and 48.5% of women) of them met the ATP III diagnosis of MetS [14].

Both the original and updated ATP III definitions were applied in 689 Americans with schizophrenia, who participated in the Clinical Antipsychotic Trials of Intervention Effectiveness Schizophrenia Trial. The prevalence rates of MetS in the Clinical Antipsychotic Trials of Intervention Effectiveness study were 40.9% (ATP III) and 42.7% (updated ATP III) [15]. A more recent study in 430 Belgian patients with schizophrenia showed a prevalence of 28.4% (ATP III), 32.3% (updated ATP III), and 36% (IDF) [16]. In Egypt, the prevalence of MetS in schizophrenic patients was 38.09% [17]. In Turkey, MetS in schizophrenic patients was 21% according to ATP III, 34% according to ATP III-A, and 41% based on IDF [18].

The higher prevalence of MetS in patients with schizophrenia may be explained by medication-related, disease-related, and lifestyle-related factors. Second-generation antipsychotic drugs cause, to a varying extent, dyslipidemia, weight gain, and diabetes [19]. Lifestyle factors such as smoking, unhealthy food intake, and little physical exercise contribute to the development of cardiovascular and metabolic diseases in patients with schizophrenia [9].

Hypothesis and aim of the studywas to assess the prevalence of MetS and its association with sociodemographic and clinical variables in a sample of patients with schizophrenia admitted to Psychological Medicine Hospital in Kuwait.

Patients and methods

This is a cross-sectional observational study; 181 adult patients aged 18 years and above, admitted at the acute admission wards of the Psychological Medicine Hospital, Kuwait over a period of 6 months (July 2009 till end of December 2009, inclusive), who fulfilled the study's inclusion criteria were invited to participate.

The exclusion criteria were being currently pregnant or a history of pregnancy in the past 6 months (to avoid metabolic disturbance), substance use disorder, dementia, mental retardation, and lack of capacity to give written informed consent. The study was approved by the hospital's research and ethics committee. A written informed consent (included study title, different measurement, and investigations) was taken from the patients and their families after discussing the aim of the study with them.

The psychiatric diagnosis considered for each patient was the primary diagnosis, confirmed by their assisting physician, according to the *Diagnostic and Statistical manual of Mental disorders Text Revised*. Sociodemographic variables, details of illness (psychiatric and medical), and a list of all past and current medications were collected systematically through patient interview and from available medical records. MetS was diagnosed using three sets of criteria (definitions of MetS are presented in Table 1).

The IDF lists the following ethnic group-specific thresholds for waist circumference to define central adiposity: Europid, sub-Saharan African men, and Eastern and Middle-Eastern men, more than or equal to 94 cm; South Asian, Chinese, and ethnic South American and Central American men, more than or equal to 90 cm; Japanese men, more than or equal to 85 cm; women except Japanese women, more than or equal to 80 cm; and Japanese women, more than or equal to 90 cm. In this analysis, the following thresholds for waist circumference were used: white men, more than or equal to 94 cm;

Table 1 Definitions of the metabolic syndrome

Criteria	ATP III[a] (NCEP)	ATP III A[a] (AHA)	IDF[b]
Waist (cm)	M>102, F>88	M>102, F>88	M ≥ 94, F ≥ 80
BP[c] (mmHg)			Obligatory criterion
HDL (mg/dl)	≥ 130/85	≥ 130/85	≥ 130/85
TG (≥ 150 mg/dl) or ≥ 1.695(mmol/l)	M<40, F<50	M<40, F<50	M<40, F<50
Glucose (mg/dl) or (mmol/l)[d]	≥ 150 or ≥ 1.695	≥ 150 ≥ or ≥ 1.695	≥ 150 or ≥ 1.695
	≥ 110 or ≥ 6.1	≥ 100 or ≥ 5.6	≥ 100 or 5.6

AHA, the American Heart Association; BP, blood pressure; F, female; HDL, high-density lipoprotein; IDF, International Diabetes Federation; M, male; MetS, metabolic syndrome; NCEP ATP III, The Third Adult Treatment Panel of The National Cholesterol Education Program; TG, triglycerides.
[a]MetS if three of five criteria are met.
[b]MetS if additional two criteria are met (waist is obligatory).
[c]Or if treated with antihypertensive medication.
[d]Or if treated with insulin or hypoglycemic medication.

African–American men, more than or equal to 94 cm; Mexican–American men, more than or equal to 90 cm; white women, more than or equal to 80 cm; African–American women, more than or equal to 80 cm; and Mexican–American women, more than or equal to 80 cm. For participants whose designation was 'other race–including multiracial', thresholds that were once based on Europid cut-points ($\geq$ 94 cm for men and $\geq$ 80 cm for women) and once based on South Asian cut-points ($\geq$ 90 cm for men and $\geq$ 80 cm for women) were used.

The participants' height was measured using a wall-mounted standiometer, and the weight was measured using calibrated electronic scales with the patient wearing light clothes. Waist circumference was measured at the midpoint between the upper border of the iliac crest and the lower rib, with a tape measuring horizontally circling the body. Blood pressure was measured with the patient seated, after a minimum of 10 min rest.

Fasting blood samples (blood was sampled after a minimum of 10 h of fasting) were collected to assess glucose, triglycerides, and high-density lipoprotein (HDL) levels. Glucose was measured by the oxidative glucose colorimetric method, with dry chemistry readings with reflectometry. The triglycerides were measured by the enzymatic and colorimetric methods. HDL was measured by the homogenic or direct method.

The statistical analysis consisted initially of descriptive measures for the variables under study. For this purpose, frequencies and percentages were used for category variables, and means and standard deviations were used for quantitative variables. Independent sample *t*-test (*t*) was used when there were two groups of patients compared regarding different variables. Paired samples *t*-test (*t*) was used when same patients (one group) were compared regarding different variables. Pearson χ^2 tests were used to detect whether there is a significant association between two categorical variables. One way analysis of variance (*F*) was applied when comparing several means to see how several independent variables interact with each other and what effects these interactions have on a dependent variable. The statistical significance level was accepted as *P* value of less than 0.05. The analyses were conducted with the software SPSS (version) 15.0 Inc. (Statistical Package for Social Sciences, Chicago, Illinois, USA).

Results

Of all the inpatients in the psychological medicine hospital during the study period, we enrolled 181 patients who met the inclusion criteria to participate in the study. Frequencies of distribution of age and the duration of illness of patients and indices of MetS are summarized in Table 2. The mean age of the patients was 38.5 ± 10.3 years, the mean duration of illness was 13.6 ± 8.5 years, the mean height of patients was 163.0 ± 8.8 cm, the mean weight of the patients was 77.0 ± 18.5 kg, the mean waist circumference of the patients was 94.5 ± 16.7 cm, the mean hip circumference of the patients was 100.7 ± 16.0 cm, the mean triglyceride level of the patients was 1.3 ± 0.81 mmol/l, the mean HDL level of the patients was 1.1 ± 0.28 mmol/l, the mean systolic blood pressure of the patients was 124.6 ± 14.5 mmHg, the mean diastolic BP of the patients was 79.9 ± 8.6 mmHg, and the mean fasting blood glucose level of the patients was 5.8 ± 2.3 mmol/l.

Table 2 Frequencies of distribution of age and duration of illness of patients and indices of metabolic syndrome (*N*=181)

Variable	Number of patient	Percentage
Age (years)		
18–30	42	23.2
31–45	97	53.6
46–68	42	23.2
Mean (SD)	38.5 (10.3)	
Duration of illness (years)		
1–5	39	21.5
6–10	41	22.7
11–20	60	33.1
21–40	41	22.7
Mean (SD)	13.6 ± 8.5	
Height of patients (cm)		
140–160	83	45.8
161–170	57	31.5
171–193	41	22.7
Mean (SD)	163.0 ± 8.8	
Weight of patients (kg)		
43–70	61	33.7
71–90	87	48.1
91–110	27	14.9
111–156	6	3.3
Mean (SD)	77.0 ± 18.5	
Waist circumference of patients (cm)		
43–80	38	21.0
81–90	36	19.9
91–100	40	22.1
101–120	56	30.9
121–150	11	6.1
Mean (SD)	94.5 ± 16.7	
Hip circumference of patients (cm)		
42–90	44	24.3
91–110	97	53.6
111–138	40	22.1
Mean (SD)	100.7 ± 16.0	
Triglycerides level (mmol/l)		
0.24–1.68	148	81.8
1.69–5.10	33	18.2
Mean (SD)	1.3 ± .8	
HDL level (mmol/l)		
0.40–1.00	75	41.4
1.1–1.50	87	48.1
1.51–2.08	19	10.5
Mean (SD)	1.1 ± .28	
Systolic BP of patients (mmHg)		
100–120	110	60.8
125–140	57	31.5
145–190	14	7.7
Mean (SD)	124.6 ± 14	
Diastolic BP of patients (mmHg)		
65–70	53	29.3
75–90	116	64.1
95–110	12	6.6
Mean (SD)	79.9 ± 8.6	
Fasting blood glucose level (mmol/l)		
2.0–5.5	116	64.1
5.6–6.1	30	16.6
6.2–8.00	21	11.6
8.1–18.2	14	7.7
Mean (SD)	5.8 ± 2.3	

BP, blood pressure; HDL, high-density lipoprotein; SD, standard deviation.

Table 3 Demographic and clinical characteristics of the patients (*N*=181)

Variable	*n*	Percentage
Age (years, mean ± SD)	38.5 ± 10.3	–
Sex		
Male	128	70.7
Female	53	29.3
Marital state		
Single	105	58
Married	38	21
Other (widowed, divorced)	38	21
Education level		
No formal education	78	43.1
Primary school	19	10.5
Secondary/intermediate	58	32
School university	26	14.4
Occupation		
Unemployed	161	88.9
Student	2	1.1
House wife only	7	3.9
Junior work	8	4.4
Senior level	3	1.7
Nationality		
Kuwaiti	138	76.2
Non Kuwaiti	23	12.7
Other Arabs	20	11
Diagnosis		
Schizophrenia	165	91.2
Schizoaffective	16	8.8
Illness duration (years, mean ± SD)	13.6 ± 8.5	–
Drug type		
Typical antipsychotic	42	23.2
Atypical antipsychotic	81	44.8
Combined typical and atypical antipsychotic	58	32.8
Smoking		
Present	92	50.8
Not present	89	49.2
Hypertension in family		
Present	88	48.6
Not present	93	51.4
Diabetes in family		
Present	67	37
Not present	114	63

SD, standard deviation.

Demographic and clinical characteristics of the patients are given in Table 3. The mean age of the patients was 38.5 ± 10.3 years; the study cases were 128 (70.7%) male patients and 53 (29.3%) female patients, 105 (58%) single, 38 (21%) married, and 38 (21%) others (divorced, widowed). In addition, there were 138 (76.2%) patients Kuwaiti, 23 (12.7%) patients nonKuwaiti, and 20 (11%) patients of other Arab nationalities.

As regards the occupational status, two patients (1.1%) were students, seven (3.9%) patients were housewives only, eight (4.4%) patients were junior-level workers, three (1.7%) patients were senior-level workers, and 161 (88.9%) patients were unemployed. Considering the educational level, 78 (43.1%) patients received no formal education, 19 (10.5%) patients went to primary school, 58 (32%) patients went to secondary/intermediate school, and 26 (14.4%) patients were university graduates.

Mean duration of illness was 13.6 ± 8.5 years. As regards the antipsychotics used, 81 patients (44.8%) used atypical antipsychotics, 42 (23.2%) patients used typical antipsychotics, and 58 (32.8%) patients used combined typical and atypical antipsychotics. As regards the diagnosis, 165 patients (91.2%) were diagnosed with schizophrenia and 16 (8.8%) patients were diagnosed as schizoaffective.

Overall, 91 patients (50.8%) were smokers, 88 (48.6%) patients had family members with hypertension, and 67 (37%) patients had family members with diabetes.

The sex differences in age and indices of MetS are shown in Table 4. Of the 181 participants, 128 patients (70.7%) were men and 53 were women (29.3%). The mean age of the patients was 38.5 ± 10.3 years; 39.5 ± 11.05 years for men and 36.35 ± 7.7 for women. There was no significant difference among both men and women. As regards the duration of illness, there was no significant difference between men and women, when the mean duration of illness was 13.54 ± 8.8 years for men and 13.9 ± 7.6 years for women.

The mean waist circumference of patients was 94.2 ± 17.8 cm for men and 95.2 ± 13.8 cm for women, with no significant difference between them. The mean triglyceride level was 1.4 ± 0.91 mmol/l for men and 1.03 ± 0.6 mmol/l for women, with no significant difference between them. The mean HDL level was 1.09 ± 0.3 mmol/l for men and 1.1 ± 0.3 mmol/l for women, with no significant difference between them.

The mean systolic BP of the patients was 126.9 ± 15.3 mmHg for men and 119.2 ± 10.9 mmHg for women, with statistically significant difference between them. The mean diastolic BP of the patients was 81.25 ± 8.8 mmHg for men and 76.8 ± 7.2 mmHg for women, with significant difference between them.

The mean fasting blood glucose level was 5.9 ± 2.5 mmol/l for men and 5.8 ± 1.9 mmol/l for women, with no significant difference between them.

Metabolic syndrome types are shown in Table 5. Of the 181 patients, the total prevalence in the population

Table 4 Sex differences in age and indices of metabolic syndrome

Variable	Male (*N*=128)	Female (*N*=53)	*t*	d.f.	Significance: *P* (two-tailed)
Age (years)	39.5 ± 11.05	36.35 ± 7.7	1.86	179	0.069
Illness duration	13.54 ± 8.8	13.9 ± 7.6	0.24	179	0.033
Waist circumference of patients (cm)	94.2 ± 17.8	95.2 ± 13.8	0.34	179	0.73
Triglycerides level (mmol/l)	1.4 ± 0.91	1.03 ± 0.6	2.51	179	0.13
HDL level (mmol/l)	1.09 ± 0.3	1.1 ± 0.3	1.07	179	0.29
Systolic BP of patients (mmHg)	126.9 ± 15.3	119.2 ± 10.9	3.3	179	0.001
Diastolic BP of patients (mmHg)	81.25 ± 8.8	76.8 ± 7.2	3.25	179	0.001
Fasting blood glucose level (mmol/l)	5.9 ± 2.50	5.8 ± 1.9	0.20	179	0.07

BP, blood pressure; d.f., degrees of freedom; HDL, high-density lipoprotein.
Significant = $P < 0.05$.

Table 5 Prevalence of metabolic syndrome types (*N*=181)

Metabolic syndrome category	*n*	Percentage
Only two criteria of MetS	43	23.8
Fulfilled MetS	49	27.1
Fulfilled MetS by NCEP ATP III	34	18.8
Fulfilled MetS by AHA	42	23.2
Fulfilled MetS by IDF	45	24.9
No MetS	89	49.2

AHA, the American Heart Association; IDF, International Diabetes Federation; MetS, metabolic Syndrome; NCEP ATP III, The Third Adult Treatment Panel of The National Cholesterol Education Program.

studied is 27.1% ($N=49$), 23.8% of patients ($N=43$) met only two criteria of metabolic syndrome but not diagnosed metabolic syndrome, and 49.2% of patients ($N=89$) had no metabolic syndrome as yet defined. Of the 181 patients 34 (18.8%) fulfilled the NCEP criteria for metabolic syndrome, 42 patients (23.2%) fulfilled AHA criteria, and 45 (24.9%) patients fulfilled IDF criteria. There was considerable overlap between the groups who fulfilled the different sets of criteria. With 69.4% ($N=34$) fulfilled NCEP, 85.7% ($N=42$) fulfilled AHA and 91.8% ($N=45$) fulfilled IDF of all those who fulfilled metabolic syndrome ($N=49$).

The relationship between MetS and sociodemographic and also the clinical characteristics are shown in Table 6. We present the comparison of demographic and clinical characteristics of the patients with or without a diagnosis of MetS. None of the sociodemographic variables were significantly associated with the presence of the syndrome, except marital status in which significant difference between the patients with and without a diagnosis of MetS ($P=0.01$) exists. Those married were found to be more in the category of fulfilled MetS than those without MetS, in which 36.8% ($N=14$) fulfilled MetS, 31.6% ($N=12$) fulfilled only two criteria of MetS, and 31.6% ($N=12$) fulfilled no MetS.

As regards sex, 25% ($N=32$) of men fulfilled MetS, 23.4% ($N=30$) met only two criteria of MetS and 51.6% ($N=66$) met no criteria of MetS. In women, 32.1% ($N=17$) fulfilled MetS, 24.5% ($N=13$) met only two criteria of MetS, and 43.4% ($N=23$) met no criteria of MetS.

Table 6 Relationship between metabolic syndrome and sociodemographic and clinical characteristics

Subject	Fulfilled MetS *n*=49 (%)	Only two criteria of MetS *n*=43 (%)	No MetS *n*=89 (%)	Statistics
Sex				
Men	32 (25)	30 (23.4)	66 (51.6)	$\chi^2=1.8$
Women	17 (32.1)	13 (24.5)	23(43.4)	d.f.=2
				Significance=0.41
Marital state				
Single	20 (19.0)	27 (25.7)	58 (55.3)	$\chi^2=13.1$
Married	14 (36.8)	12 (31.6)	12 (31.6)	d.f.=4
				Significance=0.011
Other (widowed, divorced)	15 (39.5)	4 (10.5)	19 (50)	
Education level				
No formal education	15 (19.2)	25 (32.0)	38 (48.8)	$\chi^2=1.1$
Primary school	5 (26.3)	2 (10.5)	12 (63.2)	d.f.=6
Secondary/intermediate	19 (32.8)	12 (20.7)	27 (46.5)	Significance=0.160
University	10 (38.5)	4 (15.4)	12 (46.1)	
Nationality				
Kuwaiti	38 (27.5)	31 (22.5)	69 (50.0)	$\chi^2=1.1$
Non Kuwaiti	7 (30.4)	6 (26.1)	10 (43.5)	df=4
Other Arabs	4 (20.0%	6 (30.0)	10 (50.0)	Significance=0.89
Occupation				
Unemployed	45 (27.9)	39 (24.2)	77 (47.9)	$\chi^2=7.52$
Student	0 (0)	0 (0)	2 (100.0)	d.f.=8
House wife only	3 (42.8)	2 (28.6)	2 (28.6)	Significance=0.481
Junior work	1 (12.5)	2 (25.0)	5 (62.5)	
Senior level	0 (0)	0 (0)	3 (100)	
Diagnosis				
Schizophrenia	45 (27.3)	39 (23.6)	81 (49.1)	$\chi^2=0.042$
Schizoaffective	4 (25.0)	4 (25.0)	8 (50.0)	d.f.=2
				Significance=0.098
Smoking				
Present	25 (27.2)	26 (28.3)	41 (44.5)	$\chi^2=2.40$
Not present	24 (27.0)	17 (19.1)	48 (53.9)	d.f.=2
				Significance=0.30
Hypertension in family				
Present	27 (30.7)	19 (21.6)	42 (47.7)	$\chi^2=1.23$
Not present	22 (23.6)	24 (25.8)	47 (50.6)	d.f.=2
				Significance=0.54
Diabetes in family				
Present	19 (28.3)	13 (19.4)	35 (52.3)	$\chi^2=1.1$
Not present	30 (26.3)	30 (26.3)	54 (47.4)	d.f.=2
				Significance=0.57

d.f., degrees of freedom; MetS, metabolic Syndroma.
Significant=$P<0.05$.

As regards MetS and psychiatric diagnosis, there were 165 patients diagnosed with schizophrenia [45 (27.3%) fulfilled MetS, 39 (23.6%) met only two criteria of MetS, and 81 (49.1%) met no criteria of MetS] and 16 patients with a diagnosis of schizoaffective disorder [four (25%) fulfilled MetS, four (25%) met only two criteria of MetS, and eight (50%) met no criteria of MetS].

As regards smoking state and family history of diabetes and hypertension, no significant differences exist between those with or without MetS [($P = 0.3$), ($P = 54$), ($P = 54$), respectively].

The relationship between MetS and age of patient and duration of illness is shown in Table 7. There was significant difference in mean age between those with and without MetS. The patients with MetS were found to be older than patients without MetS. The mean age of the patients diagnosed with MetS was 43.4 ± 9.5 years, mean age of patients who met only two criteria of MetS was 39.7 ± 11.3 years and mean age of patients who met no MetS was 35.3 ± 9.0 years.

With regard to the duration of illness, the mean duration of illness was 16.5 ± 8.6 years in the patients diagnosed with MetS, 16.6 ± 8.9 years in inpatients who met only two criteria of MetS, and 10.6 ± 7.1 years in patients who met no criteria of MetS, with statistically significant difference between both with and without MetS.

Table 8 shows the relationship between MetS and Brief Psychiatric Rating Scale (BPRS). The BPRS score range was 39–82, with a mean of 58.2 ± 6.9; there was significant relationship between MetS and BPRS severity ($f = 4.4$, d.f. = two of 181, $P > 0.05$).

The relationship between MetS and antipsychotic treatment is given in Table 9. There were no significant differences in the type of antipsychotic drugs used between the patients with and without MetS.

Discussion

In this sample of schizophrenic patients, 27.1% fulfilled criteria for the MetS as defined by MetS guidelines. This rate is elevated, compared with the rate of 18% found among healthy Kuwaiti adults [20], and 21.4% were found among the United States general population during the Third National Health and Nutrition Examination Survey (NHANES III, 1988–1994) [12]. In this study, the MetS prevalence in schizophrenic patients was 18.8% ($N = 34$) according to NCEP-ATP III, 23.2% ($N = 42$) according to AHA (ATP III-A), and 24.9% ($N = 45$) according to IDF. This result was lower than the result of Cerit *et al.* [18] who found that MetS prevalence in schizophrenic patients was 21% according to ATP III, 34% according to ATP III-A, and 41% according to IDF. It was also lower than Rezaei *et al.* [21] who found that the prevalence of the MetS according to the different definitions were 27.4% (ATP-III), 37.6% (ATP-III A), and 38.7% (IDF). It was also lower than the result of El Tayebani [22] who found that the prevalence of the MetS in old chronic schizophrenic patients in Kuwait was 52.5% and was lower than that of the values between 42.4 and 62.5% found in North America, [23,24] and than the values of 34.6 and 37.1% found in Sweden [25] and in Finland [26]. A study in Egypt found a prevalence of 38.09% (IDF), [17] and one study in Belgium found a prevalence of 28.4%, which was slightly higher than the value found in this study [27]. An other study in Finland only assessed patients at the age of 30–32 years and found a prevalence of 19.4% [28]. One study in Taiwan found a 22% prevalence rate in the Taiwanese inpatient cohort [29]. One study in turkey found a prevalence of MetS was 18.9% (IDF) [30].

There might be several reasons for the low prevalence rate of MetS in our study: The first might be the low mean age of our patients (38.5 ± 10.3 years). Another reason might be that 23.8% of our patients met only two positive criteria for a diagnosis of MetS and, thus, were not diagnosed with MetS. Moreover, difference in lifestyle factors and balanced hospital diets and optimal medical care provided in the hospital setting could contribute to our finding.

Demographic characteristics

When we compared patients with MetS with those without MetS, according to sociodemographic data, we found that the MetS was not associated with sex difference, educational level, and occupational states. But we found increase prevalence of the MetS according Marital states, ($P = 0.01$) in which those married were found to be more in fulfilled MetS group than those without metabolic syndrome, in which 36.8% ($N = 14$) fulfilled metabolic syndrome, 31.6% ($N = 12$) met two criteria of metabolic syndrome and 31.6% ($N = 12$) met no criteria of MetS.

Table 7 Relation between metabolic syndrome and age of patient and duration of illness

Variable	*N*	Mean (SD)	Statistics
Age of patient			
Fulfilled MetS	49	43.4 ± 9.5	$f = 11.2$
Only two criteria of MetS	43	39.7 ± 11.3	d.f. = 2
No MetS	89	35.3 ± 9.0	Significance = 0.000
Duration of illness of patients			
Fulfilled MetS	49	16.5 ± 8.6	$f = 12.3$
Only two criteria of MetS	43	16.6 ± 8.9	d.f. = 2
No MetS	89	10.6 ± 7.1	Significance = 0.000

d.f., degrees of freedom; MetS, metabolic syndrome; SD, standard deviation.
Significant = $P < 0.05$.

Table 8 Relation between metabolic syndrome and Brief Psychiatric Rating Scale

Variable	*N*	Mean (SD)	Statistics
BPRS			
MetS categorization			
Fulfilled MetS	49	60.0 (6.2)	$f = 4.4$
Only two criteria of MetS	39	55.5 (8.6)	d.f. = 2/181
No MetS	71	53.0 (8.2)	Significance = 0.01

BPRS, Brief Psychiatric Rating Scale; d.f., degrees of freedom; MetS, metabolic syndrome.
Significant = $P < 0.05$.

Table 9 Relation between metabolic syndrome and antipsychotic treatment

Variable	Fulfilled MetS	Only two criteria of MetS	No MetS	*n*	Statistics
Typical antipsychotic	12	6	24	42	*f*=3.9 d.f.=2 Significance=0.21
Atypical antipsychotic	22	21	15	81	*f*=0.89 d.f.=2 Significance=0.41
Combined typical and atypical antipsychotic	15	16	27	58	*f*=1.09 d.f.=2 Significance=0.33

d.f., degrees of freedom; MetS, metabolic syndrome.
Significant=$P<0.05$.

Age

When we compared patients with metabolic syndrome with those without MetS, according to the age, we found that the patients with MetS had higher mean age, (43.4 ± 9.5 years) and that the frequency of MetS increased consistently with age. This is in agreement with results of Cerit *et al.* [18], who found that the patients with MetS had higher mean age and that the frequency of MetS increased consistently with age. This is also in agreement with Moreno *et al.* [31] and Yazici *et al.* [32], who found an association of the syndrome with older age that was statistically significant. Hägg *et al.* [25] did not find a coherent relationship between age and MetS frequency.

Clinical characteristics

Duration of illness

In this study, durations of illness in patients with MetS were longer than in patients without MetS ($P = 0.000$). This is in agreement with the result of Cerit *et al.* [18], who found that illness and treatment durations of patients with MetS were longer than in patients without MetS.

Psychotropic medication

There is an assumption that atypical antipsychotics can trigger weight gain and related metabolic changes; however, in this study there was no statistically significant relationship between the type of drugs used (whether typical or atypical) and MetS diagnoses, which is similar to what was reported by Kato *et al.* [33], Heiskanen *et al.* [26], and Cerit *et al.* [18]. The differential metabolic side effects of atypical antipsychotics should also be considered. For instance, Meyer *et al.* [34] reported that within the 20-week period when there was a shift from olanzapine treatment to risperidone, they observed a significant decrease in the frequency of MetS among patients.

Smoking

In this study, we examined smoking and metabolic problems, but could not find any significant relationship between them, which is in line with the findings of Hägg *et al.* [25], Kato *et al.* [33], Cerit *et al.* [18], and Littrell *et al.* [29]. A family history of diabetes and hypertension has been questioned in limited studies investigating MetS in schizophrenia. In this study, it was found that there is no significant difference between family history of diabetes and hypertension in schizophrenia patients with and without MetS. This is similar to the findings of Kato *et al.* [33], Cerit *et al.* [18], and Yazici *et al.* [32] who did not find a relationship between MetS and a family history of hypertension or diabetes.

Illness severity, we found association between patients fulfilled MetS and illness severity which was those (BPRS) main score was more in patients fulfilled MetS than those met no criteria of MetS.

The main values for MetS criteria in both men and women revealed that waist circumference was more indicators in men and women. The main waist circumference in female (95.2 ± 13.8 cm) met MetS by ATP11, AHA, and IDF definitions, whereas main waist circumference in male (94.2 ± 17.8) met MetS by IDF definitions only. Waist circumference measurement indicates central obesity. Kato *et al.* [33] posited that the relationship between MetS and central obesity was stronger than the relationship between MetS and obesity (as determined by BMI), that is, fat level was less important than the distribution of fat in the body. Therefore, Kato *et al.* [33] pointed out that waist circumference measurement alone was a good indicator of MetS.

Furthermore, an important finding of this study was the mean fasting blood glucose level of the male and female patients was higher than normal levels, whereas the mean fasting blood sugar level in female (5.8 ± 1.9), and male (5.9 ± 2.50), both fulfilled MetS by AHA and IDF definitions, which is in line with the results of McEvoy *et al.* [15], who reported that prediabetes and type II diabetes were frequent among people with schizophrenia. All other main values for MetS parameters did not fulfilled MetS by any definitions.

There are limitations to this study. First, is the type of study which was a cross-sectional (data collection is limited to a single time point. Therefore, changes in relation between MetS and schizophrenia over time cannot be assessed, give no indication of the sequence and difficult to make causal inference). Second, lack of data on the dietary habits, sedentary life, family history of obesity, and other limitations include lack of a control group. On the other hand, the fact that the population studied is made up of hospitalized patients impedes the

results obtained from being generalizable to the rest of the outpatient of psychiatric illnesses. Despite these limitations, our findings are consistent with high rates of the MetS found in other psychiatric populations.

Conclusion

The prevalence of MetS among patients hospitalized in a ward of a psychological medicine hospital in Kuwait was 27.1%. Although this study found that the prevalence of MetS in patients was lower according to NCEP ATP III, (18.8%) in comparison with similar studies, it is increased when AHA (ATP III-A) (23.2%) and IDF (24.1%) were taken into account. The factors related to MetS were age, durations of illness, and illness severity.

We recommend further studies with larger samples involving both inpatients and outpatients to be able to generalize the results. In the light of the findings in this study and other studies, psychiatrists should consider measuring BP and waist circumference, two components of the MetS, and also monitoring of the weight; these are easily assessed in the clinic setting in addition to measuring fasting glucose and lipids. This is important for early intervention to reduce the high rates of the MetS and cardiovascular morbidity in severely mentally ill patients.

There is no conflict of interest to declare.

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الملخص العربى

معدل انتشار المتلازمة الأيضية في مرضى الفصام

رضا رشدى

قسم الطب النفسى- كلية الطب - جامعة الازهر

الهدف من هذه الدراسة هو دراسة معدل انتشار المتلازمة الأيضية في عينة من مرضى الفصام

تم اختيار عينة البحث من مرضى الأقسام الداخلية بمستشفى الطب النفسي بدولة الكويت في الفترة من يوليو ٢٠٠٩ إلى ٣٠ ديسمبر ٢٠٠٩ وكان العدد المشارك هو ١٨١مريض.

وتم تشخيص المرض النفسي طبقاً للدليل التشخيصي والإحصائي للأمراض النفسية الرابع المراجع .وطبق على جميع المرضى ، الدلائل (المو).ات) التشخيصية للمتلازمة الأيضية طبقاً لما يلي:

١- البرنامج الوطني لتعليم الكولسترول – المبادئ التوجيهية للممارسة السريرية لإدارة الكولسترول في البالغين.

٢- جمعية القلب الأمريكية - المبادئ التوجيهية للممارسة السريرية لإدارة الكولسترول في البالغين المعدل.

٣- الإتحاد العالمي لمرضى السكرى.

و أظهرت نتائج العينة أن متوسط الأعمار كان٣٨,٥ ±١٠,٣ عام وكانت نسبة الرجال٧٠,٧ ٪ (العدد = ١٢٨) ونسبة الإناث٢٩,٣٪ (العدد = ٥٣) .وكان معدل انتشار المتلازمة الأيضية طبقاً للدلائل التشخيصية المختلفة ١ ,٢٧ ٪. وكان معدل الانتشار طبقاً للدليل التشخيصي للبرنامج الوطني لتعليم الكولسترول ١٨,٨ ٪ و طبقاً للدليل التشخيصي لجمعية القلب الأمريكية ٢ ,٢٣ ٪ والإتحاد العالمي لمرضى السكري ٩, ٢٤ ٪ . ولوحظ ارتفاع معدل انتشار المتلازمة الأيضية مع كل من ارتفاع سن المريض وزيادة فترة المرض وشدته.

وخلصت الدراسة إلى ارتفاع معدل انتشار المتلازمة الأيضية لدى مرضى الفصام. كما لوحظ الارتباط الوثيق بين المتلازمة الأيضية وكل من سن المريض و فترة المرض وشدته. وتكمن أهمية هذه النتائج في أهمية التدخل المبكر لخفض معدل انتشار المتلازمة الأيضية وأمراض القلب والأوعية الدموية لدى المرضى بمرض نفسي شديد.