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# Prevalence of Metabolic Syndrome in Patients with Schizophrenia Referred to Farabi Hospital, Kermanshah, Iran

Jalal Shakeri, Kamyar Karimi, Vahid Farnia*, Senobar Golshani and Mostafa Alikhani

*Department of Psychiatry, Substance abuse Prevention Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran*

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**ABSTRACT**

***Objectives:*** Our study was conducted to determine the prevalence of metabolic syndrome in patients with schizophrenia. ***Methods***: The study population included all patients with schizophrenia who were referred to Farabi Hospital, Kermanshah, Iran, between March 2014 and March 2015. A total of 280 subjects who met the study criteria were selected according to the census sampling method. ***Results:*** The prevalence of metabolic syndrome was 30.4% (20.7% in men and 51.5% in women). The prevalence of metabolic syndrome was greater in patients > 40 years than patients aged 20–40 years. There was a significant relationship between marital status and number of hospitalizations with the prevalence of metabolic syndrome. ***Conclusions:*** Given the high prevalence of metabolic syndrome in patients with schizophrenia, healthcare professionals should take measures to identify the risk factors and timely treatment of affected patients, thereby improving the patient's quality of life and reducing health costs.

Schizophrenia is a psychiatric disorder that encompasses a wide range of emotional, social, and thought impairments, and is accompanied by serious functional impairments.[1] It has been reported that patients with schizophrenia have a shorter life span than the general population.[2–4] Mortality among patients with schizophrenia is two to three times more than the general population,[5,6] and life expectancy is 20–25% lower.[7]

One of the leading causes of death in patients with schizophrenia is metabolic syndrome, which has a prevalence rate twice that of the non-psychotic population.[8] Metabolic syndrome is a series of metabolic and non-metabolic abnormalities with symptoms of high blood sugar and blood pressure, elevated triglycerides, abdominal obesity, and low high-density lipoprotein (HDL). Patients with three or more symptoms are diagnosed with metabolic syndrome.[9]

Due to increased abdominal adiposity and insulin resistance, metabolic syndrome is accompanied by chronic low-grade inflammation. Several studies are needed to indicate the pathogenesis of metabolic syndrome and strategies of treatment.[10]

The prevalence of metabolic syndrome in different populations has been investigated. In the USA the prevalence is 25%. The figure is 28.6% in Korea , 24.2% in Malaysia, 21.16% in Taiwan, 21% in Oman, 19% in Mongolia, 12.2% in Singapore, 12% in Japan, 14.8% in China, 28.8% in India, and 34.7% in Iran.[11–16]

It is estimated that the prevalence of dyslipidemia, hypertension, obesity, and type 2 diabetes mellitus is 1.5 to two times higher in patients with schizophrenia and other serious mental illnesses than in the general population.[17] Metabolic syndrome increases the risk of cardiovascular disease, diabetes, dyslipidemia, stroke, osteoarthritis, some cancers, and mortality.[18,19] Available data indicate that genetic factors, environmental, antipsychotic medication, and lifestyle (e.g., physical activity, support systems, smoking, and alcohol and drug abuse) contribute to the development of metabolic syndrome in these patients.[20,21]

One of the most important factors that cause metabolic syndrome in patients with schizophrenia is antipsychotic agents' especially atypical antipsychotics that cause weight gain, impaired glucose tolerance, and disturbed lipid profile. Among atypical antipsychotics, clozapine is mostly associated with weight gain and olanzapine with a higher prevalence of metabolic syndrome.[17, 22–24]

*Corresponding author: ✉vahidfarnia@yahoo.com

McEvoy et al,[25] reported that the prevalence of metabolic syndrome in patients with schizophrenia was 40.9–42.7%. This figure was 51.6–54.2% in women compared to 36.0–36.6% in men. The results of logistic regression showed that age, race, and ethnicity are covariates of metabolic syndrome. Another study reported the prevalence of metabolic syndrome as 43.6% (39.0% in men and 55.9% in women).[26]

A study conducted in Iran used the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) criteria to calculate that the prevalence of metabolic syndrome was 39.8% in women admitted to the psychiatric ward of 22nd Bahman Hospital, Mashhad. The mean age of patients with metabolic syndrome was higher than the general population. There was a significant relationship between metabolic syndrome and the variables marital status, education level, and age. There was no significant relationship between medication type, dosage and duration, psychiatric disease type, and the prevalence of metabolic syndrome.[27] In another study, the overall prevalence of metabolic syndrome in patients with schizophrenia was 18% and in the control group was 6.5%. However, fasting blood glucose and waist circumference were higher in patients with schizophrenia than in controls; there were no significant results for the other factors of metabolic syndrome.[28]

New research suggests medication for treatment of metabolic syndrome. For example, one study concluded that losartan and enalapril can significantly affect markers of metabolic syndrome and may treat hypertension in patients with schizophrenia with markers of metabolic syndrome.[29]

Given the high prevalence of metabolic syndrome among patients with schizophrenia and the relationship between metabolic syndrome and mortality, we conducted this study to determine the prevalence of metabolic syndrome in patients with schizophrenia referred to Farabi Hospital, Kermanshah, Iran. This information could be used to find preventive strategies to improve the quality of life and reduce health care costs in patients with schizophrenia.

## METHODS

This cross-sectional study was approved by the ethics committee of the Kermanshah University of Medical Sciences before the collection of data. The study population included all patients with schizophrenia who were referred to Farabi Hospital, between March 2014 and March 2015. The total number of patients referred was 502. Patients with pure schizophrenia treated with antipsychotics agents were included in the study. Patients with other psychiatry diseases, any medical diseases like hypertension, diabetes, thyroid diseases, those having electroconvulsive therapy (ETC), or treatment with medications except antipsychotic agents were excluded. Schizophrenia was diagnosed by psychiatrists according to the latest criteria of the Diagnostic and Statistical Manual of Mental Disorders, edition five (DSM-V).

A total of 280 patients were selected by census sampling. After obtaining informed consent from the patients or their legal guardian, data gathering was done through a demographic questionnaire and paraclinical tests and anthropometric measurements. Metabolic syndrome was diagnosed according to the latest NCEP ATP III criteria (2001). Any patients with the following symptoms were considered to have metabolic syndrome: 1) large waist circumference (102 cm [40 in.] for men and 88 cm [35 in.] for women); 2) elevated triglycerides (150 mg/dL); 3) low HDL-C (40 mg/dL in men and 50 mg/dL in women); 4) hypertension (130/85 mmHg); and 5) impaired fasting glucose (110 mg/dL).[30]

Patients were weighed wearing minimal clothing and no shoes and using a digital scale (to the nearest 100 g). Their height was measured using a height meter with an accuracy of one millimeter. Waist circumference was measured at the thinnest part of the waist. Blood pressure was measured following two hours of low activity, and no tea or coffee consumption or smoking. If there was no history of hypertension, but high blood pressure was detected, the patient's blood pressure was measured again after an hour to confirm the diagnosis of hypertension. Blood sugar and lipids were measured in the Endocrine Research Center laboratory by spectrophotometry.

Data analysis was performed by SPSS Statistics (SPSS Statistics Inc., Chicago, US) and associations between the data were found using the chi-square test and logistic regression. Patients were divided into two groups of those under 40 years old and those above 40 years old for the purpose of performing logistic regression for the age variable. Individuals

were considered either married or single and then the comparison was made between the two groups.

## RESULTS

Our patient sample consisted of 280 patients with schizophrenia (193 male and 87 female). The prevalence of metabolic syndrome was 30.4%. Metabolic syndrome was diagnosed according to the criteria of the NCEP ATP III.[28] The prevalence of different components of the metabolic syndrome in patients with schizophrenia who suffered from metabolic syndrome were included: waist > 102 cm, 9.4%; fasting blood sugar > 110 mg/dL, 4.4%; HDL > 50 mg/dL, 48.2%; systolic blood pressure > 130/≥ 85 mmHg, 7.1%; and triglycerides > 110 mg/dL, 30.6%. Because of the small sample size, the prevalence of metabolic syndrome based on the kind of antipsychotic agent was not evaluated, and it is one of the limitations of this study [Table 1].

The majority of patients were aged > 40 years (n = 193, 68.9%), and the remaining patients were between 20 and 40 years old (n = 87, 31.1%) [Table 2]. In the population, 195 (69.6%) patients were single, 40 (14.3%) were married, and 41 (14.6%) were divorced. Thirty-two (11.4%) patients were illiterate, 49 (17.5%) were primary school educated, 59 (21%) were high school educated, 94 (33.5%) held diplomas, 33 (11.7%) held a college diploma, and 13 (4.6%) held licentiate degrees or higher. There was no significant relationship between education level and the prevalence of metabolic syndrome. Fifty-eight (20.7%) patients had history of one admission and 222 (79.2%) patients had more than one hospitalization.

Logistic regression analysis results indicate that the male schizophrenic patients are less likely to have metabolic syndrome than female patients (odds ratio (OR) = 0.19, $p < 0.010$) [Table 3]. The results showed that in over 40 years old patients, the risk of metabolic syndrome was more than those under 40 years old (OR = 2.53, $p = 0.010$). The results showed that the prevalence of metabolic syndrome in patients with a history of several admissions was more than patients who had been admitted once (OR = 3.80, $p < 0.010$). The results showed that concerning the relation of marital status and prevalence of metabolic syndrome; metabolic syndrome was more prevalent in married and divorced people than singles (OR = 2.01, $p = 0.030$).

**Table 1:** Frequency components of metabolic syndrome and antipsychotic agents in patients with schizophrenia.

| Variable | Metabolic syndrome, n (%) | |
|---|---|---|
| | Yes | No |
| **Components of the metabolic syndrome** | | |
| Waist > 102 cm | 8 (9.4) | 24 (12.3) |
| FBS > 110 mg/dL | 4 (4.7) | 22 (11.3) |
| HDL > 50 mg/dL | 41 (48.2) | 80 (41.0) |
| SBP > 130/≥85mmHg | 6 (7.1) | 24 (12.3) |
| TG > 110mg/dL | 26 (30.6) | 45 (23.1) |
| **Total** | **85 (30.4)** | **195 (69.6)** |
| **Antipsychotic agents** | | |
| Olanzapine | 45 (16.7) | 117 (41.8) |
| Risperidone | 9 (3.2) | 60 (21.4) |
| Quetiapine | 31 (11.1) | 0 (0) |
| Clozapine | 0 (0) | 12 (4.3) |
| Aripiprazole | 0 (0) | 6 (2.1) |
| **Total** | **85 (30.4)** | **195 (69.6)** |

*FBS: fasting blood sugar; HDL: high-density lipoprotein; SBP: systolic blood pressure; TG: triglycerides.*

**Table 2:** The relationship between metabolic syndrome and gender, age, marital status, education, and hospital admission.

| Variable | Metabolic syndrome, n (%) | | *p*-value |
|---|---|---|---|
| | Yes | No | |
| **Sex** | | | |
| Female | 45 (51.7) | 42 (48.3) | 0.001 |
| Male | 40 (20.7) | 153 (79.3) | |
| Total | 85 (30.4) | 195 (69.6) | |
| **Age, years** | | | |
| 20–40 years | 87 (31.1) | | 0.010 |
| > 40 years | 193 (68.9) | | |
| **Marital status** | | | |
| Married | 19 (43.2) | 25 (56.8) | 0.010 |
| Single | 48 (24.6) | 147 (75.4) | |
| Divorced | 18 (8.5) | 195 (91.5) | |
| **Education** | | | |
| Illiterate | 19 (59.4) | 13 (40.6) | 0.250 |
| Primary school | 6 (12.2) | 43 (87.8) | |
| High school | 13 (22.0) | 46 (78.0) | |
| Diploma | 40 (42.6) | 54 (57.4) | |
| College diploma | 0 (0) | 33 (100) | |
| Licentiate and higher | 7 (53.8) | 6 (46.2) | |
| **Hospital admission** | | | |
| < 1 | 6 (10.3) | 52 (89.7) | 0.010 |
| > 1 | 79 (35.6) | 143 (64.4) | |

**Table 3:** Factors predicting the presence or absence of metabolic syndrome in the studied sample.

| Variable | B | Sig. | Exp(B) | 95.0% CI for Exp(B) | |
|---|---|---|---|---|---|
| | | | | Upper | Lower |
| Gender (male) | -1.64 | 0.001 | 0.19 | 0.10 | 0.35 |
| Age > 40 years | 0.90 | 0.010 | 2.53 | 5.13 | 1.25 |
| > 1 admission | 1.37 | 0.002 | 3.80 | 8.89 | 1.63 |
| Marital status | 0.69 | 0.030 | 2.01 | 2.86 | 1.50 |

*B:standardized regression coefficients; Sig: significance level, CI: confidence interval; Exp(B): Exponential(B) or odds ratio.*

## DISCUSSION

We sought to determine the prevalence of metabolic syndrome in patients with schizophrenia. In this study, according to NCEP ATP III criteria, the prevalence of metabolic syndrome was 30.4%. Prior research conducted on patients with schizophrenia, prevalence of metabolic syndrome has been reported to be 31.8%,[31] 40.09–42.7%,[25] 18%,[30] and 43.6%.[26] In Iran, the prevalence of metabolic syndrome in the general population is 34.7%[11] and in other mental disorders such as depression, bipolar disorder, alcoholism, and other psychiatric disorders and attempted suicide is 48.1%, 38.3%, 5.1%, 23.1%,[31] and 52%, respectively. These differences may be the result of genetic factors, environmental conditions, and the lifestyle of the populations concerned.

The results of the present study showed that the prevalence of metabolic syndrome in men was 20.7% and 51.5% in women. Logistic regression analysis results indicate that the risk was higher for women than men. McEvoy et al,[25] showed that the prevalence rate of metabolic syndrome was 51.6–54.2% in women and 36–36.6% in men. Another study reported that the prevalence of metabolic syndrome was 39% in men and 55.9% in women.[25] The high prevalence of metabolic syndrome in women may be due to a more sedentary lifestyle, obesity (especially due to generally having a wider waist circumference compared to men), and hormonal problems.

There was a significant relationship between age and prevalence of metabolic syndrome in patients with schizophrenia. The prevalence of metabolic syndrome increased with increasing age. This could be due to the higher prevalence of obesity and lipid disorders in old age. These findings are consistent with the results of previous studies.[26,27] There was a significant relationship between marital status and the prevalence of metabolic syndrome. In married and divorced people, the prevalence of metabolic syndrome was more than that of singles. Saadatian et al,[27] showed that 75.6% of patients with metabolic syndrome and 53.2% of those without metabolic syndrome were married. However, Sweileh et al,[26] found no meaningful relationship between marital status and the prevalence of metabolic syndrome.

The majority of patients in this study did not have metabolic syndrome. Alcohol use is an important risk factor for metabolic syndrome. Alcohol causes a disturbed lipid profile, impaired glucose tolerance test (GTT), and abdominal obesity. In this study, none of the patients consumed alcohol, which is one possible reason why the prevalence of metabolic syndrome was less in men than the other populations. Also, we excluded patients with a positive history of drug abuse, which could affect the prevalence of metabolic syndrome.

The differences in the results of the prevalence of metabolic syndrome between different studies conducted in Iran may be due to the different sample sizes or study methodology. For example in the study of Fagheh Eimani et al,[28] the prevalence of metabolic syndrome in patients with schizophrenia was 18% and in the control group, it was 5.6%. This is lower than the prevalence of metabolic syndrome in our study.

The results of present study showed no significant relationship between educational level and the prevalence of metabolic syndrome. However, Saadatian et al,[27] reported a significant relationship between the level of education and the prevalence of metabolic syndrome: 65% of patients with metabolic syndrome were illiterate while 70% of patients who did not have metabolic syndrome were educated.

We observed a significant relationship between the number of admissions, duration of schizophrenia, and the prevalence of metabolic syndrome. In people diagnosed with schizophrenia for more than one year, the prevalence of metabolic syndrome was higher. These results were consistent with the study performed by Heiskanen et al.[32]

We did not look at the prevalence of metabolic syndrome and its various antipsychotic agents due to small sample size and short duration of the study. Previous studies have shown a higher risk of metabolic syndrome with some antipsychotics compared to the others.[8] Clozapine and olanzapine have the highest potential for triggering metabolic abnormalities.[11] These compound have been previous associated with overweight,[33]elevation of insulin, and increase of lipids that result in atherosclerosis.[34,35] But the results of some studies showed no relationship.[27,31] Due to the difference in published data, more studies are needed in this area to determine the medications that can be prescribed that have fewer metabolic side effects. In patients with schizophrenia and metabolic syndrome, antipsychotic agents' that cause less weight gain such as quetiapine, aripiprazole, and atypical antipsychotics such as perphenazine should be prescribed. Additional studies should also be performed to determine the prevalence of metabolic syndrome in other psychiatric patients. Our study represents the patients with schizophrenia who were admitted to Farabi Hospital, Kermanshah, Iran, and therefore caution is needed in generalizing the results.

## CONCLUSION

Given the high prevalence of metabolic syndrome in patients with schizophrenia, there is a need to monitor the physical activity and diet of these patients. Healthcare professions should be trained to identify patients with schizophrenia who suffer from metabolic syndrome.

*Disclosure*

The authors declared no conflicts of interest. No funding was received for this study.

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