JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2024, VOL 7, NO S7

The Prevalence of Metabolic Syndrome in Patients Receiving Antipsychotic Medications at King Salman Armed Forces Hospital, Tabuk, KSA

Hamdan Ahmed ALFaer[1], Majed Mohammed Alanazi[1], Mashael Abdullah Alatawi[1], Menahi Obaid Alsubaie[2], Mostafa Hussein Soltan Mohamed[3], Mohamed Ibrahim Mohamed Ahmed Mansour[4], Halah Abdullah Al anazi[5]

1 Senior Registrar Psychiatrist, Saudi board in psychiatry, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia
2 Consultant psychiatrist, Saudi board in psychiatry, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia
3 Consultant Psychiatrist, Egyptian Board in Psychiatry, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia
4 Senior registrar psychiatrist, Sudanese Board in Psychiatry,?King Salman Armed Forces Hospital, Tabuk, Saudi Arabia
5 Senior Nursing Specialist, Master Degree in Nursing, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia

Abstract

Objective: To determine the prevalence of metabolic syndrome among patients receiving antipsychotic medications at in Tabuk, Kingdom of Saudi Arabia (KSA). **Methods:** This cross-sectional study assessed the prevalence of metabolic syndrome among patients receiving antipsychotic medications at King Salman Armed Forces Hospital. Data collection involved structured questionnaires, anthropometric measurements, blood pressure readings, and laboratory tests for HbA1c, random glucose, cholesterol, HDL cholesterol, and triglycerides. **Results:** A total of 224 adult psychiatric patients participated in the study, with a metabolic syndrome prevalence of 35.7% based on NECP ATP III criteria. The male-to-female ratio was 2.5:1. Metabolic syndrome was significantly associated with male gender ($P = 0.034$). Participants with metabolic syndrome had higher BMI, waist circumference, blood pressure, triglycerides, random glucose, and HbA1c ($P < 0.001$ for all). Sedentary lifestyle ($P < 0.001$), longer smoking duration ($P < 0.001$), and absence of smoking quit attempts ($P < 0.001$) were also significant. Longer psychiatric diagnosis ($P < 0.001$), extended psychiatric medication use ($P < 0.001$), and first-generation antipsychotics ($P < 0.001$) were associated with metabolic syndrome. Central obesity was more common in females, while high triglycerides were more frequent in males ($P < 0.001$). **Conclusion:** The study reveals a high prevalence of metabolic syndrome among psychiatric patients, highlighting the need for integrated care to address metabolic risks through early detection, lifestyle interventions, and collaboration between psychiatrists and primary care providers.

Keywords*; *Metabolic syndrome; Psychiatric disorders; Antipsychotic medication.

Introduction

Metabolic syndrome is a complex and multifaceted medical condition characterized by a cluster of interconnected metabolic abnormalities, including central obesity, insulin resistance, dyslipidemia, and hypertension [1]. This syndrome poses a significant public health concern worldwide due to its association with an increased risk of cardiovascular disease, type 2 diabetes mellitus, and overall mortality [2, 3]. One intriguing aspect of metabolic syndrome is its potential relationship with the use of antipsychotic medications, which are commonly prescribed to individuals with psychiatric disorders [4, 5].

Metabolic syndrome is characterized by a constellation of risk factors that collectively contribute to an increased risk of cardiovascular disease and other related complications [2]. Central obesity, often assessed by waist circumference, reflects the accumulation of visceral adipose tissue. Insulin resistance, a central feature of metabolic syndrome, results in impaired glucose metabolism and contributes to the development of type 2 diabetes mellitus [1].

Dyslipidemia involves abnormal lipid profiles, including elevated triglycerides and reduced high-density lipoprotein cholesterol levels. Hypertension, defined as elevated blood pressure levels, further compounds the risk associated with metabolic syndrome [3].

Patients with severe mental illnesses, such as schizophrenia and bipolar disorder, often require long-term treatment with antipsychotic medications to manage symptoms and improve their quality of life [6]. However, these medications, which can be classified as first-generation (typical) or second-generation (atypical) antipsychotics, have been associated with a range of adverse metabolic effects. Second-generation antipsychotics, in particular, are linked to weight gain, dyslipidemia, insulin resistance, and an increased risk of developing diabetes mellitus [7].

The intricate relationship between metabolic syndrome and antipsychotic medications is rooted in their impact on various physiological pathways [5]. One prevailing hypothesis is that the use of antipsychotic medications, particularly second-generation agents, disrupts the delicate balance of neurotransmitters in the central nervous system [8]. This disruption can lead to alterations in appetite regulation, energy expenditure, and glucose metabolism, all of which contribute to the development of metabolic syndrome components [5, 9]. Moreover, these medications can influence hormonal systems, such as the hypothalamic-pituitary-adrenal axis, which play a role in both psychiatric disorders and metabolic regulation [8, 10].

The primary aim of this study is to determine the prevalence of metabolic syndrome among patients receiving antipsychotic medications at King Salman Armed Forces Hospital, Tabuk, KSA. The study seeks to provide a comprehensive understanding of the association between antipsychotic medication use and the development of metabolic syndrome components, thereby contributing to the advancement of medical knowledge in the field of psychiatry and metabolic disorders.

Methods

Study Design

This study employed a cross-sectional design to assess the prevalence of metabolic syndrome among patients receiving antipsychotic medications at King Salman Armed Forces Hospital, Tabuk, KSA. Cross-sectional studies were suitable for investigating the prevalence of a condition within a specific population at a given point in time.

Study Setting

The study was conducted at King Salman Armed Forces Hospital, a tertiary care medical facility in Tabuk, KSA. The hospital served a diverse patient population and provides comprehensive healthcare services, including psychiatric care.

Selection criteria

Inclusion Criteria:

1. Patients aged 18 to 65 years.
2. Patients with a confirmed diagnosis of a psychiatric disorder, including schizophrenia, bipolar disorder, or major depressive disorder.
3. Patients who have been receiving antipsychotic medications for a minimum of 6 months.
4. Patients who provide informed consent to participate in the study.

Exclusion Criteria:

1. Patients with a known history of metabolic syndrome or any of its individual components prior to starting antipsychotic treatment.
2. Patients with pre-existing diabetes mellitus.
3. Patients with severe medical conditions unrelated to psychiatric disorders that could confound the study results.
4. Pregnant or lactating individuals.

Sample Size Calculation

The sample size for this study was 182 participants calculated using a prevalence formula considering an estimated prevalence rate of metabolic syndrome among patients receiving antipsychotic medications based on previous studies, with a 95% confidence interval and a 5% margin of error.

Data Collection Tools

1. Structured Questionnaire: A structured questionnaire was developed to collect demographic information, medical history, psychiatric diagnosis, duration of antipsychotic medication use, and lifestyle factors (diet, physical activity, smoking).
2. Anthropometric Measurements: Waist circumference, height, and weight were measured using standardized techniques. Body mass index (BMI) will be calculated as weight (kg) divided by height squared (m^2).
3. Blood Pressure Measurements: Blood pressure was measured using a calibrated sphygmomanometer in a seated position after a 5-minute rest.
4. Laboratory Measurements: venous blood samples were collected for assessment of, HbA1c, random glucose, total cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides.

Data Collection Procedure

1. Participants meeting the inclusion criteria were recruited from the psychiatric outpatient clinic and inpatient wards of King Salman Armed Forces Hospital.
2. Informed consent were obtained from each participant prior to data collection.
3. Participants completed the structured questionnaire under the guidance of trained research personnel to ensure accuracy and clarity.
4. Anthropometric measurements (weight, height, waist circumference) were taken by trained Nurse following standard protocols.
5. Blood pressure was measured by trained healthcare professionals using a calibrated sphygmomanometer.
6. Blood samples were collected by experienced phlebotomists from an antecubital vein.

Statistical analysis

Data was coded, tabulated, and analyzed using the statistical package of social sciences (SPSS) version 23.0. Descriptive statistics was used to summarize demographic characteristics and prevalence rates of metabolic syndrome components. Prevalence of metabolic syndrome and its components were calculated along with 95% confidence intervals. Chi-square test, Fisher's exact test and independent samples t-tests were used to assess associations between variables. A P-value of less than 0.05 was considered as statistically significant.

Ethical Considerations

Ethical approval was sought from the scientific research center and the research ethics committee of King Salman Armed Forces Hospital before commencing the study. Informed consent was obtained from all participants. Confidentiality and privacy of participants were strictly maintained throughout the study.

Results

A total of 224 adult patients with a confirmed diagnosis of a psychiatric disorder were enrolled in the current study; the prevalence of the metabolic syndrome using NECP ATP III criteria was found to be 35.7% (95% CI: 25.2% - 46.2%). Males outnumbered females (71.5% vs. 28.6%) with male to female ratio of 2.5:1 and most of the participants were married or single (46.4% and 42.9% respectively); metabolic syndrome was significantly associated with male gender and divorced or separated participants (P = 0.034 and 0.003 respectively). The average age of the participants was 41.9 ± 12.3 years ranging from 23 to 65 years. The mean body mass index (BMI) of the participants was 31.1 ± 8.7 Kg/m^2 and the average waist circumference was 40.8 ± 6.4 inches both parameters were significantly higher in participants with metabolic

syndrome (P < 0.001). The average systolic blood pressure was 123.6 ± 13.5 mmHg and the average diastolic blood pressure was 73.1 ± 9.0 mmHg, also both were significantly higher in participants with metabolic syndrome (P < 0.001). The average total cholesterol was 4.69 ± 0.93 mmol/L and average High-Density Lipoprotein (HDL) Cholesterol was 1.19 ± 0.27 mmol/, there was no significant difference between participants with metabolic syndrome and those without it in total cholesterol (P = 0.233) while HDL cholesterol was significantly lower in participants with metabolic syndrome (P < 0.001). Moreover, the mean was 1.54 ± 0.75 mmol/L for triglycerides, 6.16 ± 3.39 mmol/L for random blood glucose and 5.71% ± 1.13% for HbA1c; all these parameters were significantly higher in participants with metabolic syndrome than those without it (P < 0.001). Regarding history of chronic illness; 24 (10.7%) were obese, 8 (3.6%) had diabetes mullites and 192 (85.7%) had no chronic illness, and history of chronic disease was significantly associated with prevalence of metabolic syndrome (P < 0.001). Concerning the lifestyle factors; majority of the participants were sedentary (75%) in term of physical activity and their physical activity was significantly associated with prevalence of metabolic syndrome (P < 0.001). About half of the participants were current smokers (n = 112, 50%); their average duration of smoking was 16.4 ± 10.8 years with average smoking intensity of 1.25 ± 0.46 pack/day. There was a significant association between duration of smoking and metabolic syndrome (P < 0.001); participants with metabolic syndrome associated with long duration of smoking. Moreover, 24 (21.4%) of the participants have tried to quit smoking with average duration of quit attempts of 4.0 ± 2.8 months and less than third of the participants (28.6%) had motivated to quit smoking. Prevalence of metabolic syndrome was significantly higher in participants who did not try to stop smoking (P < 0.001) (**Table 1**).

Table 1: Characteristics, lab measurements and lifestyle of the study respondents and its association with prevalence of metabolic syndrome

Variable	Overall (n = 224)	Metabolic syndrome		P value
		Yes, n = 80 (35.7%)	No, n =144 (64.3%)	
Mean ± SD				
Age (years)	41.9 ± 12.3	43.9 ± 14.7	40.8 ± 10.6	0.096
BMI (Kg/m^2)	31.1 ± 8.7	37.0 ± 9.1	27.8 ± 6.5	< 0.001
WC (inch)	40.8 ± 6.4	45.2 ± 4.2	38.4 ± 6.1	< 0.001
SBP (mmHg)	123.6 ± 13.5	134.2 ± 10.9	117.7 ± 10.9	< 0.001
DBP (mmHg)	73.1 ± 9.0	76.7 ± 6.9	71.1 ± 9.5	< 0.001
HDL-C (mmol/L)	1.19 ± 0.27	1.08 ± 0.20	1.25 ± 0.28	< 0.001
Total Cholesterol (mmol/L)	4.69 ± 0.93	4.59 ± 1.08	4.75 ± 0.83	0.233
TG (mmol/L)	1.54 ± 0.75	1.88 ± 0.86	1.34 ± 0.60	< 0.001
RBG (mmol/L)	6.16 ± 3.39	7.49 ± 5.05	5.42 ± 1.51	< 0.001
HbA1c (%)	5.71 ± 1.13	6.26 ± 1.50	5.41 ± 0.69	< 0.001
Duration of smoking (years)	16.4 ± 10.8	21.6 ± 12.3	13.1 ± 8.3	< 0.001
Smoking intensity (Pack/day)	1.25 ± 0.46	1.30 ± 0.41	1.22 ± 0.48	0.389
Duration of quit attempts (months)	4.0 ± 2.8	-	-	-
N (%)				
Gender:				
Male	160 (71.5)	64 (80)	96 (66.7)	0.034
Female	64 (28.6)	16 (20)	48 (33.3)	
Marital status:				
Single	96 (42.9)	32 (40)	64 (44.4)	0.003

Married	104 (46.4)	32 (40)	72 (50)	
Divorced/separated	24 (10.7)	16 (20)	8 (5.6)	
History of chronic disease:				
Obesity	24 (10.7)	0 (0)	24 (16.7)	< 0.001
DM	8 (3.6)	8 (10)	0 (0)	
Non	192 (85.7)	72 (90)	120 (83.3)	
Level of physical activity:				
Sedentary	168 (75)	72 (90)	96 (66.7)	< 0.001
Moderate	40 (17.9)	8 (10)	32 (22.2)	
Active	16 (7.1)	0 (0)	16 (11.1)	
Smoking status:				
Non-smoker	112 (50)	40 (50)	72 (50)	1.000
Current smoker	112 (50)	40 (50)	72 (50)	
Try to stop smoking in the past:				
Yes	24 (21.4)	0 (0)	24 (33.3)	< 0.001
No	88 (78.6)	40 (100)	48 (66.7)	
Currently motivated to quit smoking:				
Yes	32 (28.6)	8 (20)	24 (33.3)	0.134
No	80 (71.4)	2 (80)	48 (66.7)	

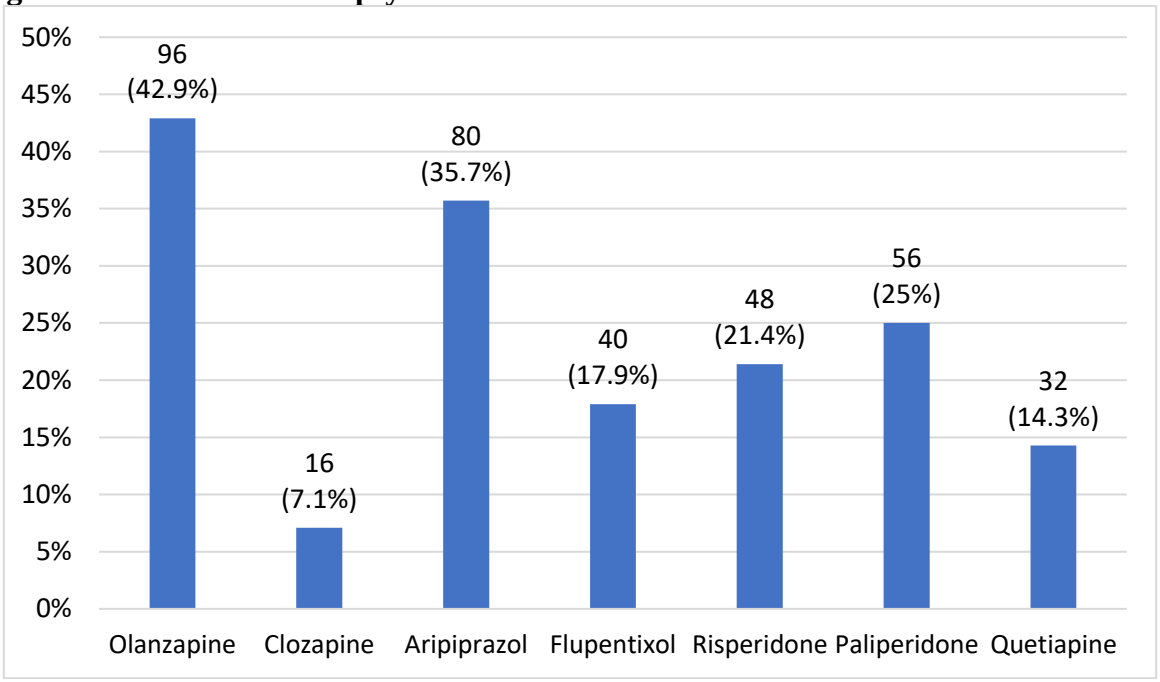
Regarding the psychiatric history of the participants; the average duration of the psychiatric diagnosis was 13.8 ± 8.4 years, mean of the duration of psychiatric medication was 12.5 ± 8.6 years and average of number of admissions was 2.7 ± 4.2 times. Metabolic syndrome was significantly associated with long psychiatric diagnosis duration, long psychiatric medication duration and higher number of admissions (P < 0.00, < 0.001 and 0.036 respectively). Majority of the used antipsychotic medication was poly-pharmacy (50%) and second-generation antipsychotic medications (46.4%); prevalence of metabolic syndrome was significantly associated with first generation antipsychotic medications (P < 0.001). Level of adherence to psychiatric medication was found to be 6.68 ± 0.66 out of 7 and it was not significantly associated with metabolic syndrome (P = 0.718) (**Table 2**).

Table 2: Psychiatric history and its association with prevalence of metabolic syndrome

Variable	**Overall (n = 224)**	**Metabolic syndrome**		**P value**
		Yes, n = 80 (35.7%)	**No,** n = 144 (64.3%)	
Mean ± SD (Range)				
Duration of psychiatric diagnosis (years)	13.8 ± 8.4	16.8 ± 8.0	12.2 ± 8.2	< 0.001
Duration of psychiatric medication (years)	12.5 ± 8.6	15.6 ± 8.4	10.8 ± 8.3	< 0.001
Number of admissions	2.7 ± 4.2	3.5 ± 3.2	2.3 ± 4.6	0.036
Level of adherence	6.68 ± 0.66	6.70 ± 0.46	6.67 ± 0.75	0.718
N (%)				
Generation of current antipsychotic medication				
1st generation	8 (3.6)	8 (10)	0 (0)	< 0.001
2nd generation	104 (46.4)	16 (20)	88 (61.1)	
Poly-pharmacy	112 (50)	56 (70)	56 (38.9)	

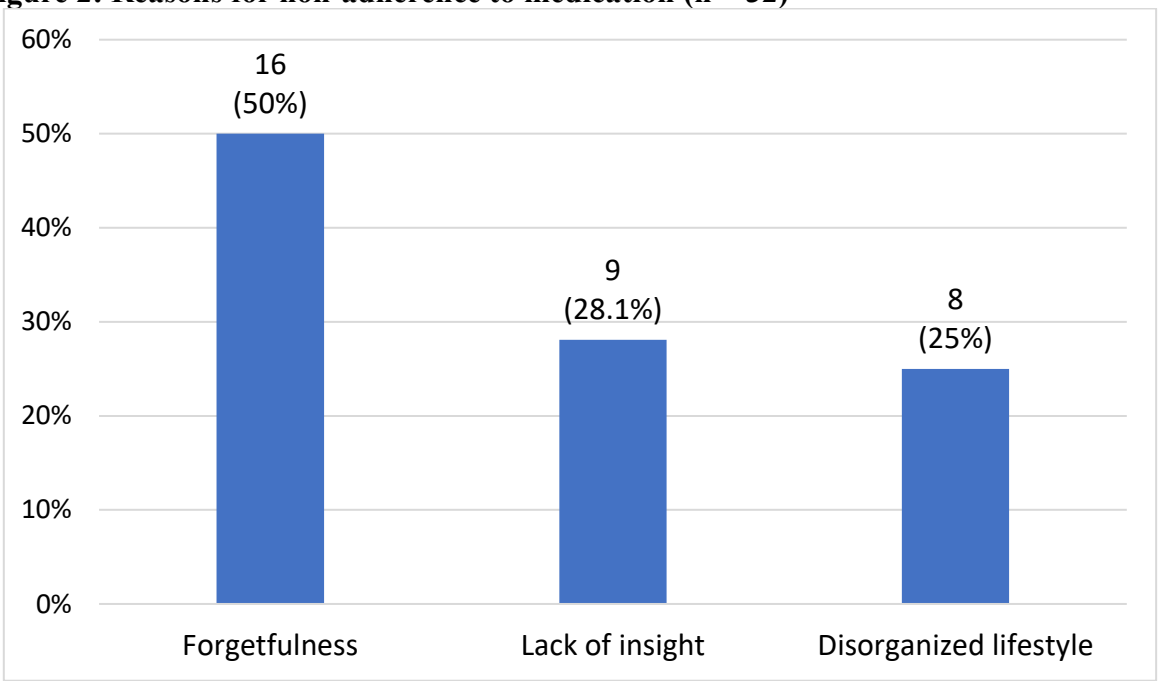
Regarding the current used antipsychotic medications; olanzapine was the most reported medication (42.9%) followed by aripiprazole (35.7%), paliperidone (25%) and risperidone (21.4%) (**Figure 1**).

Figure 1: Current used antipsychotic medications



The most reported reason of non-adherence to psychotic medications was forgetfulness (50%) followed by lack of insight (28.1%) and disorganized lifestyle (25%) (**Figure 2**).

Figure 2: Reasons for non-adherence to medication (n = 32)



Regarding the individual components of metabolic syndrome; central obesity was reported in 152 (67.9%) of the participants, hypertension was reported in 96 (42.9%), low HDL cholesterol was reported in 96 (42.9%), high triglycerides reported in 72 (32.1%) and insulin resistance

using HbA1c was reported in 64 (28.6%) of the participants. There was a significant association between central obesity and high triglycerides in relation to gender (P < 0.001); central obesity was higher in females comparted to males (87.5% vs. 60% respectively) while high triglyceride was higher in males compared to females (45% vs. 0%) (**Table 3**).

Table 3: Metabolic syndrome components and its association to gender

Variable	Overall n (%)	95% Confidence Interval (C.I.)	Gender		P value
			Male (n = 160)	Female (n = 64)	
Central obesity (WC ≥ 40 inches in men and ≥ 35 inches in women)	152 (67.9)	61.7% - 74.0%	96 (60)	56 (87.5)	< 0.001
Low HDL-C (< 1.03 mmol/L in men and < 1.29 mmol/L in women))	96 (42.9)	36.4% - 49.3%	72 (45)	24 (37.5)	0.306
High TG (≥ 1.98 mmol/L)	72 (32.1)	26.0% - 38.3%	72 (45)	0 (0)	< 0.001
High BP (≥ 130/85 mmHg)	96 (42.9)	36.4% - 49.3%	72 (45)	24 (37.5)	0.306
High HbA1c (≥ 5.7%)	64 (28.6)	22.7% - 34.5%	40 (25)	24 (37.5)	0.061

Discussion

Our study assessed Saudi 224 adult patients with psychiatric disorders, finding a 35.7% prevalence of metabolic syndrome based on NECP ATP III criteria. This prevalence was lower than estimates recorded in the USA (53.5%) [11], Palestine (43.6%) [12], Kenya (47.1%) [13], and Malaysia (37.8%) [14]. However, it was higher than records in Egypt (12%) [15] and Qatar (31.9%) [16]. This difference points out the regional, genetic, lifestyle, and healthcare factors that could play their role in defining the burden of metabolic syndrome across populations. Such comparisons point toward a more local approach in order to tackle the metabolic health disparities among psychiatric populations.

We found that male participants outnumbered females, with a male-to-female ratio of 2.5:1. Metabolic syndrome was significantly associated with male gender (P = 0.034) and marital status, particularly among divorced or separated participants (P = 0.003). Similarly, **Kwobah *et al.*** reported that males were more likely than women to have metabolic syndrome [14]; these results are different from those of a study conducted in South Africa, which found that among black African women, the prevalence of metabolic syndrome was more than three times higher than that of men in the same setting [17]. Other factors, such as genetics and environmental factors, may also contribute to the lower incidence of metabolic syndrome among females in our setting [18, 19]. These aspects may be hard to fully explain at this time, but they nevertheless need more research.

We found that sedentary behavior (P < 0.001) and prolonged smoking duration (P < 0.001) were significantly associated with metabolic syndrome, with a higher prevalence among those who never attempted to quit smoking (P < 0.001). With the exception of being more common in females, the study by **Sweileh *et al.*** on Palestinian patients with schizophrenia revealed a higher incidence of MetS in patients who were older, obese in the abdomen, had smoked, had been ill for a longer period of time, and had high blood pressure. Regression analysis, however, showed that none of these sociodemographic characteristics were significant [12]. Higher frequencies of the metabolic syndrome may be linked to severe mood and psychotic disorders for a number of reasons. The metabolic syndrome is linked to certain lifestyle choices that are prevalent in individuals with severe mental illness, such as sedentary lives and diets heavy in fat and carbohydrates [20, 21].

This study reported that participants with metabolic syndrome had significantly higher BMI (31.1 ± 8.7 kg/m², P < 0.001), waist circumference (40.8 ± 6.4 inches, P < 0.001), and elevated

blood pressure (systolic: 123.6 ± 13.5 mmHg, diastolic: 73.1 ± 9.0 mmHg, $P < 0.001$). This was similar to **Sweileh *et al.*** who found that metabolic syndrome was significantly associated with high systolic and diastolic blood pressure in both univariate and multivariate analyses [12]. In their study of MetS in drug-naive psychotic patients, **Grover *et al.*** discovered that 26% of patients had high blood pressure (>135/85 mm/Hg) [22]. In a different study, **Fernandez-Egea *et al.*** compared drug-naive schizophrenia patients with FEP to controls and found significantly greater pulse pressure but no significant difference in systolic or diastolic blood pressure [23].

Participants with metabolic syndrome in our analysis had significantly lower HDL cholesterol ($P < 0.001$) but no difference in total cholesterol ($P = 0.233$). They also showed higher levels of triglycerides (1.54 ± 0.75 mmol/L), random blood glucose (6.16 ± 3.39 mmol/L), and HbA1c (5.71% ± 1.13%; $P < 0.001$ for all). The results of the Health and Demographic Surveillance System [HDSS] site in the general population in Western Kenya, which showed that only 15% of the population had elevated plasma lipids, further support the excess of dyslipidemia among patients with psychosis in comparison to the general population [24]. Nonetheless, they are similar to the results of a cross-sectional study conducted in Saudi Arabia on 992 patients with mental illness, which found that 52.5% had low HDL cholesterol and 32.8% had increased triglycerides [25]. In order to lower the related risk of CVD, patients with psychosis in our environment require ongoing lipid monitoring and care, as demonstrated by the high incidence of dyslipidemia in this study.

Chronic illnesses such as obesity (10.7%) and diabetes (3.6%) were significantly associated with the prevalence of metabolic syndrome ($P < 0.001$). **Kwobah *et al.*** [14] found that compared to controls, patients had a considerably greater prevalence of elevated BMI, which is consistent with a number of studies conducted in high-income environments [26]. According to the current study, female sex was positively correlated with higher BMI. This is consistent with the 2010 WHO Global Infobase, which found that the prevalence of obesity in women was higher than in men in 87% of the 151 participating countries [27]. Our study found that central obesity was significantly more prevalent in females (87.5% vs. 60%, $P < 0.001$), while high triglycerides were significantly more common in males (45% vs. 0%, $P < 0.001$). The genetic and hormonal factors may be the cause of gender differences in obesity. Women tend to have higher proportional lean mass, while men tend to have higher proportional fat mass and subcutaneous adipose tissue [28, 29].

Our results demonstrated that metabolic syndrome was significantly associated with longer psychiatric diagnosis duration ($P < 0.001$), longer psychiatric medication duration ($P < 0.001$), and higher number of admissions ($P = 0.036$). While most participants used polypharmacy (50%) or second-generation antipsychotics (46.4%), metabolic syndrome was significantly linked to first-generation antipsychotics ($P < 0.001$). **Bermudes *et al.*** found no significant association between the psychiatric disease duration and the incidence of metabolic syndrome ($P=0.061$). Furthermore, increased duration of disease and continued use of current antipsychotics are likely contributing factors to the prevalence of Metabolic syndrome in antipsychotic-using individuals [12, 16].

This study highlights the significant burden of metabolic syndrome among psychiatric patients, emphasizing the importance of integrated care. The strong associations between metabolic syndrome and sedentary behavior, smoking, and psychiatric medication use underscore the need for multidisciplinary interventions. Regular monitoring of metabolic risk factors, tailored lifestyle modification programs, and careful selection of psychotropic medications are essential to mitigate the risk. Addressing central obesity, blood pressure, and biochemical markers such as HDL cholesterol and triglycerides should be prioritized to reduce long-term cardiovascular and metabolic complications.

Strengths

The study's strengths include a well-defined population of psychiatric patients and the use of standardized NECP ATP III criteria for metabolic syndrome assessment. It provides valuable insights into the interplay between psychiatric disorders, lifestyle factors, and metabolic health. The comprehensive analysis of demographic, clinical, and biochemical data strengthens the reliability of the findings and allows for a detailed understanding of the risk factors associated with metabolic syndrome in this population.

Limitations

Despite its strengths, the study has some limitations. The cross-sectional design limits the ability to infer causality between psychiatric conditions, medication use, and metabolic syndrome. Additionally, the study was conducted at a single center, which may restrict the generalizability of the findings to other populations. The lack of detailed dietary and genetic data also constrains a more comprehensive evaluation of contributing factors. Future longitudinal studies with diverse populations are needed to establish causative relationships and explore other potential influences.

Conclusion

This study demonstrates a high prevalence of metabolic syndrome among adults with psychiatric disorders, with significant associations with lifestyle behaviors, psychotropic medication use, and gender-specific patterns in metabolic components. These findings emphasize the critical need for integrated approaches in psychiatric care, focusing on early detection and management of metabolic risk factors. Collaborative efforts between psychiatrists and primary care providers can significantly improve health outcomes for this vulnerable population.

References:

1. McCracken E, Monaghan M, Sreenivasan S. Pathophysiology of the metabolic syndrome. Clinics in dermatology. 2018 Jan 1;36(1):14-20.
2. Saklayen MG. The global epidemic of the metabolic syndrome. Current hypertension reports. 2018 Feb;20(2):1-8.
3. Fahed G, Aoun L, Bou Zerdan M, Allam S, Bou Zerdan M, Bouferraa Y, Assi HI. Metabolic syndrome: updates on pathophysiology and management in 2021. International Journal of Molecular Sciences. 2022 Jan 12;23(2):786.
4. Molina JD, Avila S, Rubio G, López-Muñoz F. Metabolomic connections between schizophrenia, antipsychotic drugs and metabolic syndrome: a variety of players. Current Pharmaceutical Design. 2021 Nov 1;27(39):4049-61.
5. Ijaz S, Bolea B, Davies S, Savović J, Richards A, Sullivan S, Moran P. Antipsychotic polypharmacy and metabolic syndrome in schizophrenia: a review of systematic reviews. BMC psychiatry. 2018 Dec;18:1-3.
6. Seeman MV. Men and women respond differently to antipsychotic drugs. Neuropharmacology. 2020 Feb 1;163:107631.
7. Ceraso A, Lin JJ, Schneider-Thoma J, Siafis S, Tardy M, Komossa K, Heres S, Kissling W, Davis JM, Leucht S. Maintenance treatment with antipsychotic drugs for schizophrenia. The Cochrane database of systematic reviews. 2020;2020(8).
8. Keks N, Schwartz D, Hope J. Stopping and switching antipsychotic drugs. Australian prescriber. 2019 Oct;42(5):152.
9. Ventriglio A, Baldessarini RJ, Vitrani G, Bonfitto I, Cecere AC, Rinaldi A, Petito A, Bellomo A. Metabolic syndrome in psychotic disorder patients treated with oral and long-acting injected antipsychotics. Frontiers in psychiatry. 2019 Jan 16;9:744.
10. Lee JS, Kwon JS, Kim D, Kim SW, Kim JJ, Kim JH, Nam HJ, Ryu S, Park IH, An SK, Oh HS. Prevalence of metabolic syndrome in patients with schizophrenia in Korea: a

multicenter nationwide cross-sectional study. Psychiatry investigation. 2017 Jan;14(1):44.
11. Meyer JM, Pandina G, Bossie CA, Turkoz I, Greenspan A. Effects of switching from olanzapine to risperidone on the prevalence of the metabolic syndrome in overweight or obese patients with schizophrenia or schizoaffective disorder: analysis of a multicenter, rater-blinded, open-label study. Clinical therapeutics. 2005 Dec 1;27(12):1930-41.
12. Sweileh WM, Zyoud SE, Dalal SA, Ibwini S, Sawalha AF, Ali I. Prevalence of metabolic syndrome among patients with schizophrenia in Palestine. BMC psychiatry. 2012 Dec;12:1-8.
13. Kwobah E, Koen N, Mwangi A, Atwoli L, Stein DJ. Prevalence and correlates of metabolic syndrome and its components in adults with psychotic disorders in Eldoret, Kenya. PloS one. 2021 Jan 11;16(1):e0245086.
14. Rahman AH, Asmara HS, Baharudin A, Sidi H. Metabolic syndrome in psychiatric patients with primary psychotic and mood disorders. Asean J Psychiatry. 2009 Jan 1;10:1-8.
15. Fawzy N, Shabrawy A, Youssef A. Prevalence and risk factors of metabolic syndrome among drug-naive psychotic patients. Egyptian Journal of Psychiatry. 2015 May 1;36(2):101.
16. Hammoudeh S, Ghuloum S, Mahfoud Z, Yehya A, Abdulhakam A, Al-Mujalli A, Al-Zirie M, Abdel Rahman MO, Godwin A, Younes N, Hani Y. The prevalence of metabolic syndrome in patients receiving antipsychotics in Qatar: a cross sectional comparative study. BMC psychiatry. 2018 Dec;18:1-9.
17. Saloojee S, Burns JK, Motala AA. High risk of metabolic syndrome among black South African women with severe mental illness. South African Journal of Psychiatry. 2017 Apr 11;23.
18. Lee S, Ko Y, Kwak C, Yim ES. Gender differences in metabolic syndrome components among the Korean 66-year-old population with metabolic syndrome. BMC geriatrics. 2016 Dec;16:1-8.
19. Tian X, Xu X, Zhang K, Wang H. Gender difference of metabolic syndrome and its association with dietary diversity at different ages. Oncotarget. 2017 Sep 2;8[43]:73568–78.
20. Brown S, Birtwistle J, Roe L, Thompson C. The unhealthy lifestyle of people with schizophrenia. Psychological medicine. 1999 May;29(3):697-701.
21. Davidson S, Judd F, Jolley D, Hocking B, Thompson S, Hyland B. Cardiovascular risk factors for people with mental illness. Australian & New Zealand Journal of Psychiatry. 2001 Apr;35(2):196-202.
22. Grover S, Nebhinani N, Chakrabarti S, Parakh P, Ghormode D. Metabolic syndrome in antipsychotic naïve patients diagnosed with schizophrenia. Early Intervention in Psychiatry. 2012 Aug;6(3):326-31.
23. Fernandez-Egea E, Bernardo M, Heaphy CM, Griffith JK, Parellada E, Esmatjes E, Conget I, Nguyen L, George V, Stöppler H, Kirkpatrick B. Telomere length and pulse pressure in newly diagnosed, antipsychotic-naive patients with nonaffective psychosis. Schizophrenia bulletin. 2009 Mar 1;35(2):437-42.
24. Chege P. Multiple cardiovascular disease risk factors in rural Kenya: evidence from a health and demographic surveillance system using the WHO STEP-wise approach to chronic disease risk factor surveillance. South Afr Fam Pract. 2016 Apr 6;58[2]:54–61.
25. Alosaimi FD, Abalhassan M, Alhaddad B, Alzain N, Fallata E, Alhabbad A, et al. Prevalence of metabolic syndrome and its components among patients with various

psychiatric diagnoses and treatments: A cross-sectional study. Gen Hosp Psychiatry. 2017 Mar 1;45:62–9.
26. Annamalai A, Kosir U, Tek C. Prevalence of obesity and diabetes in patients with schizophrenia. World J Diabetes. 2017 Aug 15;8[8]:390–6.
27. Garawi F, Devries K, Thorogood N, Uauy R. Global differences between women and men in the prevalence of obesity: is there an association with gender inequality? Eur J Clin Nutr. 2014 Oct;68[10]:1101–6.
28. Link JC, Reue K. The Genetic Basis for Sex Differences in Obesity and Lipid Metabolism. Annu Rev Nutr. 2017 Aug 21;37:225–45.
29. Zore T, Palafox M, Reue K. Sex differences in obesity, lipid metabolism, and inflammation-A role for the sex chromosomes? Mol Metab. 2018;15:35–44.
30. Bermudes RA, Keck Jr PE, Welge JA. The prevalence of the metabolic syndrome in psychiatric inpatients with primary psychotic and mood disorders. Psychosomatics. 2006 Nov 1;47(6):491-7.