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Clinical Patterns of Metabolic Syndrome in First-Hospitalized Major Depressive Disorder Patients: Comparison of Antidepressant-Exposed and Drug-Naïve Groups

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Background: Major depressive disorder (MDD) and metabolic syndrome (MetS) are both major health threats nowadays, and the relationship between them is complex and close. The purpose of this paper is to compare differences in the prevalence and risk factors of MetS in first hospitalized patients with MDD with and without antidepressant exposure.

Methods: A total of 636 first hospitalized MDD patients (study group) with antidepressant exposure and 345 drug-naïve patients (control group) were included in this study. Their socio-demographic data, routine biochemical indices, and psychological symptom assessment were collected.

Results: There was no difference in the prevalence of MetS between the study group and the control group (F = 2.49, p = 0.115). Factors affecting MetS and its severity differed between the two groups, in the study group, the identified risk factors for MetS were onset age (B = 0.05, p <0.001, OR = 1.05, 95% CI = 1.02–1.08), TSH level (B = 0.42, p <0.001, OR = 1.53, 95% CI = 1.39–1.68). Meanwhile, in the control group, the identified risk factors for MetS were more extensive and they were, onset age (B = 0.11, p <0.001, OR = 1.12, 95% CI = 1.07–1.16), suicidal behavior (B = 1.54, p = 0.007, OR = 4.65, 95% CI = 1.51–14.33), HAMD scores (B = 0.23, p = 0.008, OR = 1.26, 95% CI = 1.06–1.49) and TSH levels (B = 0.33, p <0.001, OR = 1.39, 95% CI = 1.17–1.65). The number of risk factors identified was lower in the study group.

Conclusion: Antidepressant use was associated with greater MetS severity but did not affect overall prevalence. Antidepressants appear to modify MetS risk factors, highlighting the need to differentiate these effects from those in drug-naïve patients when developing MetS interventions for the MDD population.

Keywords: major depressive disorder, metabolic syndrome, antidepressant-exposed, drug-naïve, risk factor

Introduction

Depressive disorders, categorized under mood disorders, feature primary symptoms of depressed mood and the loss of interest or pleasure.[1,2] The Global Burden of Disease Study has highlighted the contribution of depressive disorders to the global burden by revealing an increase in disability-adjusted life years (DALYs) from 19th in 1990 to 13th in 2019.[3] The World Health Organization (WHO) predicts that depressive disorders will become the most prevalent disabling condition worldwide by 2030. Within the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) depressive disorders group, major depressive disorder (MDD) stands out as a typical condition.[1,4] Recent national survey data in China indicates an estimated lifetime prevalence of depressive disorders at 6.8%, with a 12-month

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prevalence of 2.1% and a lifetime prevalence of 3.4% for MDD.[5] This high prevalence imposes a significant burden for a country with nearly one-fifth of the global population.

Metabolic syndrome (MetS) is a pathological condition characterized by several factors, including insulin resistance, atherogenic dyslipidemia, central obesity, and hypertension.[6,7] It is closely linked to an elevated risk of developing diabetes and cardiovascular disease (CVD).[6] With advancements in global healthcare, MetS has appeared as a major health threat in the modern era, surpassing infectious diseases.[7] Statistics show that approximately a quarter of the global population is affected by MetS,[8] and epidemiological studies indicate a continuous increase in its prevalence over the years.[9,10] Two nationwide population-based surveys conducted in China revealed a gradual rise in MetS prevalence from 13.7% in 2000–2001 to 31.1% in 2015−2017.[11,12] As of 2021, hypertension, dyslipidemia, and type 2 diabetes mellitus have posed a threat to the lives and health of hundreds of millions of people in China, causing significant socioeconomic burdens.[13,14]

The intrinsic association between MDD and MetS has been a key area of academic interest. Researchers have discovered shared genetic pathways between MDD and MetS,[15–17] and there is often an assumption that metabolic disorders are present at the beginning of MDD onset, even before the administration of drugs.[18–20] Studies have found that the prevalence of MetS and the level of its components are significantly higher in the primary MDD population compared to healthy controls.[21,22] However, the metabolic disturbances in MDD patients who are exposed to antidepressant and antipsychotic medications are even more surprising and noteworthy than the inherent metabolic disturbances in MDD patients.[23–25] A meta-analysis showed that the use of antidepressants increased the risk of new-onset diabetes by 1.25 times in people with MDD.[26] Meanwhile, another meta-analysis similarly found that the combined use of antipsychotics was an important moderator of metabolic disorders in people with MDD.[27]

Based on the previous studies mentioned above, it is reasonable to hypothesize that antidepressant medications may have a broader influence on the development of MetS, resulting in an increased prevalence of MetS in patients with MDD. The aim of our paper is to assess the impact of antidepressant exposure on MetS in first hospitalized MDD patients by comparing differences in clinical characteristics related to MetS between patients with and without a history of antidepressant exposure, and to provide feasible references and insights for clinical interventions.

Subjects and Methods

Subjects

A total of 636 patients admitted to the Wuhan Mental Health Center between July 2017 and August 2022 with a history of antidepressant exposure and first hospitalization for MDD were included in this study.

The inclusion criteria of the patients were as follows: 1) meeting the diagnostic criteria of MDD in the International Classification of Diseases, 10th edition (ICD-10); 2) no history of previous hospitalization; 3) aged between 18 and 60 years old and of Chinese Han ethnicity; 4) no restriction on the type of antidepressant medication and the type of antipsychotic medication to be used in the outpatient clinic; and 5) a total score equal to or higher than 24 on the 17-item Hamilton Depression Scale (HAMD-17).

Patients who met any of the following criteria were excluded: 1) lactating or pregnant women; 2) those with a history of drug dependence; 3) those with severe physical illness or personality disorders; 4) those with a previous diagnosis of diabetes mellitus; and 5) those who were unable to cooperate with psychiatric evaluation due to severe behavioral disorders or other reasons, such as agitation, reticence, impulsivity, etc.

Meanwhile, we included 345 first-hospitalized and drug-naïve MDD patients as a control group, who were matched to the study group in terms of age, duration of disease, and sex ratio. The inclusion and exclusion criteria of the control group were the same as those of the study group, except that they were drug-naïve.

The study was conducted after obtaining approval from the Ethics Committee of Wuhan Mental Health Center, and written informed consent was obtained from all participants. Participants had the right to withdraw from the study at any time.

Research Design

This research was conducted using a case-control study design. The aim was to compare the metabolic parameters and common clinical indicators between a first hospitalized MDD population with a history of outpatient drug therapy and drug-naïve, as well as to analyze the differences in risk factors for MetS and its severity across two clinical subgroups.

Upon enrollment, we gathered relevant clinical information from individuals diagnosed with MDD who met the inclusion criteria. This included important variables such as age, gender, age of onset, duration of illness, marital status, history of outpatient treatment, and presence or absence of suicidal behavior. To assess the severity of depressive symptoms, we employed the 17-item Hamilton Depression Scale (HAMD-17), while anxiety symptoms were evaluated using the Hamilton Anxiety Scale (HAMA-14). Psychotic symptoms were measured using the Positive Symptom Subscale (PSS) of items P1-P7 in the Positive and Negative Symptom Scale (PANSS). We also used the Clinical Global Impression Scale (CGI) to assess pre-treatment disease severity.

Routine clinical and biochemical indicators obtained using patient fasting venous blood tests provided by the hospital biochemistry laboratory were extracted from the electronic medical record system. These indicators included the measurement of blood lipid profile, namely total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-c), and high-density lipoprotein cholesterol (HDL-c). Additionally, fasting blood glucose (FBG) levels, body mass index (BMI), blood pressure (specifically systolic blood pressure [SBP] and diastolic blood pressure [DBP]), and thyroid function (specifically thyroid-stimulating hormone [TSH], free triiodothyronine [FT_3], and free tetraiodothyronine [FT_4]) levels were assessed.

The diagnostic criteria in China for MetS require the presence of at least three of the following five indicators:[28] 1) abdominal obesity, defined as a waist circumference ≥ 90 cm in men and ≥ 85 cm in women; 2) hyperglycemia, defined as fasting blood glucose ≥ 6.1 mmol/L or a diagnosis of diabetes mellitus; 3) hypertension, defined as systolic blood pressure ≥ 130/85 mmHg or diastolic blood pressure ≥ 85 mmHg or a confirmed diagnosis of hypertension; 4) elevated triglycerides (TG) ≥ 1.70 mmol/L; and 5) low high-density lipoprotein cholesterol (HDL-c) < 1.04 mmol/L.

To evaluate the severity of MetS, scoring rules were established based on prior studies.[29,30] These rules were applied to calculate the MetS score for the participants. Firstly, the reciprocal of high-density lipoprotein cholesterol (HDL-c) and mean arterial pressure (MAP) were calculated using the equation MAP = 1/3 × SBP + 2/3 × DBP. Subsequently, the five MetS parameters - waist circumference (WC), triglycerides (TG), reciprocal of HDL-C, fasting blood glucose (FBG), and MAP - were normalized. A principal component analysis with varimax rotation was then conducted on these normalized variables to derive principal components (PCs) that explained a significant portion of the observed variation, having an eigenvalue of 1.0 or higher. In this study, PC1 and PC2 accounted for 25.23% and 20.85% of the variance, respectively. The loadings of the variables on the PC1 (PC2) were as follows: WC 0.26 (−0.63), TG 0.28 (0.50), HDL-C 0.17 (0.61), MAP 0.73 (0.04), and FBG 0.75 (−0.15). Weighted PC scores were then calculated based on the relative weights of PC1 and PC2 in the explained variance. Finally, the MetS score was obtained by summing the individual weighted PC scores.

The psychological scales were administered by two psychiatrists with the title of "attending" or higher, who were uniformly trained and affiliated with the medical institution where the study was conducted.

Data Analysis

Categorical variables were reported as counts, while continuous variables with normal distribution were depicted using means and standard deviations. Continuous variables that were not normally distributed were expressed using medians (P_{25}, P_{75}). The Shapiro–Wilk test was employed to verify the normality of all continuous variables. For both continuous variables, whether normally or non-normally distributed, and categorical variables, statistical comparisons were made using independent samples *t*-tests, Mann–Whitney *U*-tests, and chi-square tests. Pearson's correlation coefficients were utilized to investigate the relationships between MetS and various clinical variables, excluding components of MetS itself. Binary logistic regression was conducted to pinpoint risk factors for MetS across different clinical groups. In addition, multivariate linear regression models were established to evaluate the risk factors associated with MetS severity within both the study and control cohorts. All statistical analyses were conducted with a two-tailed approach, considering a significant level of 0.05 or lower. Data analysis was performed using SPSS version 27.

Results

Differences Between Clinical Parameters in the Study and Control Groups

In the study group, there were 234 patients (36.79%) who were prescribed one antidepressant, 402 patients (62.21%) who were prescribed two antidepressants, and 382 patients (60.06%) who were co-prescribed antipsychotics. The prevalence of MetS in the study group was 8.49% (54/636), while it was 11.59% (40/345) in the control group. However, this difference was not statistically significant (F = 2.49, $p = 0.115$). Nevertheless, the study group had significantly higher MetS scores (t = −1.10, $p = 0.013$), and TG levels (t = −2.05, $p = 0.041$) compared to the controls (as shown in Table 1).

Analysis of Factors Associated with MetS by Different Clinical Groups

The results of the correlation analysis were shown in Table 2. In the study group, factors associated with MetS included age, onset age, being married, suicidal behavior, PSS scores, HAMD scores, HAMA scores, CGI-SI scores, TSH levels,

Table 1 The Demographic and General Clinical Data in Different Clinical Groups

Index	Study Group (n = 636)	Control Group (n = 345)	$t/Z/\chi^2$	*p* - value
Age - years	35.20±12.36	36.39±12.58	1.44	0.151
Onset age - years	32(22–44)	36(23–45)	−1.42	0.155
Course of disease - months	10.5(8–13)	10.5(8.5–12.5)	−0.44	0.660
MetS			2.49	0.115
Yes	54, 8.49%	40, 11.59%		
NO	582, 91.51%	305, 88.41%		
Marital status - (n, %)			0.02	0.882
Married	438, 68.87%	236, 68.41%		
Others	198, 31.13%	109, 31.59%		
Suicidal behavior			2.12	0.146
Yes	93, 14.62%	39, 11.30%		
NO	543, 85.38%	306, 88.70%		
Educational background			2.47	0.116
High school and below	432, 67.92%	251, 72.75%		
Bachelor and above	204, 32.08%	94, 27.25%		
PSS	7(7–7)	7(7–7)	−183	0.067
HAMD	29(27–31)	29(27–32)	−0.48	0.663
HAMA	20(18–22)	20(17–22)	−0.88	0.380
CGI-SI	6(5–6)	6(5–6)	−0.91	0.362
TSH - uIU/mL	4.03±2.57	3.89±2.29	−0.85	0.398
FT_3 - pmol/L	4.88±0.69	4.94±0.70	1.29	0.196
FT_4 - pmol/L	16.78±3.03	16.79±3.05	0.06	0.955
MetS scores	0.05±0.35	−0.01±0.36	−1.10	0.013*

(*Continued*)

Table 1 (Continued).

Index	Study Group (n = 636)	Control Group (n = 345)	$t/Z/\chi^2$	*p* - value
MetS components				
WC - cm	80(74.0–86.5)	80(73.3–85.5)	−0.62	0.541
FBG - mmol/L	5.27±0.65	5.25±0.59	−0.30	0.768
TG - mmol/L	2.20±1.06	2.07±0.96	−2.05	0.041*
HDL-c - mmol/L	1.31±0.23	1.33±0.23	1.30	0.194
SBP - mmHg	115.88±11.28	117.32±10.85	1.93	0.054
DBP - mmHg	74.39±6.66	75.05±7.12	1.45	0.147
TC - mmol/L	4.75±0.89	4.85±0.97	1.67	0.096
LDL-c - mmol/L	2.67±0.72	2.66±0.78	−0.10	0.919
BMI - kg/m^2	24.15(23.23–25.36)	24.13(23.21–25.36)	−0.13	0.989

Note: *$p<0.05$.

Abbreviations: PSS, Positive symptom subscale; HAMD, Hamilton Depression Scale score; HAMA, Hamilton Anxiety Scale Score; CGI-SI, Clinical Global Impression Scale - Severity of Illness; TSH, Thyroid stimulating hormone; FT_3, Free triiodothyronine; FT_4, Free tetraiodothyronine; MetS, Metabolic syndrome; WC, waist circumference; FBG, fasting blood glucose; TG, triglycerides; HDL-c, high density lipoprotein cholesterol; SBP, systolic blood pressure; DBP, diastolic blood pressure; TC, total cholesterol; LDL-c, low density lipoprotein cholesterol; BMI, Body mass index.

Table 2 Correlation Between MetS and Demographic and Clinical Variable in Different Clinical Groups

Characteristic	Study Group (n = 636)		Control Group (n = 345)	
	r	*p*	*r*	*p*
Age - years	0.20	<0.001*	0.31	<0.001*
Onset age - years	0.21	<0.001*	0.32	<0.001*
Course of disease - s	−0.04	0.304	−0.03	0.630
Gender (Male vs Female)	0.01	0.764	0.08	0.127
Married (No vs Yes)	0.14	<0.001*	0.21	<0.001*
Suicidal behavior (No vs Yes)	0.26	<0.001*	0.30	<0.001*
Bachelor and above (No vs Yes)	−0.08	0.054	−0.10	0.065
PSS	0.31	<0.001*	0.34	<0.001*
HAMD	0.22	<0.001*	0.26	<0.001*
HAMA	0.24	<0.001*	0.24	<0.001*
CGI-SI	0.19	<0.001*	0.11	0.049*
TSH - uIU/mL	0.47	<0.001*	0.33	<0.001*
FT_3 - pmol/L	−0.07	0.072	0.02	0.719
FT_4 - pmol/L	−0.05	0.252	0.01	0.848
TC - mmol/L	0.18	<0.001*	0.13	0.014*
LDL-c - mmol/L	0.11	0.006*	0.03	0.570
BMI - kg/m^2	0.03	0.394	0.03	0.568

Note: *$p<0.05$.

Abbreviations: PSS, Positive symptom subscale; HAMD, Hamilton Depression Scale score; HAMA, Hamilton Anxiety Scale Score; CGI-SI, Clinical Global Impression Scale - Severity of Illness; TSH, Thyroid stimulating hormone; FT_3, Free triiodothyronine; FT_4, Free tetraiodothyronine; TC, total cholesterol; LDL-c, low density lipoprotein cholesterol; BMI, Body mass index.

TC levels and LDL-C levels, all *p*-values are less than 0.05. Meanwhile, in the control group, factors associated with MetS were age, onset age, being married, suicidal behavior, PSS scores, HAMD scores, HAMA scores, CGI-SI scores, TSH levels and TC levels, all *p*-values are less than 0.05.

Risk Factor Analysis of MetS in Different Clinical Groups

As shown in Table 3, we constructed binary logistic regression models (Backward: Wald) in each of the two clinical groups with MetS as the outcome variable and the clinical parameters associated with MetS in the previous step as independent variables. In the study group, the identified risk factors for MetS were onset age (B = 0.05, p <0.001, OR = 1.05, 95% CI = 1.02–1.08), TSH level (B = 0.42, p <0.001, OR = 1.53, 95% CI = 1.39–1.68). Meanwhile, in the control group, the identified risk factors for MetS were more extensive and they were, onset age (B = 0.11, p <0.001, OR = 1.12, 95% CI = 1.07–1.16), suicidal behavior (B = 1.54, p = 0.007, OR = 4.65, 95% CI = 1.51–14.33), HAMD scores (B = 0.23, p = 0.008, OR = 1.26, 95% CI = 1.06–1.49) and TSH levels (B = 0.33, p <0.001, OR = 1.39, 95% CI = 1.17–1.65).

Risk Factor Analysis of MetS Scores in Different Clinical Groups

Finally, we constructed multiple linear regression models (Backward) in each of the two clinical groups using MetS scores as the outcome variable and clinical parameters associated with MetS as the independent variables (See Table 4). In the study

Table 3 Binary Logistic Regression Analyses of Determinants of MetS in Different Clinical Groups

	Coefficients	Std. error	Wald	*p*-value	95% CI for EXP (B)		
	B				Exp(B)	Lower	Upper
Study group							
Onset age - years	0.05	0.01	13.57	<0.001*	1.05	1.02	1.08
TSH - uIU/mL	0.42	0.05	77.08	<0.001*	1.53	1.39	1.68
Control group							
Onset age - years	0.11	0.02	27.65	<0.001*	1.12	1.07	1.16
Suicidal behavior (No vs Yes)	1.54	0.57	7.17	0.007*	4.65	1.51	14.33
HAMD	0.23	0.09	7.02	0.008*	1.26	1.06	1.49
CGI-SI	−0.64	0.37	3.00	0.083	0.53	0.26	1.09
TSH - uIU/mL	0.33	0.09	13.60	<0.001*	1.39	1.17	1.65

Note: *p<0.05.
Abbreviations: TSH, Thyroid stimulating hormone; HAMD, Hamilton Depression Scale score; CGI-SI, Clinical Global Impression Scale - Severity of Illness.

Table 4 Correlates Affecting MetS Scores in Different Clinical Groups: a Multiple Linear Regression Model

	Coefficients	Std. error	t	*p*-value	95% CI	
	B				Lower	Upper
Study group						
Age - years	0.01	0.00	5.70	<0.001*	0.01	0.01
Married (No vs Yes)	0.06	0.03	1.70	0.090	−0.01	0.12
TSH - uIU/mL	0.06	0.01	12.12	<0.001*	0.05	0.07
Control group						
Age - years	0.01	0.00	3.11	0.002*	0.00	0.01
Married (No vs Yes)	0.13	0.05	2.63	0.009*	0.03	0.22
HAMD	0.01	0.01	1.99	0.047*	0.00	0.03
TSH - uIU/mL	0.04	0.01	5.62	<0.001*	0.03	0.06
TC - mmol/L	0.04	0.02	1.80	0.072	0.00	0.08
LDL-c - mmol/L	−0.08	0.02	−3.15	0.002*	−0.12	−0.03

Note: *p<0.05.
Abbreviations: TSH, Thyroid stimulating hormone; HAMD, Hamilton Depression Scale score.

group, the risk factors identified for higher MetS scores were age (B= 0.01, t = 5.70, p <0.001, 95% CI = 0.01–0.01), and TSH levels (B= 0.06, t = 12.12, p <0.001, 95% CI = 0.05–0.07). Meanwhile, in the control group, the risk factors identified for higher MetS were more extensive and they were, age (B= 0.01, t = 3.11, p = 0.002, 95% CI = 0.00–0.01), being married (B= 0.13, t = 2.63, p = 0.009, 95% CI = 0.03–0.22), HAMD scores (B= 0.01, t = 1.99, p = 0.047, 95% CI = 0.00–0.03) and TSH levels (B= 0.04, t = 5.62, p <0.001, 95% CI = 0.03–0.06), while LDL-c levels (B= −0.06, t = −3.15, p = 0.002, 95% CI = −0.12 - −0.03) was a protective factor.

Discussion

The key findings of this study are as follows: 1. The prevalence of MetS was not increased in MDD patients with antidepressant exposure, but the severity of MetS was increased. 2. The risk factors for MetS in the antidepressant-exposed group are different and fewer compared to the drug-naïve group. 3. The risk factors for MetS severity in the antidepressant-exposed group are different and fewer compared to the drug-naïve group.

Exposure to antidepressants and antipsychotics is usually recognized as a major cause of metabolic deterioration in patients with MDD.[31,32] Drug-induced metabolic disorders exacerbate the elevated in metabolic markers more than in the drug-naïve state.[25,33] However, this is still unproven. Two studies have found that blood glucose levels are not elevated in patients with first-onset MDD[34] and that maintenance treatment with antidepressants has no effect on insulin resistance.[35] Conjunction with our study, antidepressant exposure did not result in elevated levels of a wide range of metabolic parameters other than MetS scores and TC levels. The prevalence of MetS is another topic of concern. *Georgina E Crichton* et al reported a 1.22-fold increase in the prevalence of MetS in people with MDD who were exposed to antidepressant medications compared to drug naïve patients.[36] While another large meta-analysis reported no association between antidepressants and MetS.[27] Our study demonstrates that a history of antidepressant treatment does not adversely affect the prevalence of MetS in first hospitalized MDD patients, which is consistent with the latter finding. In short, our report shows that antidepressant exposure increases the severity of MetS in the MDD population but does not negatively affect its prevalence.

An important finding of our study is that patients with antidepressant exposure have a lower number of risk factors associated with MetS compared to drug-naïve patients with MDD. The relationship between MDD and MetS components, including obesity and others, is complex and heterogeneous. It is important to consider the potential impact of antidepressant exposure on metabolic disorders within this context.[37,38] However, it is vital to acknowledge that these conclusions cannot be readily applied to specific subgroups within the MDD population. Among frequently discussed risk factors, the severity of depressive symptoms is a notable contributor to MetS. This association has been extensively documented in various studies.[36,39] However, it is important to note that this association primarily applies to initial depressive symptoms during the onset of MDD and lacks generalizability.[40] Similar to our study, a large cross-sectional study found that suicidal behavior is a risk factor for worsening metabolic markers in an MDD population without prior drug exposure,[41] while no correlation was reported in patients with a history of antidepressant use. In the context of our study, exposure to antidepressants appears to moderately decrease the number of risk factors for MetS among the MDD population, potentially contributing to a more precise management of metabolic disorders in this demographic.

Furthermore, we transformed MetS into a continuous variable to evaluate the risk factors associated with MetS score or severity. Similarly, we observed that the risk factors for MetS severity differed between the study and control groups, with fewer risk factors identified in the study group. However, there is a lack of similar studies in this area. Only a few studies have examined the correlation between depressive symptoms and the severity of MetS. One study focused on the general clergy (without antidepressant exposure) and found a correlation between depressive symptoms and MetS severity.[40] Another study among the general population of African Americans (drug-naïve) found a correlation between baseline depression scores in females and MetS severity over an 8-year period.[42] Two other studies reported that more severe depressive symptoms corresponded to higher levels of MetS components in individuals with MDD.[43,44] Consistent with these findings, our study found that the severity of depressive symptoms in the drug-naïve group with a history of MetS was a risk factor for greater MetS severity. However, among patients with a history of antidepressant exposure, only exposure to tricyclic antidepressants was identified as a risk factor for an increased number of MetS components.[43] This finding may be further supported by the fact that we identified fewer risk factors for MetS severity in

our study group. In conclusion, our study suggests that antidepressant exposure may act as a potential protective factor in reducing the number of risk factors associated with MetS severity in a first hospitalized MDD population.

However, this study has some limitations. Firstly, the risk factors we identified for MetS and its severity were conducted based on cross-sectional studies, which do not allow for the establishment of a causal relationship. Secondly, the conclusion that the number of factors affecting MetS and its severity was less in the study group than in the control group was based on the clinical variables of interest in this study and did not include other biological indicators that were not included as potentially affecting MetS. Thirdly, in the regression analyses of the study group, antidepressant and antipsychotic exposure were not included to maintain consistency with the control group, which may have overlooked and minimized the risk factors identified in the study group. In future studies, we will conduct more rigorous prospective studies to remedy these deficiencies.

In summary, in hospitalized patients with MDD, antidepressant use was linked to increased severity of MetS but did not impact its overall prevalence. Antidepressants seem to alter MetS risk factors, and these effects should be distinguished from those in drug-naïve patients when devising intervention strategies for MetS in the MDD population.

Data Sharing Statement

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

The ethics committees of the Wuhan mental health center reviewed and approved this study. All subject guardians knew about this study and signed informed consent. All procedures carried out in studies conformed to the 1964 helsinki Declaration and its subsequent amendments or similar ethical standards.

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Disclosure

The authors report no conflicts of interest in this work.

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