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ORIGINAL RESEARCH

Gender Differences in Prevalence and Associated Factors of Dyslipidemia in Initial-Treatment and Drug-Naïve Schizophrenia Patients

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Background: Dyslipidemia is frequently comorbid with schizophrenia (SCZ), and both conditions often demonstrate significant gender differences in their clinical features. This study specifically focuses on investigating the prevalence of dyslipidemia and the factors that contribute to it in initial-treatment and drug-naïve (ITDN) SCZ patients, specifically focusing on gender differences.

Methods: A total of 224 male ITDN SCZ patients and 424 female ITDN SCZ patients were included in this study. Socio-demographic and general clinical data of the patients were collected, and routine biochemical parameters, such as lipid levels, fasting blood glucose, thyroid function, renal function, and blood cell counts, were measured. Patients were also assessed for psychopathology and disease severity using the Positive and Negative Syndrome Scale (PANSS) and the Clinical Global Impression Scale - Severity of Illness (CGI-SI), respectively. In addition, a lipids score was calculated for assessing the severity of dyslipidemia.

Results: The study revealed that the prevalence of dyslipidemia in male patients was 34.02% (83/224), whereas 33.25% (141/424) in females, indicating no statistically significant difference ($\chi^2 = 0.04$, $p = 0.841$). For males, the risk factors for dyslipidemia were high education levels and diastolic blood pressure (DBP), while red blood cell count (RBC) as a protective factor. Additionally, DBP was identified as a risk factor for dyslipidemia score. In females, systolic blood pressure (SBP) was identified as a risk factor for dyslipidemia, while being married and creatinine (CRE) levels were found to be protective factors. Moreover, SBP was revealed as a risk factor for dyslipidemia score.

Conclusion: No significant gender differences were observed in the prevalence of dyslipidemia among the ITDN SCZ patients. However, notable gender differences were identified in the factors influencing dyslipidemia and its severity within this group. These findings suggest the necessity of implementing gender-specific interventions to address the potential risk factors associated with dyslipidemia.

Keywords: gender difference, dyslipidemia, lipid levels, schizophrenia, drug-naïve

Introduction

Schizophrenia (SCZ) is a prevalent and chronic mental illness with a multifaceted etiology.[1] Recent research has highlighted a higher susceptibility to secondary endocrine and metabolic disorders among individuals with SCZ.[2] Notably, dyslipidemia, a widely prevalent metabolic disorder, frequently occurs in SCZ patients.[3,4] The presence of dyslipidemia in SCZ patients is significantly associated with elevated morbidity and mortality rates from cardiovascular diseases, as well as reduced life expectancy.[5] Additionally, dyslipidemia has been identified as a significant biological factor associated with cognitive impairment, suicide attempts, and aggressive behavior.[6–8] Hence, comprehensively understanding dyslipidemia in SCZ patients and delineating its clinical characteristics are essential for effective clinical management.

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There is increasing evidence suggesting that dyslipidemia may be present even before the onset of psychiatric disorders and during the first psychotic episode.[9,10] In individuals at risk for mental illness, including those with subthreshold symptoms, reductions in high-density lipoprotein (HDL) levels have been observed.[11] Moreover, genome-wide association analyses have shown shared genetic loci between SCZ and cardiovascular disease risk factors, such as high-density lipoprotein (HDL) and low-density lipoprotein (LDL).[12,13] These findings indicate that dyslipidemia is inherent in SCZ. Dyslipidemia generally exhibits significant gender differences in both diagnosis and treatment.[14–16] As observed in the general population, men tend to have a higher prevalence of cardiovascular disease compared to premenopausal women. However, after menopause, the prevalence of cardiovascular disease in women gradually increases to match that of men.[17,18] These disparities can be attributed, in large part, to variations in body fat distribution and the consequences of visceral fat accumulation due to estrogen.[19,20]

Previous studies have reported gender differences in dyslipidemia among individuals with SCZ. For instance, a small-sample study found that drug-naïve male patients experiencing their first psychotic episode may be at a higher risk of insulin resistance and dyslipidemia compared to females.[21] Similarly, Yongjie Zhou and colleagues discovered that female patients with first-episode schizophrenia exhibit a lower prevalence of high body mass index (BMI) and hypertriglyceridemia but a higher prevalence of low HDL when compared to males.[22] However, these studies were limited by their small sample sizes or lack of comprehensive investigation into dyslipidemia among individuals with SCZ. Therefore, the objective of this study is to examine gender differences in the prevalence of dyslipidemia among patients with SCZ who are undergoing initial-treatment and are drug-naïve (ITDN). By utilizing a larger sample size, we aim to explore the factors influencing dyslipidemia and its severity in patients of different genders, ultimately providing gender-specific interventions for dyslipidemia in clinical settings.

Materials and Methods

Subjects

From February 2017 to June 2022, a total of 244 male patients and 424 female patients diagnosed with ITDN SCZ were admitted to the Wuhan Mental Health Center.

To be eligible for enrollment in the study, patients had to meet the following inclusion criteria:

1. They must satisfy the diagnostic criteria for SCZ according to the 10th revision of the International Classification of Diseases (ICD-10).

2. Their Positive and Negative Symptom Scale (PANSS) score, which measures the severity of psychopathology, must be equal to or greater than 60.

3. The patients must be aged between 18 and 49, regardless of gender, female patients need to be premenopausal.[23]

4. They should not have a history of previous antipsychotic exposure prior to this admission, and the use of benzodiazepines must not be prohibited.

5. Patients with comorbid common metabolic disorders such as hypertension, hyperlipidemia, diabetes, and obesity who were drug-naïve were not excluded from the study.

On the other hand, the study excluded patients under the age of 18, as well as those with other mental illnesses including bipolar disorder, depression, intellectual developmental disorders, substance abuse or dependency. Additionally, patients with serious physical illnesses, autoimmune diseases, recent surgeries within the past six months, and those taking lipid-lowering and glucose-lowering medication were also disqualified from participating in the study. Patients who cannot be ruled out as having another psychiatric disorder within 14 days of admission and who do not have a definitive diagnosis of schizophrenia will be excluded from this study at the end of the 2-week period.

Ethical approval for the study was obtained from the Ethics Committee of the Wuhan Mental Health Center (ID number: KY20170201.02), and all participants provided written informed consent prior to their involvement in the study.

Research Design

This study was designed as a case-control study with the aim of comparing the differences in the prevalence of dyslipidemia and associated factors between male and female initial-treatment and drug-naïve SCZ patients.

Collection of socio-demographic information: To collect demographic data and general clinical information about our patients, we used self-developed EXCEL spreadsheets to extract information including gender, age, age of onset of disease, duration of disease, marital status, and education level and height and weight in the electronic medical record system.

Serum assays: Patients' venous blood samples were collected from 5–7 am, after 8 hours of fasting, from elbow veins. Red blood cell count (RBC), white blood cell count (WBC), hemoglobin (HG), platelets (PLT), cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and triglycerides (TG), fasting blood glucose (FBG), urea nitrogen (BUN), creatinine (CRE), uric acid (UA), thyroid-stimulating hormone (TSH), free triiodothyronine (FT_3) and free thyroxine (FT_4) were measured by the diagnostic laboratory of Wuhan Mental Health Centre.

Clinical measurement: Two attending psychiatrists, who underwent uniform training, utilized the PANSS and Clinical Global Impression Scale - Severity of Illness (CGI-SI) to evaluate the severity of psychiatric symptoms on the day of admission. Before the study, two qualified psychiatrists were trained in the use of the above two scales at the same time. The results of repeated assessment after training showed that the correlation coefficients between them were more than 0.8.

Diagnosis of dyslipidemia: According to the latest Chinese official publication in 2023, dyslipidemia is defined by meeting at least one of the following criteria:[24] (1) TC ≥ 5.2 mmol/L, (2) TG ≥ 1.7 mmol/L, (3) LDL-C ≥ 3.4 mmol/L, (4) HDL-C < 1.0 mmol/L.

Scoring of lipids: Drawing inspiration from our team's previous scoring method for metabolic syndrome,[25] we initially calculated the reciprocal of HDL-C. Then, we standardized the four indicators (TC, TG, LDL-C, and the reciprocal of HDL-C) obtained for the new lipid levels. Subsequently, a principal component analysis with varimax rotation was performed on the normalized components to generate principal components (PCs) that accounted for a significant portion of the observed variation. In this study, PC1 and PC2 explained 52.75% and 30.47% of the variance, respectively [loadings PC1 (PC2): TC 0.98 (−0.09), TG 0.47 (0.70), LDL-C 0.91 (0.03), and HDL-C −0.30 (0.85)]. The weight of the PC score was determined by the relative weights of PC1 and PC2 in the explained variance. The individual weighted PC scores were then summed to create the dyslipidemia score.

Data Analysis

The normal distribution of all continuous variables in the patient data was assessed using the Shapiro–Wilk test. For continuous variables with normal and non-normal distributions and categorical variables, independent samples t-tests, Mann–Whitney *U*-tests, and chi-square tests were utilized. Gender differences in comorbid dyslipidemia and clinical parameters were examined through a 2×2 analysis of variance considering gender (male and female) and diagnosis (dyslipidemia and non-dyslipidemia) to investigate the main effects of gender and diagnostic grouping, as well as the interaction between gender and diagnosis category. Point-biserial correlation analysis and chi-square test were conducted to identify clinical variables (excluding lipid components) associated with dyslipidemia. Binary logistic regression analyses were employed to explore the factors association of dyslipidemia in both male and female samples. Additionally, multivariate linear regression models were developed to analyze factors associated with dyslipidemia scores in males and females separately. All p-values were two-tailed, with statistical significance set at $p < 0.05$. Statistical analyses were carried out using SPSS 27 (SPSS, Inc.).

Results

Gender Differences in the Prevalence, Demographic and Clinical Features of Dyslipidemia in Enrolled Patients

We conducted a comparison of the overall prevalence of dyslipidemia and the prevalence of the four components of lipids among male and female patients, as presented in Table 1. The prevalence of dyslipidemia was found to be 34.02% (83/224) in male patients and 33.25% (141/424) in female patients, indicating no statistically significant difference (X^2=0.04, $p = 0.841$). Moreover, no gender differences were observed among the four components of lipids, as evidenced by all *p*-values being greater than 0.05. However, there were notable gender disparities in certain targeted clinical parameters, as shown in Table 2. Specifically, females exhibited higher levels of WC (Z = −1.37, $p = 0.012$) and higher

Table 1 Gender Differences in Prevalence of Dyslipidemia

Index	Male (n = 224)	Female (n = 424)	X^2	*p*-value	OR	95% CI
Total			0.04	0.841	1.03	0.74–1.44
Yes	83, 34.02%	141,33.25%				
No	161, 65.98%	283,66.75%				
Hyper-TC			0.17	0.682	0.86	0.42–1.76
Yes	12, 4.92%	24, 5.66%				
No	232, 95.08%	400, 94.34%				
Hyper-TG			0.97	0.325	0.79	0.48–1.27
Yes	28, 11.48%	60, 14.15%				
No	216, 88.52%	364, 85.85%				
Hyper-LDL-C			0.00	0.958	0.98	0.49–1.97
Yes	13, 5.33%	23, 5.42%				
No	231, 94.67%	401, 94.58%				
Hypo-HDL-C			1.84	0.175	1.30	0.89–1.90
Yes	58, 23.77%	82, 19.34%				
No	186, 76.23%	342, 80.66%				

Note: *$p<0.05$.
Abbreviations: TC, total cholesterol; TG, triglycerides; LDL-C, low density lipoprotein cholesterol; HDL-C, high density lipoprotein cholesterol.

Table 2 Gender Differences in Demographic and General Clinical Data

Index	Male (n = 244)	Female (n = 424)	t/Z/X^2	*p*-value
Age - years	29.23±6.87	29.77±7.35	−0.94	0.348
Course of disease - years	4.00 (2.00–7.67)	4.00 (1.63–8.08)	−0.23	0.819
Onset age - years	24.00 (19.00–29.00)	24.00 (18.00–28.00)	−0.88	0.381
Marital status - (n, %)			0.64	0.424
Spousal	109, 44.67%	203, 47.88%		
Others	135, 55.33%	221, 52.12%		
Educational level - (n, %)			3.56	0.059
Junior school and below	158, 64.75%	282, 66.51%		
High school and above	86, 35.25%	142, 33.49%		
Hypertension	38, 15.57%	70, 16.51%	0.10	0.752
Abdominal obesity	24, 9.84%	94, 22.17%	16.20	<0.001*
Dysglycaemia	40, 16.39%	51, 12.03%	2.51	0.113
Dyslipidemia scores	0.00±0.37	0.00±0.39	0.11	0.909
Lipid components				
TC - mmol/L	3.84±0.7	3.85±0.72	−0.16	0.875
TG - mmol/L	1.08±0.55	1.10±0.56	−0.36	0.720
LDL-C - mmol/L	2.19±0.58	2.18±0.59	0.28	0.778
HDL-C - mmol/L	1.18±0.25	1.19±0.22	−0.40	0.689
WC - cm	78.00 (71.50–84.00)	72.50 (61.50–83.00)	−1.37	0.012*
FBG - mmol/L	5.74 (5.56–6.01)	5.71 (5.54–6.01)	−1.51	0.130
SBP - mmHg	112.64±11.53	113.34±12.82	−0.71	0.477
DBP - mmHg	75.08±7.95	75.2±9.12	−0.18	0.861
RBC - 10^{12}/L	4.52±0.51	4.56±0.45	−1.05	0.293
HGB - g/L	134.00 (123.00–150.00)	133.00 (123.00–150.00)	−0.02	0.988
WBC - 10^9/L	7.07±2.15	6.82±1.91	1.52	0.130
PLT - 10^9/L	244.59±60.17	241.03±55.87	0.77	0.440
BUN - mmol/L	4.59±1.76	4.43±1.77	1.18	0.239

(*Continued*)

Table 2 (Continued).

Index	Male (n = 244)	Female (n = 424)	t/Z/X^2	*p*-value
CRE - mmol/L	58.07±12.41	57.83±12.66	0.24	0.814
UA - mmol/L	418.34±128.97	410.23±120.91	0.81	0.416
TSH - ulU/mL	1.80 (1.02–2.29)	1.77 (0.98–2.28)	−1.50	0.134
FT_3 - pmol/L	4.88±0.68	4.83±0.69	0.79	0.433
FT_4 - pmol/L	17.03±3.21	16.9±3.13	0.51	0.609
CGI-SI	6.00 (5.00–6.00)	6.00 (5.00–6.00)	−2.21	0.027*
PANSS	87.00 (83.00–96.00)	87.00 (82.00–95.00)	−0.81	0.420

Note: *p<0.05.
Abbreviations: TC, total cholesterol; TG, triglycerides; LDL-C, low density lipoprotein cholesterol; HDL-C, high density lipoprotein cholesterol; WC, waist circumference; FBG, fasting blood glucose; SBP, systolic blood pressure; DBP, diastolic blood pressure; RBC, red blood cell; HGB, hemoglobin; WBC, white blood cell; PLT, platelet; BUN, blood urea nitrogen; CRE, blood creatinine; UA, blood uric acid; TSH, thyroid stimulating hormone; FT_3, free triiodothyronine; FT_4, free tetraiodothyronine; PANSS, Positive and Negative Syndrome Scale; CGI-SI, Clinical Global Impression Scale - Severity of Illness.

proportions of abdominal obesity (X^2=16.20, p<0.001) compared to males, while males demonstrated higher CGI-SI scores than females (Z = −2.21, p = 0.027). Nevertheless, no gender disparities were found in dyslipidemia scores and levels of the four lipid components, all of which exhibited p-values greater than 0.05.

Gender Differences in Blood Lipid Levels: Based on Two-Factor ANOVA

We conducted a 2×2 analysis of variance to investigate the main effects of gender (male and female) and diagnosis (dyslipidemia and non-dyslipidemia), as well as the interaction effect between gender and diagnosis group, as presented in Table 3. Notably, we found significant effects of dyslipidemia on various variables including the dyslipidemia score (F = 75.16, p < 0.001), TC (F = 11.12, p < 0.001), TG (F = 20.29, p < 0.001), LDL-C (F = 34.95, p < 0.001), HDL-C (F = 17.26, p < 0.001). Moreover, the interaction between gender and diagnosis had significant effect on TC (F = 4.06, p = 0.044). However, we did not find a significant effect of gender on lipid component levels and dyslipidemia scores with all p-values greater than 0.05.

Factors Associated with Dyslipidemia in Male SCZ Patients

In male patients, dyslipidemia was found to be associated with high education levels (C = 0.14, p = 0.030), SBP (r = 0.17, p = 0.008), DBP (r = 0.14, p = 0.030), RBC (r = −0.19, p = 0.003), HBG (r = −0.16, p = 0.012), WBC (r = −0.14, p = 0.024), CRE (r = −0.20, p = 0.002), and FT_4 (r = −0.13, p = 0.043), as shown in Table 4. Subsequently, we created a binary logistic regression model (Backward: Wald) using the parameters associated with dyslipidemia as independent variables and dyslipidemia as the outcome variable. The results showed that high education levels (OR = 2.02, 95% CI: 1.13–3.64, p = 0.019) and DBP (OR = 1.06, 95% CI: 1.02–1.10, p = 0.001) were risk factors for dyslipidemia, while RBC (OR = 0.38, 95% CI: 0.19–0.75, p = 0.005) was a protective factor, as shown in Table 5. Finally, we developed

Table 3 Lipid Levels Between Enrolled Patients with and without Dyslipidemia, Grouped by Gender

Parameters	Dyslipidemia (n = 224)		Non-dyslipidemia (n = 444)		Gender F (*p* -value)	Diagnosis F (*p* -value)	Gender × Diagnosis F (*p* -value)
	Male (n=83)	Female (n=141)	Male (n=161)	Female (n=283)			
Dyslipidemia scores	0.27±0.36	0.32±0.41	−0.14±0.28	−0.16±0.26	0.22 (0.641)	75.16 (<.001*)	2.07 (0.151)
Lipid components							
TC - mmol/L	3.88±0.92	4.07±0.96	3.81±0.57	3.75±0.54	1.19 (0.276)	11.12 (<.001*)	4.06 (0.044*)
TG - mmol/L	1.45±0.69	1.52±0.71	0.90±0.31	0.89±0.31	0.45 (0.502)	20.29 (<.001*)	1.02 (0.313)
LDL-C - mmol/L	2.31±0.72	2.43±0.75	2.11±0.47	2.06±0.45	0.41 (0.522)	34.95 (<.001*)	2.86 (0.091)
HDL-C - mmol/L	0.99±0.25	1.03±0.24	1.27±0.19	1.26±0.17	0.77 (0.380)	17.26 (<.001*)	2.11 (0.147)

Note: *p<0.05.
Abbreviations: TC, total cholesterol; TG, triglycerides; LDL-C, low density lipoprotein cholesterol; HDL-C, high density lipoprotein cholesterol.

Table 4 Correlation Between Dyslipidemia and Clinical Variable in Male and Female Patients

Characteristic	Male (n = 244)		Female (n = 424)	
	r/C	*p* -value	r/C	*p* -value
Age - years	0.00	0.958	−0.08	0.102
Course of disease - years	0.03	0.672	0.03	0.533
Onset age - years	−0.02	0.807	−0.11	0.019*
Marital status (spousal vs others)	−0.11	0.099	0.18	<0.001*
Educational level (low vs high)	0.14	0.030*	0.13	0.010*
WC	−0.04	0.599	0.12	0.018*
FBG - mmol/L	0.00	0.984	0.04	0.417
SBP - mmHg	0.17	0.008*	0.18	<0.001*
DBP - mmHg	0.14	0.030*	0.12	0.012*
RBC - 10^{12}/L	−0.19	0.003*	−0.03	0.538
HGB - g/L	−0.16	0.012*	−0.03	0.593
WBC - 10^9/L	−0.14	0.024*	0.01	0.833
PLT - 10^9/L	−0.03	0.659	0.07	0.148
BUN - mmol/L	−0.06	0.351	−0.05	0.336
CRE - mmol/L	−0.20	0.002*	−0.10	0.049*
UA - mmol/L	−0.06	0.353	0.03	0.483
TSH - uIU/mL	0.02	0.768	−0.07	0.143
FT_3 - pmol/L	0.05	0.418	−0.09	0.080
FT_4 - pmol/L	−0.13	0.043*	−0.08	0.093
CGI-SI	−0.06	0.331	−0.03	0.488
PANSS	0.13	0.052	−0.04	0.377

Note: *p<0.05.

Abbreviations: WC, waist circumference; FBG, fasting blood glucose; SBP, systolic blood pressure; DBP, diastolic blood pressure; RBC, red blood cell; HGB, hemoglobin; WBC, white blood cell; PLT, platelet; BUN, blood urea nitrogen; CRE, blood creatinine; UA, blood uric acid; TSH, thyroid stimulating hormone; FT_3, free triiodothyronine; FT_4, free tetraiodothyronine; PANSS, Positive and Negative Syndrome Scale; CGI-SI, Clinical Global Impression Scale - Severity of Illness.

Table 5 Analyses of Determinants of Dyslipidemia in Male and Female Patients: Based on Binary Logistic Regression Models

Parameters	Coefficients	Std. error	Wald	*p*-value	95% CI for EXP (B)		
	B				Exp(B)	Lower	Upper
Male							
Educational level (high vs low)	0.70	0.30	5.53	0.019*	2.02	1.13	3.64
DBP - mmHg	0.06	0.02	10.59	0.001*	1.06	1.02	1.10
RBC - 10^{12}/L	−0.97	0.35	7.76	0.005*	0.38	0.19	0.75
CRE - mmol/L	−0.02	0.01	3.37	0.066	0.98	0.95	1.00
FT_4 - pmol/L	−0.08	0.05	3.00	0.084	0.92	0.84	1.01
Female							
Marital status (spousal vs others)	−0.69	0.23	8.93	0.003*	0.50	0.32	0.79
Educational level (high vs low)	0.42	0.23	3.28	0.070	1.53	0.97	2.41
WC - cm	0.02	0.01	3.11	0.078	1.02	1.00	1.05
SBP - mmHg	0.03	0.01	8.16	0.004*	1.03	1.01	1.04
CRE - mmol/L	−0.03	0.01	9.94	0.002*	0.97	0.95	0.99

Note: *p<0.05.

Abbreviations: DBP, diastolic blood pressure; RBC, red blood cell; CRE, blood creatinine; FT_4, free tetraiodothyronine; SBP, systolic blood pressure; WC, waist circumference.

Table 6 Correlates Affecting Dyslipidemia Scores in Male and Female Patients: Based on Multiple Linear Regression Models

Parameters	Coefficients	Std. error	t	*p*-value	95% CI	
	B				Lower	Upper
Male						
Educational level (high vs low)	0.03	0.05	0.51	0.608	−0.07	0.12
DBP - mmHg	0.01	0.00	2.69	0.008*	0.00	0.01
RBC - 10^{12}/L	0.02	0.05	0.45	0.656	−0.07	0.12
Female						
Marital status (spousal vs others)	−0.02	0.04	−0.44	0.658	−0.09	0.06
SBP - mmHg	0.01	0.00	4.70	<0.001*	0.00	0.01
CRE - mmol/L	0.00	0.00	−0.57	0.567	0.00	0.00

Note: *p<0.05.
Abbreviations: SBP, systolic blood pressure; HGB, hemoglobin; WBC, white blood cell; CRE, blood creatinine; WC, waist circumference.

a multiple linear regression model (Input) using the factors related to dyslipidemia diagnosis as independent variables and dyslipidemia score as the dependent variable. The results indicated that DBP (B = 0.01, t = 2.69, p = 0.008) was a risk factor for dyslipidemia score, as shown in Table 6.

Factors Associated with Dyslipidemia in Female SCZ Patients

Among female patients, dyslipidemia was found to be associated with onset age (r = −0.11, p = 0.019), marital status (C = 0.18, p < 0.001), higher education level (C = 0.13, p = 0.010), WC (r = 0.12, p = 0.018), SBP (r = 0.18, p < 0.001), DBP (r = 0.12, p = 0.012), and CRE (r = −0.10, p = 0.049), as presented in Table 4. Subsequently, we performed a binary logistic regression model (Backward: Wald) using the parameters associated with dyslipidemia as independent variables and dyslipidemia as the outcome variable. The findings revealed that SBP (OR = 1.03, 95% CI: 1.01–1.04, p = 0.004) posed a risk factor for dyslipidemia, whereas being married (OR = 0.50, 95% CI: 0.32–0.79, p = 0.003) and CRE (OR = 0.97, 95% CI: 0.95–0.99, p = 0.002) served as protective factors (Table 5). Finally, a multiple linear regression model (Input) was constructed using the factors identified in the binary logistic regression analysis related to dyslipidemia diagnosis as independent variables and dyslipidemia score as the dependent variable. The results indicated that SBP (B = 0.01, t = 4.70, p < 0.001) was a risk factor for dyslipidemia score (Table 6).

Discussion

Our study has revealed that there is no gender difference in the prevalence of dyslipidemia among ITDN patients with SCZ. However, gender differences do exist in the factors influencing dyslipidemia and its severity. This suggests that there may be gender variations in the biological markers of dyslipidemia, thus emphasizing the importance of tailored interventions for dyslipidemia in ITDN patients with SCZ based on their gender.

Dyslipidemia is a common comorbidity of SCZ and is not associated with the use or non-use of any antipsychotic medication.[9,26] It is commonly accepted that both lipid levels and SCZ show significant gender differences.[15,27] The presence of this phenomenon is commonly attributed to the protective effect of estrogen.[28] In the general population of China, the overall prevalence of dyslipidemia was 34.1%, with a higher prevalence in men (36.67%) than in women (29.80%).[29] In our study, the overall prevalence without gender difference was reported to be 34.02% in men vs 33.25% in women. In addition, neither univariate nor ANOVA analyses revealed gender differences in the levels of the four lipid components. Unfortunately, the known reports on the prevalence of dyslipidemia in patients with SCZ are relatively few and heterogeneous. A population-based cross-sectional study from Denmark reported no gender differences in the prevalence of dyslipidemia, but it was much lower than the prevalence we reported.[30] Another study including multiple non-affective psychiatric disorders reported gender differences in levels of specific lipid components, but no gender differences in the prevalence of multiple lipid component disorders.[31] In a sample of Chinese patients with primary SCZ,

the TG levels and the prevalence of hypertriglyceridemia were lower in female patients than in males, while the HDL-C levels and the prevalence of low HDL-C was higher than in males.[22] We found that the diagnostic criteria for dyslipidemia used in the above studies were different from the official Chinese diagnostic criteria used in the present study, which may be one of the important reasons for the differences in the studies. Overall, we did not find any gender differences in the prevalence of dyslipidemia.

Next, we identified gender differences in the factors associated with dyslipidemia that influenced the inclusion of patients. To the best of our knowledge, little research has been reported up to now on lipid composition aggregate as a whole, and more often specific components of lipids have been discussed, such as TG. It has been found that males, but not females, may be associated with more severe elevated TG levels in patients with first-episode SCZ,[21,32] and that increased TG levels are associated with leptin, insulin, cortisol, and thyroid-stimulating hormone (TSH) levels in males.[33] It has also been reported that obesity in female patients is associated with a wider range of metabolic parameters in addition to TG levels compared to male SCZ patients.[34] We found that the risk factors for dyslipidemia in male patients were high education level and DBP level, and the protective factor was RBC level; in female patients, SBP level was a risk factor, while having a spouse and CRE level were protective factors. The protective effect of female hormones on metabolism continues to be used as the best reason to explain this gender difference.[35] And when more clinical parameters were introduced, the greater susceptibility of males to smoking was also found to be an important contributor to the gender difference.[36,37] Thus, summarizing the previous studies and our study, it is reasonable to believe that there is a significant gender-specific pattern of metabolic disorders in patients with ITDN SCZ.

Several studies have assessed the severity of dyslipidemia, consistently demonstrating that more severe dyslipidemia corresponds to a higher incidence of cardiovascular disease and a poorer prognosis.[38,39] Consequently, we have confirmed the existence of gender differences in the factors influencing the severity of dyslipidemia. Nevertheless, studies specifically examining the extent of dyslipidemia in patients with SCZ are scarce. These limited studies have found that CVD increases with the number of abnormal lipid levels in males, but not in females.[40] Moreover, the risk ratio for myocardial infarction per 1 percentage point increase in abnormal lipid levels is 1.57 in men and only 1.25 in women.[40] Although we lack direct support from previous studies on gender differences in the severity of dyslipidemia in patients with SCZ, it is evident that dyslipidemia varies by gender and has complex causes, both among the general population and in other types of psychiatric disorders.[41–44] By summarizing these previous studies and our own findings, we believe that identifying gender differences in the factors influencing the severity of dyslipidemia in ITDN SCZ patients remains necessary and valuable for a deeper understanding and knowledge of gender differences in dyslipidemia among SCZ patients.

Our study has several limitations. Firstly, being a cross-sectional study, it was not feasible to establish causality between variables. Secondly, there was a gender imbalance in our sample, with significantly fewer male participants, potentially impacting the statistical robustness of regression analyses involving male patients. Thirdly, we did not collect an extensive array of factors that could influence lipid levels, such as smoking, alcohol consumption, oral contraceptives, sedentary lifestyle, and beta-blockers. Additionally, there is a scarcity of literature on the severity of dyslipidemia, with existing studies often relying on the count of abnormal lipid levels as a metric for severity. This scarcity limited our ability to reference and compare literature in our study. Moving forward, to address these limitations, future studies should strive for larger and more balanced sample sizes, include a broader range of variables, and explore widely accepted methods for assessing dyslipidemia severity to enhance the scope and depth of our investigations.

In conclusion, no gender differences were found in the detection rate of dyslipidemia in ITDN SCZ patients, whereas gender differences were found in the factors influencing dyslipidemia and its severity in this group. This means that we need to pay equal attention to the prevalence of dyslipidemia in ITDN SCZ patients of different sexes, but that potential interventions to intervene in the development of dyslipidemia should be gender specific.

Data Sharing Statement

The datasets used and/or analyzed in this study are available from the corresponding author on reasonable request.

Ethics Statements

This study was conducted in accordance with the Declaration of Helsinki and approved by the Medical Research Ethics Committee of Wuhan Mental Health Center. All patients had signed an informed consent form for inclusion.

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Disclosure

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