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Body Mass Index of Schizophrenic Patients with Combined Antipsychotic Therapy

Novi Susilowati[1*], Diffah Hanim[2], Yulia Lanti Retno Dewi[2]

1. Postgraduate Program of Nutritiom Science, Sebelas Maret University, Kentingan, Jebres, Surakarta, Indonesia
2. Department of Nutrition, Faculty of Medicine, Sebelas Maret University, Kentingan, Jebres, Surakarta, Indonesia

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**Corresponding author:*
Novi Susilowati,
Postgraduate Program of Nutritiom Science, Sebelas Maret University,
Ir. Sutami Street No. 36A,
Kentingan, Jebres,
Surakarta 57126, Indonesia.
Tel: +82-186144648
Email: novisusilowatidrspkj@gmail.com

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ABSTRACT

Background: The prevalence of schizophrenia is increasing every year. Schizophrenia also causes other problems because of the risk of experiencing malnutrition. The study aims to determine the description of the Body Mass Index (BMI) and analyze its relationship with demographic variables in schizophrenic patients.

Methods: This study involved outpatients (n=117) aged 36.83±9.29 (mean±SD) years with a diagnosis of schizophrenia based on PPDGJ-III (Pedoman Penggolongan Diagnosis Gangguan Jiwa III) criteria, which came use for treatment at a mental hospital. The study used a cross-sectional design. Data were collected from interviews in term of sociodemographic data, medical records, weight measurements, and height. BMI categories were underweight (<18.5 kg/m^2), normal (18.5-22.9 kg/m^2), overweight (23-24.9 kg/m^2) and obese (≥25 kg/m^2).

Results: Overall, the prevalence of obesity was 39.3%, while underweight was 6.8%. The proportion of obesity was the same between men (19.7%) and women (19.7%). Spearman correlation test analysis showed a significant relationship between female gender and BMI (r=0.275; P<0.05). Schizophrenic patients with female gender had a BMI of 2.41 units higher than male sex, and this relationship was statistically significant (b=2.41; 95% CI: 0.78-4.03; P<0.05).

Conclusion: The prevalence of obesity was quite high in schizophrenic patients who were on an outpatient basis. Gender was a significant predictor of increased BMI. This study suggests that gender can be a risk factor for obesity in schizophrenic patients.

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Introduction

People suffering from schizophrenia in the world were estimated to be around 21 million (1). This number has continued to increase in the last five years in Indonesia (2). Malnutrition problems are prone to occur in schizophrenic populations. Malnutrition causes the risk of various diseases. Malnutrition can be in the form of malnutrition, particular nutrient deficiency, over nutrition, and nutritional imbalance. The impact is to have the potential to increase the cost of treatment and health services (3). People with schizophrenia are more likely to experience an early risk of death when compared to the general population (1).

Schizophrenic patients are at risk of hypertension and diabetes mellitus (4, 5), increased inflammation (6), dyslipidemia (7), metabolic syndrome (8, 9), and impaired cognitive function (10).

Previous studies found a high proportion of underweight in schizophrenic inpatients in Japan (11, 12) compared to outpatients and the general population (13). Schizophrenic patients with less weight are at risk of developing infectious diseases and the delayed length of hospital stay (11). Previous studies have shown that schizophrenic patients are more at risk of obesity compared to other populations (4, 5, 14). An unbalanced diet (15-17), lack of physical activity (9, 18, 19), and antipsychotic drugs (20) have the potential for weight gain. Fatty schizophrenic patients tend to experience immune system disorders, so they are susceptible to inflammation and infection (21). Abdominal obesity in schizophrenic patients is also associated with hyperuricemia (22), dyslipidemia, hypertension and abnormalities in serum glucose (7).

Schizophrenic patients with obesity are associated with increased health care and care costs (23). Weight gain in schizophrenia patients is also associated with treatment noncompliance (24). The higher BMI is associated with a lower quality of life (18). The need for periodic monitoring of BMI is in accordance with the ADA (American Diabetes Association) consensus recommendation (25) to detect various cardiovascular and metabolic risks (4, 7, 9, 26). This study aimed to determine the BMI and analyze its relationship with demographic variables in schizophrenic patients.

Materials and Methods

This study used a descriptive-analytic research design with a cross-sectional approach from September 2019 to October 2019 in the outpatient clinic at the Surakarta Regional Mental Hospital. A total of 117 subjects were included in the study with criteria for patients seeking outpatient care at the Surakarta outpatient clinic with a diagnosis of schizophrenia based on PPDGJ-III (Pedoman Penggolongan Diagnosis Gangguan Jiwa III) by psychiatrists. This study consisted of 6% paranoid schizophrenia, 65% unspecified schizophrenia, 9.4% residual schizophrenia, and 19.7% other schizophrenia. Patients received combination antipsychotic drug therapy (chlorpromazine, risperidone, seroquel, haloperidol, clozapine, or trifluoperazine); treated for more than a year; could read, write, speak Indonesian; and were accompanied by caregivers.

Schizophrenic patients with organic disorders (epilepsy, mental retardation, severe systemic disease, and stroke) were excluded from the study. This study has received approval from the Health Research Ethics Committee for Dr. Moewardi with number: 1.071/IX/HREC/2019. Research subjects and caregivers were willing to sign an informed consent form. Data were collected from the results of sociodemographic interviews, medical records, measurements of body weight, and height. Measurement of body weight and height began by asking the subject to remove footwear, hats, and clothing to a minimum. Weight scales used under the brand name "Camry" with an accuracy of 0.1 kg.

Height was measured by the instrument with the brand "Microtoise General Care," with a measuring capacity of 2 meters and accuracy of 0.1 cm. Measurement of body weight and height was twice as much as BMI. BMI categories were based on Asian-Pacific cutoff points: underweight (<18.5 kg/m^2), normal (18.5-22.9 kg/m^2), overweight (23-24.9 kg/m^2) and obese (≥25 kg/m^2) (3). Statistical analysis was undertaken by SPSS software (version 22, Chicago,IL, USA). Data analysis used univariate analysis to find out the distribution of frequency, percentage, mean value, and standard deviation. The bivariate analysis used the Pearson's correlation method, if the data were normally distributed, and the Spearman's correlation; if the data were not normally distributed. Multivariate analysis used multiple linear regression tests. A pvalue less than 0.05 was considered statistically significant.

Results

Table 1 presents the characteristics of the research subjects. The mean age of subjects was 36.83±9.29 years. More than 50% of the subjects were not married. Almost all subjects had low educational level. More than half of the subjects did not work. More than 50% of the subjects were male. Table 2

Table 1: Characteristics of subjects (n=117)

Variable	N (%)
Gender	
Male	71 (60.7)
Female	46 (39.3)
Marital status	
Not married	75 (64.1)
Married	42 (35.9)
Level of education	
Low (<bachelor)	106 (90.6)
High (≥bachelor)	11 (9.4)
Job status	
Does not work	62 (53.0)
Work	55 (47.0)
Age, year (mean±SD)	36.83 (9.29)

Source: primary data

Table 2: Body mass index of subjects by gender (n=117)

Variable	Underweight (%)	Normal (%)	Overweight (%)	Obese (%)	Total (%)
	BMI<18.5 kg/m²	BMI 18.5-22.9 kg/m²	BMI 23-24.9 kg/m²	BMI ≥25 kg/m²	
Gender					
Male	7 (6.0)	31 (26.5)	10 (8.5)	23 (19.7)	71 (60.7%)
Female	1 (0.9)	9 (7.7)	13 (11.1)	23 (19.7)	46 (39.3%)
Total	8 (6.8)	40 (34.2)	23 (19.7)	46 (39.3)	117 (100%)

Source: primary data; BMI: Body mass index

Table 3: Correlation coefficients of Body Mass Index and demographic variables

Variable	BMI
Gender (female=1)	0.275*
Age	0.087
Marital status (married=1)	0.023
Level of education (high=1)	-0.180
Job status (working=1)	-0.041

Source: primary data. Note: Category data (BMI, sex, marital status, education level and employment status) are presented based on the Spearman's correlation coefficient (p, two-tailed) while numerical data (age and BMI) are presented based on the Pearson's correlation coefficient (r, two-tailed is age); * P<0.05; BMI: Body mass index

Table 4: Results of multiple BMI regression analysis and demographic variables (n=117)

	B	SE	Beta	T	P	95% CI		Adjusted R²	F
						Upper limit	Lower limit		
Gender (female=1)	2.41	0.82	0.30	2.94	0.004*	0.78	4.03		
Age	0.03	0.04	0.07	0.74	0.464	-0.05	0.11		
Marital status (married=1)	-0.57	0.79	-0.07	-0.71	0.477	-2.13	1.00		
Educational level (high=1)	-2.31	1.28	-0.17	-1.81	0.073	-4.84	0.22		
Job status (working=1)	1.02	0.79	0.13	1.29	0.200	-0.55	2.60		
A constant	21.71	1.51		14.38	<0.001	18.71	24.70		
								0,060	2,488*

Source: primary data. Note: Independent variable: BMI; * significant if the P<0.05, BMI:body mass index, B:unstandardized regression coefficient, SE: standard error, Beta: standardized regression coefficient, T: t value calculated, p:probability value, CI: confidence interval, Adjusted R2: coefficient of determination, F: F test results in the ANOVA table.

presents the BMI of research subjects by gender. About 46 subjects (39.3%) were obese according to BMI. The proportion of obese men (19.7%) and women were identical (19.7%). About 6.8% of subjects were underweight, based on BMI range with more men than women. Table 3 presents the relationship of BMI with demographic variables. There was a significant positive relationship, between female gender and BMI (r=0,275; P<0,05), while other demographic variables did not have a significant relationship (P>0.05).

Table 4 presents the results of the analysis of the BMI multiple regression model with demographic variables. The adjusted R^2 value is 6%. This shows the 6% contribution of independent variables (gender, age, marital status, education level, and employment status) to BMI (dependent variable). While the rest was influenced by other variables outside the research model. F test value of 2.488 with P<0.05 indicated that there was a significant influence of independent variables (gender, age, marital status, education level, and employment status) on BMI (dependent variable). Schizophrenic patients with female gender had a BMI of 2.41 units higher than male sex, and the relationship was statistically significant (b=2.41; 95% CI: 0.78 to 4.03; P<0.05).

Discussion

This study aimed to determine the relationship of BMI with the demographic variables of schizophrenic patients. In this study, it was found that the proportion of subjects with a BMI in the overall obesity category was around 39.3%, while the proportion of underweight was 6.8%. The proportion of subjects with BMI in the obese category was quite high in this study. This result is supported by previous studies that found a higher risk of obesity in schizophrenic patients (4, 5, 14). Weight gain is induced by antipsychotic drugs (20). Previous studies have shown that about 45%

of schizophrenic patients taking antipsychotic drugs experience weight gain (27). Clozapine and olanzapine drugs induce weight gain, when compared to other antipsychotic drugs (28).

Antipsychotic drugs stimulate orexigenic in the structure of the hypothalamus, thereby increasing appetite (29). The proportion of obesity in male and female subjects in this study was similar. In contrast, previous studies have found that obesity was more common in women than in men (4). In this study, there were more male subjects. The results of the Spearman's correlation test analysis in this study showed a significant relationship between female gender and BMI (r=0.275; P<0.05). The results of the multiple regression analysis also found a significant relationship between female gender with BMI (b=2.41; 95% CI: 0.78 to 4.03; P<0.05). Obesity in women was related to genetics, lifestyle, and hormonal changes (30).

The proportion of BMI in the underweight category in this study was quite low around 6.8%. More underweight men were based on BMI compared to women. In contrast, previous studies found a high prevalence of underweight in schizophrenic patients (13). Underweight was associated with hypocholesterolemia (13), hypotriglyceridemia (11), risk of pneumonia (31), and risk of fracture (32). Implications of the results of this study were for clinicians and nutritionists in the development of treatment for schizophrenic patients (21). First, the high prevalence of obesity increased the risk of the burden of treatment, associated with the risk of several diseases, such as inflammation and infection due to increased TNF-α and IL-1β and decreased IL-1ra (21).

Furthermore, an increase in BMI is associated with a decrease in cognitive function (10). Changes in white matter in the brain result in inhibition of brain tissue connectivity that plays a role in cognitive function (33). Cognitive function is also determined by leptin levels in the body (34). Increased leptin levels is related to an increased BMI (35, 36). The need for a periodic BMI monitoring program in the treatment of schizophrenic patients (25), and for early detection of various disease risks (4, 7, 9, 26). Second, the need for aerobic exercise program activities in schizophrenic patients was to achieve ideal body weight. Previous studies found low physical activity in schizophrenic patients (9, 18, 19). Aerobic exercise programs can reduce psychiatric symptoms and improve quality of life (37).

Third, it is necessary to have a balanced nutrition program in schizophrenic patients. Schizophrenic patients can be at risk of malnutrition associated with an unbalanced nutritional intake. Previous studies have found that weight gain is related to high energy intake (15), such as consumption of saturated fatty acids and PUFA (polyunsaturated fatty acids), which are high and low in the fiber (16, 19, 38). The limitation of this study is the cross-sectional study design, so that it did not assess the causal relationship between BMI with demographic variables or other variables. It needs a patient follow-up survey to determine changes in body weight due to antipsychotic treatment. Not all schizophrenic patients participated in the study, namely children, patients with antipsychotic monotherapy, elderly, or patients without treatment. Not all parameters were included in the study, such as eating habits, medication adherence, and level of physical activity.

Conclusion

Overall, the proportion of schizophrenic patients with BMI of the obese category was quite high, at 39.3% in this study. Conversely, the proportion of BMI underweight was low at 6.8%. Gender was a significant predictor of increased BMI. This study suggested that gender was a risk factor for obesity in schizophrenic patients. It needs attention from medical personnel and other relevant agencies related to the problem of obesity in this population with consideration of the magnitude of the impact it caused. Previous studies have suggested aerobic exercise programs and balanced nutritional intake to achieve ideal body weight, reduce psychiatric symptoms, and improve quality of life.

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Conflict of Interest

None declared.

References

1 World Health Organization (WHO). Schizophrenia. In: World Health Organization. World Health Organization; 2019.

2 Kemenkes RI. Kementerian Kesehatan Republik Indonesia. *Hasil Utama Riskesdas 2018*. Kementerian Kesehatan Badan Penelitian dan Pengembangan Kesehatan Republik Indonesia, Jakarta. 2019.

3 Mehrabani G, Aminian S, Mehrabani G, et al. Dietetic plans within the multiple sclerosis community: a review. *Int J Nutr Sci*. 2019;4:14-22. DOI:10.30476/IJNS.2019.81531.1007.

4 Dickerson FB, Brown CH, Kreyenbuhl JA, et al. Obesity among individuals with serious mental illness. *Acta Psychiatr Scand*. 2006;113:306-13. DOI:10.1111/j.1600-0447.2005.00637.x. PMID:16638075.
5 Annamalai A, Kosir U, Tek C. Prevalence of obesity and diabetes in patients with schizophrenia. *World J Diabetes*. 2017;8:390-6. DOI:10.4239/wjd.v8.i8.390. PMID:28861176.
6 Boozalis T, Devaraj S, Okusaga OO. Correlation between body mass index, plasma high sensitivity C-reactive protein and lipids in patietns with schizophrenia. *Psychiatr Q*. 2019;90:101-10. DOI:10.1007/s11126-018-9606-3. PMID:30315442.
7 Kato MM, Currier MB, Villaverde O, et al. The relation between body fat distribution and cardiovascular risk factors in patients with schizophrenia: a cross-sectional pilot study. *Prim Care Companion J Clin Psychiatry*. 2005;7:115. DOI:10.4088/pcc.v07n0307. PMID:16027766.
8 McEvoy JP, Meyer JM, Goff DC, et al. Prevalence of the metabolic syndrome in patients with schizophrenia: baseline results from the Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) schizophrenia trial and comparison with national estimates from NHANES III. *Schizophr Res*. 2005;80:19-32. DOI:10.1016/j.schres.2005.07.014. PMID:16137860.
9 Vancampfort D, Probst M, Scheewe T, et al. 2011. Lack of physical activity during leisure time contributes to an impaired health related quality of life in patients with schizophrenia. *Schizophr Res*. 2011;129:122-7. DOI: 10.1016/j.schres.2011.03.018. PMID:21493044.
10 Hidese S, Matsuo J, Ishida I, et al. 2018. Relationship of handgrip strength and body mass index with cognitive function in patients with schizophrenia. *Front Psychiatry*. 2018;9:156. DOI:10.3389/fpsyt.2018.00156. PMID:29743873.
11 Suzuki Y, Sugai T, Fukui N, et al. High prevalence of underweight and undernutrition in Japanese inpatients with schizophrenia. *Psychiatry Clin Neurosci*. 2014;68:78-82. DOI:10.1111/pcn.12082. PMID:23992354.
12 Sugawara N, Maruo K, Sugai T, et al. Prevalence of underweight in patients with schizophrenia: A meta-analysis. *Schizophr Res*. 2018;195:67-73. DOI:10.1016/j.schres.2017.10.017. PMID:29054486.
13 Sugai T, Suzuki Y, Yamazaki M, et al. High prevalence of underweight and undernutrition in Japanese inpatients with schizophrenia: a nationwide survey. *BMJ Open*. 2015;5:e008720. DOI:10.1136/bmjopen-2015-008720. PMID:26656016.
14 Theisen FM, Linden A, Geller F, et al. Prevalence of obesity in adolescent and young adult patients with and without schizophrenia and in relationship to antipsychotic medication. *J Psychiatr Res*. 2001;35:339-45. DOI:10.1016/S0022-3956(01)00041-3. PMID:11684141.
15 Mehrabani D, Vahedi M, Eftekhari MH, et al. Food avoidance in patients with ulcerative colitis: a review. *Int J Nutr Sci*. 2017;2:189-95.
16 Nouripour F, Hejazi N. Nordic diet and cardio-metabolic diseases: A Review. *Int J Nutr Sci*. 2019;4:105-108. DOI:10.30476/IJNS.2019.82686.1025.
17 Brown S, Birtwistle J, Roe L, et al. The unhealthy lifestyle of people with schizophrenia. *Psychol Med*. 1999;29:697-701. DOI:10.1017/s0033291798008186. PMID:10405091.
18 Gomes E, Bastos T, Probst M, et al. Quality of life and physical activity levels in outpatients with schizophrenia. *Braz J Psychiatry*. 2016;38:157-60. DOI:10.1590/1516-4446-2015-1709. PMID:26814836.
19 Vancampfort D, Probst M, Knapen J, et al. Associations between sedentary behaviour and metabolic parameters in patients with schizophrenia. *Psychiatr Res*. 2012;200:73-8. DOI:10.1016/j.psychres.2012.03.046. PMID:22497956.
20 Allison DB, Casey DE. Antipsychotic-induced weight gain: a review of the literature. *J Clin Psychiatry*. 2001;62:22-31. PMID:11346192.
21 Sirota P, Hadi E, Djaldetti M, et al. Difference in inflammatory cytokine production by mononuclear cells from obese and non-obese schizophrenic patients. *Acta Psychiatr Scand*. 2015;132:301-5. DOI:10.1111/acps.12396. PMID:25627461.
22 Godin O, Leboyer M, Gaman A, et al. Metabolic syndrome, abdominal obesity and hyperuricemia in schizophrenia: results from the FACE-SZ cohort. *Schizophre Res*. 2015;168:388-94. DOI:10.1016/j.schres.2015.07.047. PMID:26255568.
23 Chwastiak LA, Rosenheck RA, McEvoy JP, et al. The impact of obesity on health care costs among persons with schizophrenia. *Gen Hosp Psychiatry*. 2009;31:1-7. DOI:10.1016/j.genhosppsych.2008.09.012. PMID:19134502.
24 Weiden PJ, Mackell JA, McDonnell DD. Obesity as a risk factor for antipsychotic noncompliance. *Schizophr Res*. 2004;66:51-7. DOI:10.1016/S0920-9964(02)00498-X. PMID:14693352.
25 American Diabetes Association. Consensus development conference on antipsychotic

drugs and obesity and diabetes. *Diabetes Care*. 2004;27:596-601. DOI:10.2337/diacare.27.2.596. PMID:14747245.

26 Aghasadeghi K, Zarei-Nezhad M, Keshavarzi A, et al. The prevalence of coronary risk factors in Iranian lor migrating tribe. *Arch Iran Med*. 2008;11:322-5. DOI:08113/AIM.0015. PMID:18426325.

27 Allison DB, Mackell JA, McDonnell DD. The impact of weight gain on quality of life among persons with schizophrenia. *Psychiatr Serv*. 2003;54:565-7. DOI:10.1176/appi.ps.54.4.565. PMID:12663847.

28 Wirshing DA, Wirshing WC, Kysar L, et al. Novel antipsychotics: comparison of weight gain liabilities. *J Clin Psychiatry*. 1999;60:358-63. PMID:10401912.

29 Manu P, Dima L, Shulman M, et al. Weight gain and obesity in schizophrenia: epidemiology, pathobiology, and management. *Acta Psychiatr Scand*. 2015;132:97-108. DOI:10.1111/acps.12445. PMID:26016380.

30 Azarbad L, Gonder-Frederick L. Obesity in women. *Psychiatr Clin North Am*. 2010;33:423-40. DOI:10.1016/j.psc.2010.01.003. PMID:20385345.

31 Haga T, Ito K, Sakashita K, et al. Risk factors for pneumonia in patients with schizophrenia. *Neuropsychopharmacol Rep*. 2018;38:204-9. DOI:10.1002/npr2.12034. PMID:30353691.

32 Pines A. Weight loss, weight regain and bone health. *Climacteric*. 2012;15:317-319. DOI:10.3109/13697137.2012.667975. PMID:22369637.

33 Spangaro M, Mazza E, Poletti S, et al. Obesity influences white matter integrity in schizophrenia. *Psychoneuroendocrinology*. 2018;97:135-42. DOI:10.1016/j.psyneuen.2018.07.017. PMID:30025224

34 Farr OM, Tsoukas MA, Mantzoros CS. Leptin and the brain: influences on brain development, cognitive functioning and psychiatric disorders. *Metabolism*. 2015;64:114-30. DOI:10.1016/j.metabol.2014.07.004. PMID:25092133

35 Potvin S, Zhornitsky S, Stip E. Antipsychotic-induced changes in blood levels of leptin in schizophrenia: a meta-analysis. *Canadian J Psychiatry*. 2015;60:26. PMID:25886677.

36 Al Maskari MY, Alnaqdy AA. Correlation between serum leptin levels, body mass index and obesity in Omanis. *Sultan Qaboos Univ Med J*. 2006;6:27. PMID: 21748132.

37 Dehghanpisheh S, Daryanoosh F, Mehrabani D, et al. The effect of eight weeks aerobic exercise on visfatin level in non-athletic young women, southern Iran. *Middle East J Sci Res*. 2014;21:314-19.

38 Dipasquale S, Pariante CM, Dazzan P, et al. The dietary pattern of patients with schizophrenia: a systematic review. *J Psychiatr Res*. 2013;47:197-207. DOI:10.1016/j.jpsychires.2012.10.005. PMID:23153955.