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METABOLIC SYNDROME AND ITS ASSOCIATED FACTORS IN PATIENTS WITH SEVERE MENTAL ILLNESS IN MALAYSIA

Nur Sabrina Z. [1], Gan W. Y. [1*], Ang J. K.[2], Siti Irma Fadhilah I.[2], Chan Y.M.[1,3]

[1]Department of Nutrition & Dietetics, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.
[2]Department of Psychiatry, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia
[3]Malaysian Research Institute on Ageing, Universiti Putra Malaysia

**Corresponding author: Gan Wan Ying, Department of Nutrition and Dietetics, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, wanying@upm.edu.my*

ABSTRACT

Background: Mental illness is a huge public health issue. Patients with severe mental illness (SMI) are at risk of developing metabolic syndrome (MetS). Therefore, this cross-sectional study aimed to determine the associations between personal, clinical and lifestyle factors with MetS in patients with SMI.

Materials and Methods: 151 patients attending psychiatric outpatient clinics in two government hospitals in Klang Valley participated in this study. The Mini International Neuropsychiatric Interview (MINI) was used to diagnose patients with SMI by a psychiatrist. MetS was defined based on the 2009 Joint Interim Statement (JIS) criteria. Information needed on socio-demographic background, clinical characteristics (types and duration of illness and medication), lifestyle factors (physical activity level, smoking behaviour and alcohol consumption) were collected through a face-to-face interview. Body weight, height, waist circumference, percentage of body fat and blood pressure were measured by the researchers. Blood test results were obtained from the medical records.

Result: Nearly half of the respondents (48.3%) had MetS, in which it was higher among males (48.5%), married respondents (61.5%), older age group (66.7%) and schizophrenic patients (50.7%). Overweight (AOR=3.64, 95% CI=1.55-8.58) and obese (AOR=15.06, 95% CI=5.27-43.09) patients were more likely to develop MetS. Moreover, middle-aged and older patients were about 3 times (AOR=3.31, 95% CI=1.38-7.94) and 6 times (AOR=5.65, 95% CI=1.62-19.73), respectively, more likely to develop MetS compared to younger patients.

Conclusion: This study demonstrated high prevalence of MetS among patients with SMI. It also highlighted the need of regular assessment of BMI among patients with SMI to prevent MetS.

Keywords: Metabolic syndrome, severe mental illness, overweight and obese, Malaysia

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1.0 Introduction

In recent years, metabolic syndrome (MetS) has been gaining attention in the medical field. MetS is also known as dysmetabolic syndrome, insulin resistance syndrome, obesity syndrome and Reaven's syndrome (Simonson & Kendall, 2005). This syndrome exhibits several known cardiovascular risk factors such as abdominal obesity, dyslipidemia, insulin resistance, and hypertension (Huang, 2009). These conditions are interrelated and share underlying mediators, mechanisms and pathways. Furthermore, MetS is increasingly becoming a health problem in patients with severe mental illness such as schizophrenia, bipolar disorder and major depressive disorder (MDD). This is true not only in western societies (Gubbins, Lally & McDonald, 2012; Saloojee, Burns & Motala, 2016) but also in Asia (Bressington et al., 2013; Charnsil, Pilakanta, & Panikul, 2015; Hussain et al., 2017; Kamkar et al., 2016; Lee et al., 2013), and this includes Malaysia (Hat, Chong, Ee, Amirah, & Hazli, 2011; Rahman, Asmara, Baharudin, & Sidi, 2009; Said et al., 2013).

Obesity is becoming a significant health crisis, affecting both developed and developing countries. This is because people with obesity have shorter life span and are at higher risk to have a number of general medical conditions, including type 2 diabetes mellitus, cardiovascular disease, dyslipidemia and hypertension (De Hert et al., 2011). Furthermore, obesity and mental health may contribute significantly to the global burden of disease (Rahman et al., 2009). There was a high prevalence of obesity among patients with severe mental illness. For instance, 55% of American adults with serious and persistent mental illness (SPMI) were obese (De Hert et al., 2009). In Australia, the percentage of obesity in patients with severe mental illness (30.3%) was higher than that of the general population (21.4%) (Stanley, Laugharne, Addis, & Sherwood, 2013). Similar trend is observed in Malaysia, where the prevalence of obesity in patients with schizophrenia was 40.5% (Said et al., 2012).

On different note, there are limited studies on MetS among psychiatric patients and the contributing factors of MetS in Malaysia (Hat et al., 2011; Rahman et al., 2009; Said et al., 2012). Consequently, the situation and prevalence of MetS among patients with severe mental illness in Malaysia is unclear. Thus, a comprehensive study on MetS is needed. This study was therefore designed to determine the associations between personal, clinical and lifestyle factors with MetS among mental illness patients in Malaysia.

2.0 Materials and Methods

2.1 Design and sample

This cross-sectional study on mental illness was conducted in Klang Valley, Malaysia in view of most psychiatry clinics and hospitals in Malaysia are located in this area. There were nine

government hospitals in Klang Valley, and two were selected randomly to participate in this study.

A list of patients who had an appointment at the psychiatry clinic was obtained from the nurse. After the usual check-up, a diagnostic screening using the Mini International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998) was performed by a psychiatrist, who is one of the co-researchers in this study (AJK), to screen the patients. This was to recruit those who were eligible to be the respondents of this study. The eligible respondents were then referred to the researcher. Next, respondent's information sheet was given to inform respondents about the background of the study. Finally, prior to data collection, written informed consent was obtained from all respondents.

2.2 Ethical consideration

Ethical approval was granted by the Ethics Committee for Research Involving Human Subjects, Universiti Putra Malaysia (Reference No.: FPSK_Disember(13)08). Also, the researchers gained approval from the Medical Research and Ethics Committee, Ministry of Health Malaysia (Reference No.: NMRR-13-1518-18687) prior to the commencement of the study.

2.3 Measurements

A set of questionnaire was used during face-to-face interview. The questionnaire contained questions on socio-demographic background, physical activity, smoking behaviour, and alcohol consumption. Following the completion of the questionnaire, measurements of body weight, height, waist circumference, body fat, and blood pressure were carried out by the researcher. Furthermore, blood test results on lipid profile and fasting plasma glucose were obtained from the medical records at the psychiatry clinics. Moreover, medication history, types of illness and duration of psychiatry illness were also obtained from the patients' medical records.

2.3.1 Physical activity

The International Physical Activity Questionnaire - Short Form (IPAQ-SF) is a 7-item questionnaire used to determine the physical activity (PA) levels of adults aged 15 to 69 years old across four domain – transportation, occupation, house, and leisure (Craig et al., 2003). It collected information on time spent (i.e. number of sessions and average time per session) walking, moderate intensity PA, vigorous-intensity PA and sitting on weekdays and weekend. Then, respondents were grouped into three PA categories – low, moderate and high levels. The validated Malay version of IPAQ (IPAQ-M) was used in the present study, which had demonstrated good reliability and validity (Chu & Moy, 2012).

2.3.2 Smoking

Smoking behaviour of the respondents was assessed using the WHO STEPwise approach to surveillance (WHO STEPS Instrument) for tobacco use (WHO, 2010). This WHO STEPS Instrument had been used in many global studies (WHO, 2011), including Malaysia. There

were three main categories of smoking behaviour identified – smokers, ex-smokers and non-smokers.

2.3.3 Alcohol consumption

The Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001) was used to assess alcohol consumption of the respondents in this study. It is a 10-item questionnaire developed by WHO to assess alcohol consumption, drinking behaviours, and alcohol-related problems. A total score of 8 or more indicated hazardous or harmful alcohol use. Also, it has been used in many Malaysian studies (IPH, 2011; Krishnaswamy et al., 2009). In current research, the internal consistency reliability of the AUDIT was good (Cronbach's alpha = 0.709).

2.3.4. Anthropometric and biochemical measurements

Body weight of the respondents was measured using Tanita HD-306 weighing scale (TANITA Corporation, USA) to the nearest 0.1 kg. Meanwhile, height was measured using Seca Body Meter 206 (SECA, Germany) to the nearest 0.1 cm. These measurements were used to determine body mass index (BMI). The classification of BMI in this study was based on WHO (2000). Body fat percentage of the respondents was measured using Omron Body Fat monitor HBF-302 (Omron, Japan). Also, waist circumference (WC) was measured using SECA Ergonomic Circumference Measuring Tape SE203 (SECA, Germany) to the nearest 0.1 cm. It is worth noting that women with WC ≥80 cm and men with WC ≥90 cm were considered as having abdominal obesity (WHO/IASA/IOTF, 2000). Additionally, blood pressure of the respondents was measured using Omron IA2 Blood Pressure Monitor (Omron, Japan). The fasting plasma glucose and lipid profile of the respondents were obtained from their medical records. Also, MetS was defined with regard to the 2009 Joint Interim statement (JIS) criteria (Alberti et al., 2009) with the presence of any three of the five risk factors: abdominal obesity, elevated triglyceride level, low HDL-C level, raised blood pressure, and raised fasting blood sugar.

2.4 Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics 22. Descriptive statistics were presented in mean and standard deviation for continuous variables, while frequency and percentage were used to present categorical variables. Furthermore, Chi-square test of independence was used to determine the associations between categorical variables. Then, simple logistic regression and multiple logistic regression analyses were used to determine the factors contributing to the likelihood of having MetS among patients with severe mental illness. All variables with $p<0.25$ in the simple logistic regression analysis were included in the multiple logistic regression analysis. It should be noted that the acceptable level of statistical significance for multiple logistic regression analysis was $p<0.05$.

3.0 Result

A total of 151 adult psychiatric (45.0% males and 55.0% females) with a mean age of 41.84±12.19 years participated in this study. The overall prevalence of MetS in this study was 48.3% based on the JIS criteria. The prevalence in males (48.5%) and females (48.2%) were almost similar. Table 1 shows that there were significant associations between age groups, ethnicity, and marital status with MetS (p<0.05). Young adults (34.7%) were less likely to have MetS compared to those of middle-aged (51.9%) and older adults (66.7%). On the other hand, those who were married (61.5%) were more likely to have MetS compared to those who were unmarried (41.4%). Furthermore, respondents who have been suffering from mental illness for more than 10 years (61.4%) tend to have higher risk of developing MetS than those of less than 10 years (43.0%). In addition, the prevalence of MetS by psychiatric diagnosis was 50.7% in patients with Schizophrenia, followed by 46.3% with MDD, and 45.5% with Bipolar Disorder. There were no significant associations between types of illness and medications as well as duration of medication with MetS (p>0.05). In addition, more obese patients (78.6%) had MetS problem compared to overweight (51.0%) and normal weight/underweight (24.1%) patients. Furthermore, patients with high percentage of body fat were more likely to have MetS (56.3%) than those with low percentage of body fat (16.7%). As for lifestyle factors, no significant associations between smoking behaviour, alcohol consumption and physical activity with MetS (p>0.05) were found.

Table 1: General characteristics of the respondents (n=151)

Variable	**Metabolic syndrome n (%)**		***p***
	Yes (n=73)	**No (n=78)**	
Sex			1.000
Male	33 (48.5)	35 (51.5)	
Female	40 (48.2)	43 (51.8)	
Age group			0.032
Young adults (≤ 35 years old)	17 (34.7)	32 (65.3)	
Middle-aged adults (36 – 55 years old)	42 (51.9)	39 (48.1)	
Older adults (≥ 56 years old)	14 (66.7)	7 (33.3)	
Ethnicity			0.015
Malay	26 (45.6)	31 (54.4)	
Chinese	25 (39.7)	38 (60.3)	
Indian	22 (71.0)	9 (29.0)	
Marital status			0.029
Single	41 (41.4)	58 (58.6)	
Married	32 (61.5)	20 (38.5)	
Level of education			0.252
Primary education and no education	7 (63.6)	4 (36.4)	
Secondary education	41 (51.9)	38 (48.1)	
Tertiary education	25 (41.0)	36 (59.0)	
Employment status			0.369
Working	34 (44.2)	43 (55.8)	
Not working	39 (52.7)	35 (47.3)	
Monthly personal income (RM)			0.042
<2000	57 (50.0)	57 (50.0)	
2000 to 5000	14 (53.8)	12 (46.2)	
>5000	2 (18.2)	9 (81.8)	
Types of illness			0.849
Schizophrenia	38 (50.7)	37 (49.3)	

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Bipolar Disorder	10 (45.5)	12 (54.5)	
Major Depressive Disorder (MDD)	25 (46.3)	29 (53.7)	
Duration of illness			0.040
< 10 years	46 (43.0)	61 (57.0)	
≥ 10 years	27 (61.4)	17 (38.6)	
Family history of mental illness			0.980
Yes	27 (48.2)	29 (51.8)	
No	46 (48.4)	49 (51.6)	
Antipsychotic (Typical)			0.927
Yes	9 (47.4)	10 (52.6)	
No	64 (48.5)	68 (51.5)	
Antipsychotic (Atypical)			0.976
Yes	41 (48.2)	44 (51.8)	
No	32 (48.5)	34 (51.5)	
Antidepressant			0.866
Yes	30 (49.2)	31 (50.8)	
No	43 (47.8)	47 (52.2)	
Mood stabilizer			0.220
Yes	5 (33.3)	10 (66.7)	
No	68 (50.0)	68 (50.0)	
Benzodiazepine			0.821
Yes	24 (47.1)	27 (52.9)	
No	49 (49.0)	51 (51.0)	
Others			0.420
Yes	18 (54.5)	15 (45.5)	
No	55 (46.6)	63 (53.4)	
Duration of medication			0.971
< 10 years	55 (47.8)	60 (52.2)	
≥ 10 years	18 (50.0)	18 (50.0)	
BMI			<0.001
Underweight and normal weight	14 (24.1)	44 (75.9)	
Overweight	26 (51.0)	25 (49.0)	
Obese	33 (78.6)	9 (21.4)	
Body fat percentage			<0.001
Acceptable	5 (16.7)	25 (83.3)	
High	67 (56.3)	52 (43.7)	
Smoking Behavior			0.567
Non-smokers	14 (42.4)	19 (57.6)	
Smokers	59 (50.0)	59 (50.0)	
Alcohol Consumption			1.000
Drinking alcohol	9 (47.4)	10 (52.6)	
Do not drinking alcohol	64 (48.5)	68 (51.5)	
Physical Activity Level			0.145
Low	48 (55.2)	39 (44.8)	
Moderate	14 (40.0)	21 (60.0)	
High	11 (37.9)	18 (62.1)	

For individual components of MetS, the most frequent abnormality was the increase of waist circumference, where two thirds of the respondents (69.5%) had this problem. Only 13.9% of the respondents in this study did not meet any components of MetS (Table 2).

Table 2: Prevalence of the individual components of metabolic syndrome in the study respondents (*n*=151)

Variable	n (%)			*p*
	Male (n=68)	Female (n=83)	Total (n=151)	
Metabolic syndrome (MetS)	33 (48.5)	40 (48.2)	73 (48.3)	1.000
Individual components				
Increased waist circumference	48 (70.6)	57 (68.7)	105 (69.5)	0.900
Elevated blood pressure				
Systolic	33 (48.5)	24 (28.9)	57 (37.7)	0.016
Diastolic	24 (35.3)	22 (26.5)	46 (30.5)	0.346
Elevated fasting plasma glucose	25 (36.8)	28 (33.7)	53 (35.1)	0.719
Elevated serum triglycerides	30 (44.1)	29 (34.1)	59 (39.1)	0.355
Low HDL-cholesterol	25 (36.8)	36 (43.4)	61 (40.4)	0.569
Number of MetS criteria met				0.283
0	7 (10.3)	14 (16.9)	21 (13.9)	
1	14 (20.6)	9 (10.8)	23 (15.2)	
2	14 (20.6)	20 (24.1)	34 (22.5)	
3	11 (16.2)	18 (21.7)	29 (19.2)	
4	12 (17.6)	16 (19.3)	28 (18.5)	
5	10 (14.7)	6 (7.2)	16 (10.6)	

As demonstrated in Table 3, there were significant differences in all components of MetS (WC, blood pressure, fasting blood glucose, triglycerides level and HDL-C level) between patients with MetS and without MetS. Respondents with elevated WC (65.7%) were more likely to have MetS compared to respondents with normal WC (8.7%). Almost all respondents with normal WC (91.3%) had no problem with MetS. More than half of the respondents with elevated blood pressure (70.4%) had MetS compared to those with normal blood pressure level (22.9%). Furthermore, more than three quarter of the respondents (81.1%) with an elevated fasting blood glucose had MetS. Also, majority of the respondents (89.8%) with elevated TG level had MetS. There were more patients with low HDL-C level (93.4%) had MetS compared to those with normal HDL-C level (17.8%).

Table 3: Associations between components of metabolic syndrome with metabolic syndrome

Components of MetS	Metabolic syndrome n (%)		*p*
	Yes (n=73)	No (n=78)	
Waist circumference (cm)	97.73±11.17	83.57±11.47	
Normal	4 (8.7)	42 (91.3)	<0.001
Elevated	69 (65.7)	36 (34.3)	
Blood pressure			<0.001
Normal	16 (22.9)	54 (77.1)	
Elevated	57 (70.4)	24 (29.6)	
Systolic (mmHg)	131.78±16.67	120.72±16.45	
Diastolic (mmHg)	83.78±10.00	75.22±11.77	

Fasting blood glucose level (mmol/L)	6.86±3.39	5.01±1.53	
Normal	30 (30.6)	68 (69.4)	<0.001
Elevated	43 (81.1)	10 (18.9)	
Triglycerides level (mmol/L)	2.30±1.56	1.16±0.75	
Normal	20 (21.7)	72 (78.3)	<0.001
Elevated	53 (89.8)	6 (10.2)	
HDL-C level (mmol/L)	1.22±0.66	1.55±0.52	
Normal	16 (17.8)	74 (82.2)	0.001
Low	57 (93.4)	4 (6.6)	

As tabulated in Table 4, multiple logistic regression results showed that middle-aged or older age adults as well as overweight and obese respondents had higher risks of having MetS. Middle-aged and older adults were almost 3 times (AOR = 3.31, 95% CI = 1.38-7.94) and almost 6 times (AOR = 5.65, 95% CI = 1.62-19.73), respectively, more likely to develop MetS, compared to younger adults. Furthermore, severe mental illness patients who were overweight (AOR = 3.64, 95% CI = 1.55-8.58) and obese (AOR = 15.06, 95% CI = 5.27-43.09) were approximately 4 times and 15 times more likely to develop MetS, respectively. It is worth noting that the full model containing all predictors was statistically significant (χ^2 = 38.98, p< 0.001). This indicates that the model was able to differentiate between respondents with and without MetS. Also, the Nagelkerke R^2 was 0.309, reflecting that the factors predicted 30.9% of MetS in patients with severe mental illness in this study.

Table 4: Factors associated with metabolic syndrome in patients with severe mental illness

Variable	**Crude OR[a] (95% CI)**	***p*[a]**	**Adjusted OR[b] (95% CI)**	***p*[b]**
Personal Factors				
Sex				
Male	1			
Female	0.96 (0.51, 1.83)	0.906	-	-
Age group				
Young adults (≤ 35 years old)	1		1	
Middle aged adults (36 – 55 years old)	2.03 (0.98, 4.22)	0.059	3.31 (1.38, 7.94)	0.007
Older adults (≥ 56 years old)	3.50 (1.17, 10.41)	0.025	5.65 (1.62, 19.73)	0.007
Ethnicity				
Malay	1			
Chinese	0.75 (0.37, 1.54)	0.435	-	-
Indian	2.71 (1.03, 7.15)	0.043	-	-
Marital status				
Single	1			
Married	2.19 (1.10, 4.37)	0.026	-	-
Level of Education				
Primary education and no education	1			
Secondary education	0.60 (0.16, 2.22)	0.446	-	-
Tertiary education	0.40 (0.11, 1.50)	0.173	-	-
Employment status				
Working	1			
Not working	1.42 (0.74, 2.70)	0.288	-	-
Monthly personal income (RM)				

<2000	1			
2000 to 5000	1.17 (0.50, 2.74)	0.723	-	-
>5000	0.11 (0.01, 0.91)	0.040	-	-
BMI				
Underweight and normal weight	1		1	
Overweight	3.27 (1.45, 7.38)	0.004	3.64 (1.55, 8.58)	0.003
Obese	11.18 (4.31, 28.99)	<0.001	15.06 (5.27, 43.09)	<0.001
Body fat percentage				
Acceptable	1			
Too high	6.35 (2.27, 17.72)	<0.001	-	-
Clinical Characteristics				
Types of illness				
Major Depressive Disorder (MDD)	1			
Bipolar Disorder	1.00 (0.37, 2.73)	0.989	-	-
Schizophrenia	1.24 (0.61, 2.51)	0.549	-	-
Duration of illness				
< 10 years	1			
≥ 10 years	2.15 (1.05, 4.42)	0.037	-	-
Family history of mental illness				
No	1			
Yes	1.01 (0.52, 1.97)	0.968	-	-
Types of medication				
Antipsychotic (Typical)				
No	1			
Yes	0.97 (0.37, 2.54)	0.953	-	-
Antipsychotic (Atypical)				
No	1			
Yes	1.02 (0.54, 1.95)	0.947	-	-
Antidepressant				
No	1			
Yes	1.02 (0.53, 1.97)	0.947	-	-
Mood stabilizer				
No	1			
Yes	0.51 (0.16, 1.56)	0.237	-	-
Benzodiazepine				
No	1			
Yes	0.89 (0.45, 1.75)	0.729	-	-
Others				
No	1			
Yes	1.40 (0.64, 3.04)	0.395	-	-
Duration of medication				
< 10 years	1			
≥ 10 years	1.11 (0.52, 2.35)	0.783	-	-
Lifestyle Factors				
Smoking Behavior				
Non-smokers	1			
Smokers	0.93 (0.46, 1.86)	0.831	-	-
Alcohol Consumption				
Low risk	1			
Moderate risk	2.20 (0.20, 24.83)	0.523	-	-
High risk	1.10 (0.07, 17.95)	0.946	-	-

Physical Activity Level				
Low	1			
Moderate	0.46 (0.18, 1.15)	0.095	-	-
High	0.53 (0.24, 1.15)	0.109	-	-

[a]Simple logistic regression, [b]Multiple logistic regression
Variables with $p<0.25$ in the simple logistic regression model were chosen to be included in the multiple logistic regression analysis.
Multiple logistic regression analysis: associations are significant at $p<0.05$.

4.0 Discussion

This study contributes to the understanding of MetS among those with severe mental illness. In this study, it was found that approximately half of the patients (48.3%) met the JIS criteria for MetS. The prevalence of MetS was 50.7% in schizophrenia, 46.3% in MDD and 45.5% in bipolar disorder patients. These are higher than those reported in other studies in Malaysia (Hat et al., 2011; Rahman et al., 2009; Said et al., 2013). Hat et al. (2011) found that 37.5% of the patients with MDD had MetS. Furthermore, Said et al. (2013) reported that 46.7% of the patients with schizophrenia had MetS. It should be noted that these previous local studies involved only patients with specific mental illness, while current study involved patients with different types of severe mental illness. Close collaboration between mental healthcare professionals and dietitians is needed to establish better healthcare for patients with severe mental illness who are at risk of developing MetS.

When compared to other countries, MetS observed in this study is much higher compared to the 46% of patients with schizophrenia in Singapore (Lee, Nurjono, Wong, & Salim, 2012), 43.6% of patients with schizophrenia in Palestine (Sweileh et al., 2012), 37.9% of patients with MDD in Thailand (Charnsil et al., 2015), 31.7% of patients with schizophrenia in Korea (Lee et al., 2013), and 11.9% of patients with anxiety disorders in Taiwan (Chien & Lin, 2016). The high prevalence of MetS in the present study might be caused by the different MetS criteria used in those studies. Some studies (Charnsil et al., 2015; Said et al., 2012) used NCEP ATP III criteria to assess the prevalence of MetS, whilst others (Hat et al., 2011; Rahman et al., 2009) used IDF criteria. Although direct comparisons with other countries are complicated by the differing criteria used to define MetS, our results suggest that the prevalence of MetS was high in patients with severe mental illness. Furthermore, the JIS criteria on MetS used in this study can identify more individuals with MetS, compared to other definitions due to the presence of other multiple risk factors (Ramli et al., 2013).

Sex was not significantly associated with MetS in this study. In other words, both males and females have similar risk in getting MetS. This is in agreement with other studies (Bressington et al., 2013; Ramli et al., 2013), which stated that there was no significant difference between sexes with regard to the presence or absence of MetS. In contrast, this finding contradicts some previous studies which reported that females had higher risk in getting MetS compared to males (Kamkar et al., 2016; Saloojee et al., 2016; Sweileh et al., 2012). Further studies are needed to confirm these findings. Despite these inconsistency, one key message from these results is that patients with severe mental illness were at risk of developing MetS, regardless of sex.

In this study, the prevalence of MetS was the highest among the Indian (70.0%), followed by the Malay (45.6%) and Chinese (39.7%). A significant association was found between ethnicity and MetS in the bivariate analysis of this study, where it was in agreement with previous studies (Hat et al., 2011; Kumar et al., 2003; Ramli et al., 2013). A local study by Hat et al. (2011) found that ethnicity was significantly associated with MetS, where the prevalence of MetS was the highest in Indian (70%). Also, Indians were almost five times more likely to have MetS compared to non-Indians (Kumar et al., 2003). In other words, Indians had greater risk of developing MetS compared to other ethnicities. In fact, there were studies demonstrating that Indians were genetically predisposed to diabetes mellitus, which is a component of MetS and its complications (Kumar et al., 2003; Radha & Mohan, 2007).

Consistent with previous studies (De Hert et al., 2006; Hat et al., 2011), this study found that there were no significant associations between types and duration of medication and MetS. The most frequently prescribed medication was atypical antipsychotic medication such as Risperidone and Olanzapine, followed by antidepressant medication such as Escitalopram and Fluvoxamine, and Benzodiazepine such as Lorazepam and Alprazolam. Previous study found that antipsychotic medication was associated with greater weight gain in patients with severe mental illness due to the involvement of different neurochemical and hormonal systems in the body which vary according to the medication prescribed (Hasnain et al., 2010). Therefore, a warning about the risk of hyperglycaemia and diabetes and suggestions for regular monitoring are included in all atypical antipsychotic medications (Riordan, Antonini & Murphy, 2011). Although previous studies had shown that many antidepressants and antipsychotic had certain side effects (Kivimäki et al., 2010; Seida et al., 2012) such as weight gain and diabetes, none of them was found to be associated with MetS in the current study. This might be due to the uneven distribution of patients in the current study with different types of medication. One patient might take more than one medication at one time. Also, the number of patients who consumed specific medication might be too small as not many patients are taking medication in this study. Thus, future studies need to confirm these findings.

The multiple logistic regression model demonstrated that patients with middle-aged and older age were more likely to develop MetS compared to younger age patients. These are consistent with the results of other studies in India (Hussain et al., 2017), Thailand (Charnsil et al., 2015), Iran (Kamkar et al., 2016), and South Africa (Saloojee et al., 2016). For instance, Saloojee et al. (2016) showed that among patients with severe mental illness, age (OR=1.09, 95% CI=1.06–1.12, p<0.001) was a risk factor for MetS. Another study by Charnsil et al. (2015) among patients with MDD found that those between 46–60 years old were 2.84 times more likely to develop MetS, while those who were >60 years old were 7.89 times more likely to develop MetS.

Furthermore, there was also significant association between BMI and MetS in patients with severe mental illness. This is consistent with previous studies (Hat et al., 2011; Lee et al., 2012). A study conducted by Lee et al. (2012) among patients with schizophrenia in Singapore showed that overweight and obese patients were 5.23 times (95% CI = 1.00-27.43) and 23.40 times (95% CI = 4.44-123.20) more likely to develop MetS, respectively. Also, another study in India found that mental illness patients who were overweight were 56% more likely to have MetS than those who were not overweight (Mattoo & Singh, 2010). It is worth noting that BMI is routinely measured in most clinical practices and should be used as a screening tool to monitor the development of MetS among patients with severe mental illness.

This study has several limitations that need to be addressed. Firstly, this study is limited by its cross-sectional study design. Thus, causal relations between personal, clinical and lifestyle factors with MetS could not be inferred. Secondly, the findings of this study cannot be generalized to the whole population of patients with severe mental illness in Malaysia. This is because it was only conducted in Klang Valley. Larger sample from other geographical locations in Malaysia should be recruited to further confirm the findings. Furthermore, this study recruited only outpatients and had had no control group. Therefore, comparison to the general population could not be made. Future studies should involve both groups to validate the findings.

Despite these limitations, the findings in this study help us to understand the associations between personal, clinical and lifestyle factors with MetS in patients with severe mental illness. Besides, this study focused on multiple possible risk factors of MetS, not only as an individual risk factor. Most of previous studies only focused on a particular factor related to MetS. Furthermore, previous local studies only recruited patients with specific mental illness. Nevertheless, current study involved patients with different types of severe mental illness, including schizophrenia, Bipolar Disorder and MDD. In all, this study could extend our knowledge on MetS in severe mental illness in local patients. This is beneficial to many stakeholders as they would be able to develop prevention and intervention programs to combat the negative impacts of MetS on patients with severe mental illness.

5.0 Conclusion and recommendation

To conclude, MetS is an important health concern among patients with severe mental illness. This study highlights high prevalence of MetS among patients with severe mental illness, especially patients with schizophrenia. It also suggests that patients with severe mental illness should receive regular monitoring and adequate treatment of metabolic risk factors. Also, early screening and identification of MetS can be beneficial to be integrated in the management of mental illness. Furthermore, the development of MetS in older age group and in overweight and obese patients is of real concern. The findings of this study demonstrated the need to include these two factors in the metabolic risk preventive and screening programs for patients with severe mental illness.

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Declaration

Authors declare that there is no conflict of interest in this study.

Authors contribution

Author 1: Concept, idea, literature review, data collection and manuscript writing
Author 2: Concept, idea, statistical analysis and manuscript writing
Author 3: Data collection and revising the manuscript
Author 4: Data collection and revising the manuscript
Author 5: Revising the manuscript

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