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Original Article

A comparative study of prevalence and predictors of metabolic syndrome in various psychiatric disorders in state of Haryana: More than 30 years Vs. less than 30 years

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ABSTRACT

Background: Exponential growth of metabolic syndrome in psychiatric disorders is becoming alarming situation to handle with. It is associated with reduced life span of 10–30 years in psychiatric patients attributed to metabolic syndrome, thus needs to be screened and addressed in all psychiatric patients.

Objective: the objective of this study was to know the prevalence and its risk factors in various psychiatric disorder and comparing them in older vs younger patients.

Methodology: A cross sectional indoor based study was conducted after taking ethical committee approval in 140 patients (substance use disorder, schizophrenia, bipolar and depressive disorders). All the metabolic parameters as per International diabetes federation criteria for metabolic syndrome were assessed involving waist circumference, weight, height, Systolic/diastolic blood pressure, fasting blood sugar, high density lipoprotein and triglycerides.

Statistics: Chi square and *t*-test were used.

Results: It was seen that prevalence of metabolic syndrome (MS); 21.4% in psychiatric illness, up to 40% in major depressive disorders, followed by 33% in substance use disorder and 26.7% in psychotic disorders. Prevalence of MS was higher in older patients >30 years group (26% Vs. 16.4% in <30 years group). It was observed that substance use and depressive disorder and high BP in older male patients are all the significant risk factors for metabolic syndrome.

Conclusion: More than 1/5th psychiatric patients are affected by metabolic syndrome. Thus, all male psychiatric patients with high BP must be evaluated for metabolic syndrome.

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1. Introduction

Metabolic syndrome is a cluster of risk factors that fuel the development of cardiovascular disorders and type 2 diabetes mellitus, and its exponential growth is becoming an alarming situation for our ill developed health system. Metabolic syndrome is a major public health concern with prevalence ranging from 11.2 to 35% globally [1–5], in the general population while its prevalence range from 20 to 65% of patients with mental illness. While it is up to 19–22% in north India [1,6].

1.1. World health organization criteria [1–3] for metabolic syndrome include

1. Insulin resistance and/or impaired fasting glucose and/or impaired glucose tolerance and
2. Two or more of the following:
 - a. Increase in waist circumference (≥ 80 cm for females and ≥ 90 cm for males of Asian origin)
 - b. Two of the following:
 - i. Systolic BP ≥ 130 mm of Hg and/or diastolic BP ≥ 85 mm of Hg (or on treatment for hypertension)
 - ii. TG levels ≥ 150 mg/dl (or on specific treatment for this abnormality)
 - iii. HDL levels ≤ 40 mg/dl for males and ≤ 50 mg/dl for females (or on specific treatment for this abnormality)
 - iv. FBS ≥ 100 mg/dl (or on specific treatment for diabetes mellitus)

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- v. Increase in waist circumference (≥ 80 cm for females and ≥ 90 cm for males of Asian origin)

Metabolic syndrome has its modifiable as well as non-modifiable risk factors and being medicos our preferred focus remains on modifiable and preventable risk factors which are obesity, overweight, diabetes mellitus, hypertension, smoking, lifestyle, nutritional habits, and dyslipidemia. Though all these risk factors are present in the general population as well but it has shown by various epidemiological studies that psychiatric disordered patients have much more propensity of development of metabolic syndrome [7], which may be because of multiple factors like non working status as a result of mental handicap by disease, altered eating habits during the acute phase of depression/mania/schizophrenia and substance use disorders, poor access to health care system, specialization of professionals causing them to very specific approach for only disorder and ignoring the overall health of the patient by psychiatrist and of course side effect of psychotropic medications [7]. Development of this cluster of syndromes is associated with high mortality approximately 10–30 years of reduced lifespan of patients with psychiatric disorders attributed to premature development of cardiometabolic disturbances as compared to general population [8], is associated with increased psychopathology, treatment resistance, increased duration and severity of illness (from new 2017 studies), poor outcome of treatment and impaired cognition [9].

Thus, this chunk of the population needs much more attention and screening, and regular monitoring of metabolic parameters is recommended for these patients. Thus decision for treatment in a patient with a psychiatric illness must incorporate general medical as well as the metabolic risk factor in particular in patients with psychiatric illness.

Most of the previous studies done on metabolic syndrome, a majority of reviews are from western countries, and most of the studies are done on patients who are receiving treatment. Moreover, most of the studies done are on individual disorder including mainly schizophrenia and bpad [10] while very –very few studies are done on other types of very prevalent psychiatric disorders including depressive disorder and substance dependence disorders. As we know from the previous literature [11] that all kinds of psychotropic increases the risk of development of metabolic syndrome, thus with this background this study was conducted aiming to assess the prevalence and its predictors of metabolic syndrome in various psychiatric disorders in patients who are not receiving any treatment.

As growing age is considered one of the risk factors for developing metabolic syndrome in general population [12] thus, this study also conducted also to evaluate whether psychiatric disorders also follows the similar trends in developing metabolic syndrome. As studies say that biological aging starts at the age of 30 years [13] thus, we divided our patients into two groups patients aged below 30 years and to compare those aged above 30 years.

2. Methodology

Strobe checklist was followed while conducting the study.

Study design: This was a cross-sectional study done in patients admitted in Psychiatry indoor ward of the MMIMSR.

Sample Size: A total of 140 patients were recruited for this study.

Institutional ethical committee approval before the recruitment of the patients into the study.

2.1. Instruments and tools used

1. ICD 10 diagnostic criteria for establishing the diagnosis of substance dependence, major depressive disorder, bipolar affective disorder and schizophrenia, and other psychotic illness.
2. Socio-demographic Performa for anthropometric measurement used in our department.
3. WHO criteria for establishing metabolic syndrome.
4. Weight (in Kg), waist circumference (in cm) and Blood pressure (in mm of Hg) assessment was done by using the standard protocol.
5. Fasting Blood Glucose (FBG), Triglycerides (TGs), High-Density Lipoprotein (HDL) cholesterol, Low-Density Lipoprotein (LDL) cholesterol was measured by taking a venous sample under aseptic conditions.

2.2. Inclusion criteria

1. Patients who were admitted to the psychiatry ward of MMIMSR.
2. Patients who gave voluntary consent for the study.
3. All the patients who were meeting the criteria of ICD-10 for substance dependence, major depressive disorder, bipolar affective disorder and schizophrenia, and other psychotic illness.
4. *Drug naïve patients*, i.e., patients who either never received any psychotropic for more than two weeks and not so in last three months; which was ascertained by information gathered from patients and their caregiver and wherever available, the review of treatment records.

2.3. Exclusion criteria

1. Patients having the co-morbid psychiatric illness.
2. Patients having the co-morbid organic illness.
3. Patients with a co-morbid physical illness that can influence the metabolic profile like diabetes mellitus, hypertension, etc.
4. Pregnant females.

2.4. Method of data collection

After diagnosis on the basis of ICD-10, all the patients were divided into four groups: major depressive disorder, bipolar affective disorder, schizophrenia, and other psychotic disorders and substance dependence (which included alcohol, opioids, and cannabis). After this, all the groups were further divided into two groups, i.e., group A – patients aged above 30 years and group B, i.e., patients aged less than 30 years.

3. Results

Table 1 shows socio-demographic profile of our study which shows 82 patients were married (Statistically significant, p value – 0.000) belonged to Hindu religion followed by Muslim population (Statistically significant, p value - 0.059). Rest of the findings are statistically insignificant as shown in Table 1.

Table 2 shows the prevalence of various types of psychiatric disorders in the study which shows that more than half of older patients i.e. > 30 years suffering from mental disorders (except schizophrenia higher prevalence in younger age group (p value 0.04).

Table 1
Socio-demographic Profile.

		Total	Chi-square value	p-value
Sex	Female	59	0.897	0.344
	Male	81		
Locality	Rural	120	1.546	0.214
	Urban	20		
Occupation	Unskilled	101	0.482	0.786
	Semiskilled	20		
	Skilled	19		
Education	Uneducated	21	17.904	0.001
	V	38		
	X	35		
	XII	30		
Marital Status	Graduate	16	63.727	0.000
	Married	82		
	Unmarried	58		
Religion	Hindu	93	7.45	0.059
	Muslim	36		
	Sikh	7		
	Christian	4		

Table 3 shows prevalence of metabolic syndrome; 21.4% in psychiatric illness which was higher in older patients >30 years group (26% Vs. 16.4% in <30 years group), it was statistically non-significant.

Table 4 is showing the prevalence of metabolic abnormalities in patients with metabolic syndrome showing which is up to 40% in major depressive, followed by 33% in substance use disorder and 26.7% in psychotic disorders supported. It is statistically significant, p value –0.002.

Also, most common metabolic abnormality was high waist circumference (100%) with p value of 0.000 and least common finding was high FBS (26.7%); a statistically significant finding with p value of 0.003.

Table 5 shows the comparison of the prevalence of different predictors in older Vs. younger patients with metabolic syndrome showing that older males (>30 years) is a risk factor for development of metabolic syndrome which is significant finding, p value 0.023.

Also, substance use disorder and depressive disorder is a risk factor in older patients (47.4% in >30 years Vs. 9.1% in <30 years while schizophrenia is a risk factor in younger patients (54.5% for <30 years Vs. 10.5% > 30 years) for development of metabolic syndrome which is a significant finding, p value-0.017. High blood pressure is a risk factor for older patients for development of metabolic syndrome a significant finding, p value 0.020 for SBP and 0.03 for DBP.

Table 6 shows the comparison of means of anthropometric predictors of metabolic syndrome. On comparing both the groups it has been observed that in older patient's longer duration of illness, tall height (167.05 ± 8.83 cm) and obesity (high BMI (76.79 ± 11.22 kg weight and 92.63 ± 6.76 cm of waist circumference) are the significant predictors; p value for height and weight are 0.002 and 0.003 of metabolic syndrome as compared to younger population.

Table 2
Prevalence of various types of psychiatric disorders in the study.

ICD -10	Group	Group		Total	Chi-square value	p-value
		More than 30 (n = 73)	Less than 30 (n = 67)			
BPAD	BPAD	17	23.3%	13	19.4%	8.104
	Depressive Disorder	16	21.9%	14	20.9%	
	Schizophrenia	9	12.3%	21	31.3%	
	Substance Use Disorder	31	42.5%	19	28.4%	
				30		0.044
				30		
				30		
				50		

Table 3
Prevalence of metabolic syndrome in the study.

Metabolic syndrome	More than 30 (n = 73)		Less than 30 (n = 67)						
	Absent	Present	54	74.0%	56	83.6%	110	1.916	0.166
			19	26.0%	11	16.4%	30		

It has observed that older patients has higher mean BP (BP-1 $1130.32 \pm 8.52/88.32 \pm 5.26$ and BP-2 $126.74 \pm 8.01/84.63 \pm 4.86$ mm of Hg) (BP-1 $1118.18 \pm 9.82/78.55 \pm 7.70$ and BP-2 $2118.00 \pm 8.58/80.36 \pm 6.44$ mm of hg which is statistically significant; p value of 0.001/0.003 for BP-1 and 0.009/0.0049). Also, younger patients have higher mean FBS, Lower HDL and higher mean TGS (99.73 ± 27.00 Vs. 90.00 ± 10.15 , 40.09 ± 6.02 Vs. 41.37 ± 15.13 and 152.36 ± 69.52 Vs. 139.47 ± 38.9 respectively. All these findings are insignificant statistically.

4. Discussion

4.1. Socio-demographic profile of the patients

Our study recruited a total of majority were males consistent with Haryana census (2011) [14] (856 in 2011 sex ratio). A total of 120 patients were from the rural background our institute's catchment area is rural. Majority of the patients were unskilled laborers; educated up to high school. A total of 82 patients were married, Hindu by religion, followed by Muslim matched with the Haryana census 2011 and national mental health survey 15–16 [14,15].

4.2. Prevalence of various types of psychiatric disorders in the study

From our research it showed that more than half of the population suffering from mental disorders were more than 30 years of age; except schizophrenia which showed higher prevalence in younger age group which is consistent with the finding of national mental health survey [15] showing that psychiatric disorder contributes greater morbidity in most productive and earning age group (30–49 years); thus affecting national economy while it was just 7.5% affecting <30 years of age [15].

A total of 73 patients were aged more than 30 years (BPAD – 17; major depression – 16; schizophrenia- 9 and substance use disorder – 31), and the rest were aged less 30 years. The substance use disorder prevalence is consistent with the national mental health survey [15] which showed that substance use disorder is much more common in 40–59 years of age. Similar trends [15] were seen for depressive disorders more prevalence in >40 years of age as compared to the younger population (Significant statistically p-value of 0.04).

Table 4
Prevalence of metabolic abnormalities in patients with Metabolic Syndrome.

		Metabolic syndrome		Total	Chi-square value	p-value		
		Absent	Present					
Sex	Female	46	41.8%	13	43.3%	59	0.022	0.882
	Male	64	58.2%	17	56.7%			
Locality	Rural	96	87.3%	24	80.0%	120	1.018	0.313
	Urban	14	12.7%	6	20.0%			
Occupation	Unskilled	81	73.6%	20	66.7%	101	0.580	0.748
	Semiskilled	15	13.6%	5	16.7%			
	Skilled	14	12.7%	5	16.7%			
Education	Uneducated	17	15.5%	4	13.3%	21	2.565	0.633
	V	27	24.5%	11	36.7%			
	X	30	27.3%	5	16.7%			
	XII	24	21.8%	6	20.0%			
Marital Status	Graduate	12	10.9%	4	13.3%	16	2.055	0.210
	Married	61	55.5%	21	70.0%			
	Unmarried	49	44.5%	9	30.0%			
Religion	Hindu	71	64.5%	22	73.3%	93	3.287	0.349
	Muslim	28	25.5%	8	26.7%			
	Sikh	7	6.4%	0	0.0%			
	Christian	4	3.6%	0	0.0%			
ICD -10	Bpad	30	27.3%	0	0.0%	30	14.877	0.002
	Depressive Disorder	18	16.4%	12	40.0%			
	Schizophrenia	22	20.0%	8	26.7%			
	Substance Use Disorder	40	36.4%	10	33.3%			
Waist group	High	38	34.5%	30	100.0%	68	40.428	0.000
	Normal	72	65.5%	0	0.0%			
SBP group	High	23	20.9%	19	63.3%	42	20.202	0.000
	Normal	87	79.1%	11	36.7%			
DBP group	High	8	7.3%	13	43.3%	21	24.040	0.000
	Normal	102	92.7%	17	56.7%			
FBS group	High	8	7.3%	8	26.7%	16	8.759	0.003
	Normal	102	92.7%	22	73.3%			
Triglycerides group	High	13	11.8%	18	60.0%	31	31.741	0.000
	Normal	97	88.2%	12	40.0%			
HDL group	Low	40	36.4%	25	83.3%	65	20.908	0.000
	Normal	70	63.6%	5	16.7%			
Total		110	100.0%	30	100.0%	140		

4.3. Prevalence of metabolic syndrome

It was found that metabolic syndrome was present in 21.4% of the population which is inconsistent with previous studies done that shows the prevalence ranging from 20 to 63% of psychiatric illness [1–3,9,11,16,17]; lower prevalence may be explained by the fact that most of the studies done earlier have recruited patients who were receiving treatment with psychotropic medications.

The prevalence of metabolic syndrome was high in older patients, i.e., patients aged more than 30 years group (26% vs. 16.4% in aged less 30 years group); supported by a study which showed that increasing age is a risk factor for the development of metabolic syndrome [18]. This may be attributed by the fact that increasing age leads to decreased physical activity, development of medical disorders and altered nutritional habits and increased perception of decreased support leading to stress [11].

4.4. Prevalence of metabolic abnormalities in patients with metabolic syndrome

Out of the 30 patients who were having metabolic syndrome it was observed that 13 were females and 17 were males, i.e., male gender is a risk factor for metabolic syndrome; although it was statistically not significant. It was seen that in older male psychiatric disorders is a risk factor for the development of metabolic syndrome which may be explained by the fact that estrogen in the premenopausal female is a protective factor for metabolic syndrome. Studies are negating our finding that there is no sex variation; [19] this may be due to cultural variations of the population in

different regions of India.

As per our study, the prevalence of metabolic syndrome is up to 40% in major depressive disorder supported by a research done by Grover et al. [11], followed by 33% in substance use disorders supported by our previous study [3] done in substance use disorders and 26.7% in psychotic disorders backed by our study [1]. Higher prevalence of metabolic syndrome in depressive disorders may be explained by the fact that depressive patients have a higher propensity of altered HPA axis, sedentary lifestyle, insulin resistance is all associated with the higher metabolic syndrome in depressive disorder as mentioned in the previous literature [11].

Out of the 30 patients who had metabolic syndrome most common metabolic abnormality was high waist circumference for all patients. Consistent with the finding of a study [20] showing that northern Indian population (involved Haryana and Chandigarh) has high propensity to develop abdominal obesity [21] (high waist circumference is called abdominal obesity as defined by WHO).

This was followed by low HDL cholesterol, i.e., 83.3%, followed by high blood pressure, and the least common finding was high FBS in approximately 26.7% of the patients, Also raised BP was a significant predictor of metabolic syndrome in various psychiatric disorders These findings are supported by our previous studies [1–3] and other research data [10,11]. All these can be attributed to the higher genetic risk of development of metabolic syndrome in patients with psychiatric disorders [20]. These findings are statistically significant (p-value <0.05). It is also suggested that increased waist circumference, low HDL and raised BP can be considered as clinical markers for the development of metabolic syndrome in

Table 5
A comparison prevalence of different predictors in older Vs younger patients with metabolic syndrome.

Metabolic syndrome		Group				Total	Chi-square value	p-value
		More than 30 (n = 19)		Less than 30 (n = 11)				
Sex	Female	5	26.3%	8	72.7%	13	6.110	0.023
	Male	14	73.7%	3	27.3%	17		
Locality	Rural	15	78.9%	9	81.8%	24	0.036	0.100
	Urban	4	21.1%	2	18.2%	6		
Occupation	Unskilled	13	68.4%	7	63.6%	20	0.072	0.965
	Semiskilled	3	15.8%	2	18.2%	5		
	Skilled	3	15.8%	2	18.2%	5		
Education	Uneducated	3	15.8%	1	9.1%	4	13.069	0.011
	V	8	42.1%	3	27.3%	11		
	X	0	0.0%	5	45.5%	5		
	XII	6	31.6%	0	0.0%	6		
	Graduate	2	10.5%	2	18.2%	4		
Marital Status	Married	16	84.2%	5	45.5%	21	4.953	0.042
	Unmarried	3	15.8%	6	54.5%	9		
Religion	Hindu	16	84.2%	6	54.5%	22	3.135	0.104
	Muslim	3	15.8%	5	45.5%	8		
ICD -10	Depressive Disorder	8	42.1%	4	36.4%	12	8.182	0.017
	Schizophrenia	2	10.5%	6	54.5%	8		
	Substance Use Disorder	9	47.4%	1	9.1%	10		
Waist group	High	19	100.0%	11	100.0%	30	0.000	1.000
	Normal	0	0.0%	0	0.0%	0		
SBP group	High	15	78.9%	4	36.4%	19	5.44	0.020
	Normal	4	21.1%	7	63.6%	11		
DBP group	High	11	57.9%	2	18.2%	13	4.474	0.034
	Normal	8	42.1%	9	81.8%	17		
FBS group	High	4	21.1%	4	36.4%	8	0.835	0.361
	Normal	15	78.9%	7	63.6%	22		
Triglycerides group	High	11	57.9%	7	63.6%	18	0.096	0.757
	Normal	8	42.1%	4	36.4%	12		
HDL group	Low	14	73.7%	11	100.0%	25	3.474	0.062
	Normal	5	26.3%	0	0.0%	5		
Total		19	100.0%	11	100.0%	30		

Table 6
Comparison of means of anthropometric predictors of metabolic syndrome in older Vs younger patients.

Metabolic syndrome	More than 30 (n = 19)		Less than 30 (n = 11)		t	p-value	95% Confidence Interval of the Difference	
	Mean	SD	Mean	SD			Lower	Upper
Dur of Illness	126.05	115.87	52.45	48.79	1.995	0.056	-1.967	149.163
Height (cm)	167.05	8.83	156.55	8.48	3.186	0.004	3.752	17.263
Weight (kg)	76.79	11.22	62.55	12.35	3.232	0.003	5.215	23.273
Waist (cm)	92.63	6.76	91.27	5.69	0.560	0.580	-3.607	6.325
SBP 1	130.32	8.52	118.18	9.82	3.557	0.001	5.147	19.121
DBP 1	88.32	5.26	78.55	7.70	4.132	0.000	4.926	14.614
SBP 2	126.74	8.01	118.00	8.58	2.807	0.009	2.361	15.112
DBP 2	84.63	4.86	80.36	6.44	2.058	0.049	0.020	8.516
FBS	90.00	10.15	99.73	27.00	-1.421	0.166	-23.751	4.296
Triglycerides	139.47	38.90	152.36	69.52	-0.655	0.518	-53.208	27.428
HDL	41.37	15.13	40.09	6.02	0.266	0.792	-8.545	11.100

various psychiatric patients and thus needs to be evaluated all the patients.

4.5. A comparison prevalence of different predictors in older vs. younger patients with metabolic syndrome

It was observed that older males and younger females are the risk factor for the development of metabolic syndrome supported by a study by Pradhan [22] this may be explained by the fact that men have more visceral adipose tissue as compared to females which have a significant contribution for the development of insulin resistance [22,23].

It was observed in our study that substance use disorder and

depressive disorder is a risk factor in older patients (47.4% in above 30 years Vs. 9.1% in aged less 30 years) supported by the study done previously [24,25].

While schizophrenia is a risk factor in younger patients (54.5% in aged less 30 years Vs. 10.5% in above 30 years) for the development of metabolic syndrome which is inconsistent with previous studies [18] showing that older age is a risk factor for development of metabolic syndrome [18], this may be explained by the fact that in that systematic review most of the studies included patients who were receiving treatment with psychotropic drugs. Thus, it can be said that all the substance used disorders and depressive disorder who are older (>30 years of age) should be evaluated for metabolic syndrome while this evaluation should be started at the even

earlier age of schizophrenic and psychotic disorder patients.

It has been observed that high waist circumference is equally prevalent in both the groups while all other metabolic parameters such as high BP, high TGs, low HDL cholesterol, and high FBS are more prevalent in older patients as compared to younger patients. This is supported by a study did previously showing the similar trends that higher [23,26]. This can also be explained by the fact that increasing age contributes to the expression of metabolic syndrome due to decreased activity, increased risk of medical comorbidities, increased sensitivity to stress and altered eating habits [26].

On comparing both the groups, it was observed that higher prevalence of high blood pressure in the older patient as compared to younger patients is a significant finding and thus is a significant risk factor for the development of metabolic syndrome and eventually must be carefully evaluated in all the patients aged above 30.

4.6. Comparison of means of anthropometric predictors of metabolic syndrome

On comparing both the groups, it has been observed that in older patient's longer duration of illness, tall height and obesity (waist circumference) are the significant predictors of metabolic syndrome as compared to the younger population.

Also, it has been observed that older patients have higher mean BP as compared to younger patients which is significant statistically.

4.7. Comparison of means of metabolic predictors of metabolic syndrome

It was observed that comparing the means of the older Vs. younger age group it has been observed that younger patients have higher mean FBS, Lower HDL and higher mean TG's as compared to older patients for the development of metabolic. All these findings are statistically insignificant.

5. Conclusion

From our study we can conclude that metabolic syndrome prevalence is affecting almost 1/5th (21.4%) of all the psychiatric patients, depressive disorder and substance use disordered patients have higher chances of developing metabolic syndrome. Thus, it needs deep attention from every psychiatrist, and the treatment decision in each patient must incorporate assessment of all the clinical risk factors and the waist circumference, in all the psychiatric patients.

On comparing both the older Vs. younger patients, we can conclude that older males, less education with substance use and depressive disorder and presence of high BP are all the risk factors for the development of metabolic syndrome in older patients as compared to younger ones. Thus if any male patient with high BP > 130/85 mm of Hg must be evaluated for metabolic syndrome thoroughly.

Limitations and future directions

1. Lifestyle and dietary habits have not been excluded which may have confounded our findings.
2. The family history of any cardiac abnormalities was not excluded which might also have confounded our results.
3. It was a comparative short sampled and cross-sectional study, a large sample size and follow up of the patient might be more beneficial.

4. Only two age-based groups may not be sufficient to know the trends of the metabolic syndrome further age-based division of patients is needed to understand the better age-based patterns of metabolic syndrome.

Strengths of the study

1. To our knowledge, this is the only study evaluating the prevalence and risk factors for metabolic syndrome in various drug-free psychiatric disorder.
2. This is the only study which has assessed the trends of metabolic syndrome's prevalence and risk factors concerning age.

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