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Prevalence of the metabolic syndrome in a psychiatric hospital in Mexico

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Introduction. The metabolic syndrome (MS) is formed by elevated blood pressure, hypercholesterolemia, hypertriglyceridemía, hyperglycemia and abdominal obesity. Mexico occupies the second place worldwide in prevalence of obesity. It has been reported that the use of psychopharmaceuticals increase the risk of MS.

Objective. To detect prevalence of MS in patients with a psychiatric diagnosis with or without psychopharmaceutical treatment.

Material and Methods. An observational, descriptive study was designed. Informed consent was obtained, enrolling a sample of 216 patients in the six-month period, all of them over 18 years of age. The following variables were measured: blood pressure, weight, height, waist circumference, triglyceride, glucose and high-density lipoprotein serum levels, by colorimetric enzyme assay in Roche analyzer. Statistical analysis: Student's t-test, and Cochran-Mantel-Haenszel and Fisher's exact test.

Results. A total of 50% of the sample had a waist circumference >88 cm; 10% glycemia superior to 110 mg/dl, 30% triglycerides >150 mg/dl; 14% met the MS criteria. When patients with and without MS were grouped, and glucose and triglycerides were compared, a p 0.0001 was obtained. With a 93.4% confidence interval, the relationship between sedentary life and MS was accepted. Women, aged 40-59 years tended to have MS, with 98.4% CI. The only family background associated to MS was obesity (97.7% CI). There is a positive relationship between MS and the use of typical or atypical antipsychotics. SSRIs are significantly related with MS: p 0.072 and 91.5% confidence interval, benzodiazepines with p 0.073 and 92.7% confidence interval.

Conclusions. Only 14% of the sample had MS. Psychopharmaceuticals were associated to MS, women between 40 to 59 years having a greater risk.

Keywords:
Prevalence, Metabolic Syndrome, Mental Disorders.

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Prevalencia de síndrome metabólico en un hospital psiquiátrico de Méjico

Introducción. El síndrome metabólico (SM) se integra por elevación de presión arterial, hipercolesterolemía, hipertrigliceridemía, hiperglucemia y obesidad abdominal; México ocupa el segundo lugar mundial en prevalencia de obesidad; se ha reportado que el uso de psicofármacos aumenta riesgo de SM.

Objetivo. Detectar prevalencia de SM en pacientes con diagnóstico psiquiátrico y con o sin tratamiento psicofarmacológico.

Material y Método. Se diseñó estudio observacional descriptivo, se obtuvo consentimiento informado, recolectándose muestra de 216 pacientes en periodo de seis meses, todos mayores de 18 años de edad. Se midieron las siguientes variables: presión arterial, peso, talla, circunferencia abdominal, niveles séricos de triglicéridos, glucosa y lipoproteínas de alta densidad, por test enzimático colorimétrico en analizador Roche. Análisis estadístico: t student, prueba exacta Fisher y Cochran-Matel-Haenszel.

Resultados. El 50 % de la muestra tuvo circunferencia abdominal >88cm; 10% glicemia superior a 110mg/dl, 30% triglicéridos >150mg/dl; el14 % cumplió con criterios de SM. Al agrupar pacientes con y sin SM comparando glucosa y triglicéridos se obtiene p=0,0001 Con 93,4% de confianza se acepta relación sedentarismo y

SM. Mujeres con 40-59 años de edad tienden a SM, 98,4% confianza. El único antecedente familiar asociado a SM fue obesidad (97,7% confianza). Existe relación positiva entre SM y uso de antipsicóticos típicos o atípicos. Los ISRS se relacionan con SM significativamente p=0,072 y 91,5% de confianza; benzodiacepinas con p=0,073 y 92,7% de confianza.

Conclusiones. Solamente el 14% de la muestra presentó SM; los psicofármacos sí se asociaron a SM, teniendo mayor riesgo mujeres entre 40-59 años.

Palabras clave:
Prevalencia, síndrome metabólico, trastornos mentales.

INTRODUCTION

The concept of Metabolic Syndrome (MS,) has as antecedent the "syndrome X," proposed by Gerald Reaven in 1988 which included a series of factors that could be attributed to insulin resistance. Its components were glucose intolerance, high triglycerides, low high-density lipoprotein bound cholesterol (HDL-C) and elevated blood pressure.[1] The National Cholesterol Education Program, Adult Treatment Panel III defines MS as having three of the following criteria: abdominal obesity: waist circumference >102 cm in men and >88 cm in women, triglycerides: >150 mg/dl, HDL-C: <40 mg/dl in men and <50 mg/dl in women; fasting glucose: over 110 mg/dl, and blood pressure: greater than 130/85 mmHg.[2] Different organizations have established opinions regarding the diagnosis of MS, so that the World Health Organization in 1999 established the following as essential: glucose intolerance, abnormal fasting glucose or insulin resistance in addition to albumin excretion superior to 20 micrograms/dl in urine.[3] On its part, the International Diabetes Federation (IDF) in 2005 considered that the need existed for a clearer and universal definition in which central obesity was the necessary requirement and this threshold value was defined in accordance with the ethnic group.[4] Measurement of waist circumference was an indispensable element. In this way, the measurement of the waist in men, when it exceeds 102 cm, and in women at 88 cm, has been established as a high-risk parameter.[5] A panel of experts has reported that the protocol of measurement of waist circumference does not affect its association with cardiovascular disease or diabetes.[6]

Obesity is considered a public health problem in Mexico, with an incidence of 24.2%,[7, 8] this being the factor most associated to MS for this population.[9] In Mexico, 39.7% of those who suffer MS are under 40 years of age. It has been estimated that in 2025, 11.7 million persons will be suffering from type II diabetes mellitus, the principal cause of long-term discapacity caused by this syndrome.[10, 11] Mental diseases increase the risk of death 2 to 3 times more and double the risk of suffering cardiovascular diseases.[2] In addition, unhealthy lifestyle such as sedentary life and smoking double or triple the relative risk of obesity, dyslipidemias, hypertension, diabetes and MS.[13]

Several studies have established the relationship between antipsychotics and MS[14] and state that there are prevalences of 24.6%.[15] During the first episode of psychosis, a prevalence of 17% has been reported, and in patients with an evolution of psychosis over 20 years (49.4%).[16] This is more frequent in patients with psychotic disorders than in patients with non-psychotic disorders.[17] Different studies have reported an increased risk at 10 years for MS of 74% and 61% for patients with schizophrenia and affective disorders, respectively.[18] Depression has been considered as a predictor of the onset of metabolic syndrome, its association being clear.[19] Patients with bipolar disorder have a greater risk of cardiovascular diseases. Studies have reported prevalences of metabolic syndrome of 22%.[20]

The Hospital Psiquiátrico Fray Bernardino Álvarez attends to the adult psychiatric population with possible risk factors of MS such as sedentary life, obesity, smoking habit and psychopharmaceutical treatment. Thus, it has been proposed a study to detect the prevalence of MS in a sample considered to be representative of the hospital.

MATERIAL AND METHODS

A cross-sectional, descriptive and observational study was performed in the period including January to June 2008. Inclusion criteria: patients hospitalized in the observation service of the Psychiatric Hospital Fray Bernardino Álvarez who had acute and chronic psychiatric disorders with or without previous psychopharmaceutical treatment. All were over 18 years, had agreed to participate and had signed an informed consent. Exclusion criteria: patients who did not agree to participate in the study and those diagnosed of metabolic or cardiovascular disease. The diagnoses were established in accordance with the Diagnostic and Statistical Manual of Mental Disorders DSM IV-TR. Procedure: the following measurements were obtained: 1) blood pressure, 2) calculation of body mass index (weight /height ^{2}), these being classified as follows: 25-29= overweight, 30-34.9= obesity class I, 35-39= obesity class II, >40= obesity class III;[21] 3) waist circumference with the following procedure: An imaginary line of the superior iliac spine to the costal margin was drawn. The mean point, where the metric tape is placed, was obtained. The measurements were made by nurses who were specialists in instrumental calibration in accordance with the standardization required.

The blood samples to determine triglycerides, HDL-C and glucose were obtained with an adequate technique, after 12 hours fasting. The direct quantitative determination

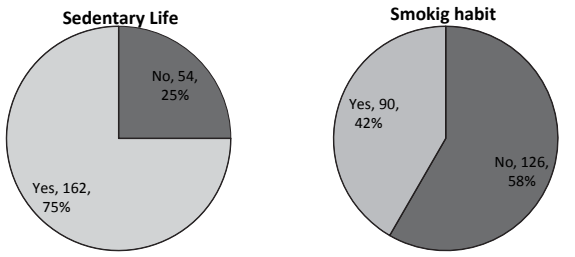

Figure 1 Habits that favor health problems in the sample studied. A total of 75% have a sedentary life and 42% smoke

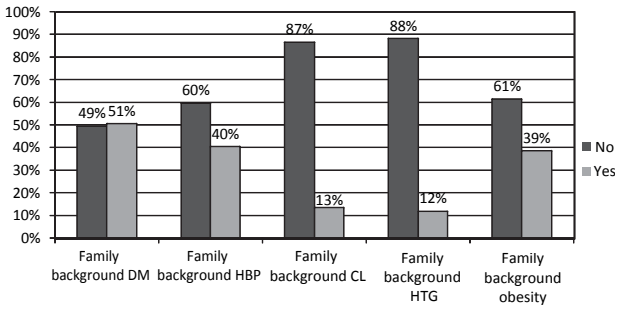

Figure 2 Family backgrounds associated to the metabolic syndrome

of triglycerides and glucose in serum and plasma was measured using the colorimetric enzyme assay. For the quantitative determination of HDL-C, the homogeneous colorimetric enzyme assay was used, using the Roche/Hitachi automatic enzyme analyzer. The clinical laboratory of the hospital in which the study was conducted had the ISO 9000-2008 certification.

Statistical analysis: descriptive and inferential statistics, using Fisher's exact test, Cochran-Mantel-Haenszel test and Student's t test.

RESULTS

Of the 216 patients enrolled in this study, most were women (58%). By age range, most of them were between 18 and 30 years, representing 46% of the subjects studied. The most frequent type of schooling was secondary (39%). Most of them, 69%, were economically dependent (it standing out that 32% were unemployed and 20% were housewives). Only 28% were economically solvent.

In regards to habits that favored health problems, the following stood out: 75% lead a sedentary life and 42% smoked. Another piece of information is that 63% had some family background of a condition associated to MS, such as diabetes mellitus, high blood pressure and obesity (Fig. 1,2).

Schizophrenia was the most frequent diagnosis (31.5%), followed by Personality Disorder (29.6%), mood disorders (9.3%) and anxiety (6.9%). The first two diagnoses included 60% of the total admissions to the psychiatric hospital Fray Bernardino Álvarez. Regarding treatments, 63% of the sample had received previous psychopharmaceutical treatment for at least 3 months. However, one out of every 10 cases ignored their treatment while 35% of the patients of the sample did not follow any treatment prior to their admission to the hospital. Of the patients with some psychopharmaceutical treatment, the most common was a regime that combined several drug groups. The drugs that were prescribed the most were typical antipsychotics, followed by Selective Serotonin Reuptake Inhibitors (SSRI), anti-seizure drugs and benzodiazepines.

The waist circumference in half of the sample was > 88 cm, independently of gender. Serum levels of HDL-C < 40 mg/dl were more frequent in men. A total of 10% of the sample had blood glucose levels of >110 mg/dl. Three out of every 10 subjects had triglycerides serum levels of >150 mg/dl. In accordance with their body mass index, 45% of the sample was considered to be overweight or obese. (Table 1). When those subjects who met three out of the 5 criteria that defined MS in accordance with the NCEP ATP III were grouped, only 14% of the sample had MS (Fig. 3).

The metabolic syndrome, by construction, directly depends on 5 variables. Therefore, the relationship existing

Table 1 Differences in weight. height. waist circumference and HDL-C by gender

Gender	Statistics	Weight	Height	Waist circumference	HDL-C
Woman (126 patientes)	Mean	63.3	1.57	89.0	46.1
	Median	62.5	1.56	88.0	43.5
	Minimum	40.0	1.38	45.0	23.0
	Maximum	105.0	1.85	126.0	94.0
Man (189 patientes)	Mean	70.9	1.68	89.6	43.3
	Median	69.5	1.68	89.0	42.0
	Minimum	41.5	1.48	56.0	5.0
	Maximum	111.0	1.92	129.0	79.0

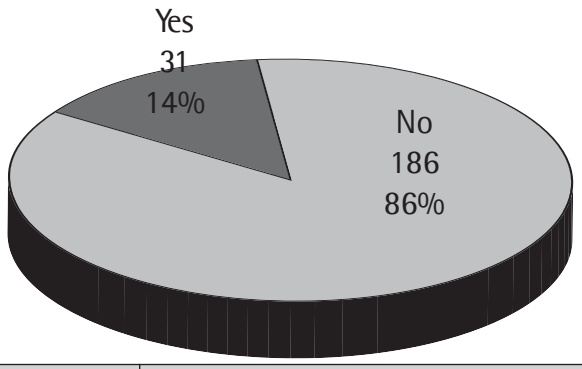

Figure 3 Prevalence of Metabolic Syndrome

between the variables making it up should be statistically significant. Beginning with blood pressure, a statistically significant difference was observed when comparing the fact that the patients would or would not have metabolic syndrome regarding diastolic pressure (p- 0.038) and systolic pressure (p– 0.006), when using the t-test. Equally, highly significant differences were observed in the means of the glucose and triglyceride levels between the patients who suffered metabolic syndrome and those who did not (p – 0.001). In the case of HDL-C and waist circumference, the criteria used to determine if their levels contributed or not to MS depend on the gender of the individual. Thus, to verify the existence of the relationship, both variables were studied as add-ons within the gender variable. For the waist circumference, it could be observed that although there are significant differences between suffering or not suffering MS, among the patients who did not have MS, there were no significant differences in the waist circumference according to whether they are men or women. On the contrary, men who had the metabolic syndrome had a significantly higher waist circumference than women with the same condition, on an average of 14 cm (Table 2,3).

Significant differences were also observed among those who had MS when compared with the average of HDL-C between both groups. However, in this case, there was a significant difference between men and women who did not suffer metabolic syndrome. On the contrary, among those who did or did not have the syndrome, there were significant differences between being a man or a woman (although in the case of men, it stands out that there was a dispersion that was almost 3 times greater than that of women (3.4 versus 1.2). This reflects the amplitude of its confidence interval). When sedentary life was compared to MS, it was found that among the patients of the sample, there was a significant relationship between having a sedentary lifestyle and having MS. The hypothesis of the nonexistence of the relationship was rejected (93.4% CI). On the contrary, given the sample

Table 2 Significant differences in waist circumference between suffering or not suffering the metabolic syndrome

				95% Wald CI	
		Gender	Mean waist circumference	Upper	Lower
Metabolic syndrome	No	Woman	85.7	82.7	88.7
		Man	87.7	85.3	90.0
	Yes	Woman	102.5	97.6	107.4
		Man	116.7	110.3	123.1

Table 3 Significant differences in HDL-C between those who have or do not have metabolic syndrome

				95% Wald CI	
		Gender	Mean HDL-C	Upper	Lower
Metabolic syndrome	No	Woman	48.9	46.2	51.5
		Man	43.9	41.5	46.2
	Yes	Woman	35.0	32.5	37.5
		Man	35.2	28.4	41.9

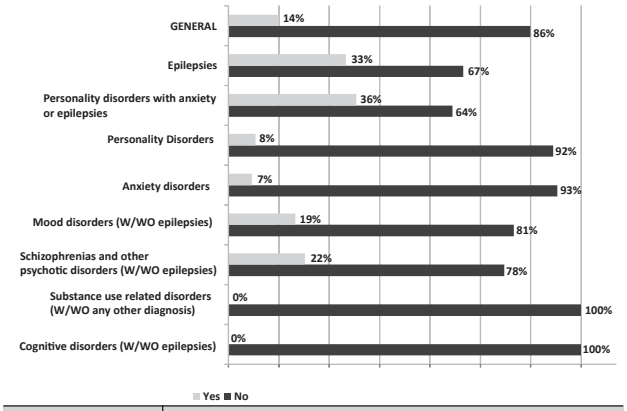

Figure 4 Diagnostic categories

under study, no statistically significant relationship was found between having MS and smoking habit. Furthermore, a statistically significant relationship was found between occupation (contemplating the above-mentioned categories), schooling and MS. On the contrary, the variable, age, with 97.6% confidence interval was found to be associated to having MS in the following way: patients between 40 and 59 years of age tend to suffer MS to a greater degree than the rest of the patients. It can be stressed that this relationship, when compared with the variable gender, prevails among women while it is not present among the men. That is, women between 40 and 59 years of age have MS in a greater proportion with a 98.4% confidence interval. In general, MS occurs to a greater degree in women than in men. Statistically, the hypothesis of nonexistence of relationship is rejected with 99.4% CI. In principle, there is no relationship between MS and the fact of having a family background of DM, BHP, HCL and HTG. On the other hand, the presence of any family background of obesity is statistically related with the presence of a MS with 97.7% CI. However, the presence of obesity with other family backgrounds may modify the force of the relationship with MS. The presence of MS seems to be more associated with persons who do not have a background of DM but do have one with obesity with 93.8% CI. Among the persons with the background of DM, there does not seem to be a relationship with the presence (or nonpresence) of MS and obesity. The presence of MS is associated, with 94.5% CI, with persons who in addition to having backgrounds of high blood pressure also have backgrounds of obesity. On the

Table 4 Significant variables of the study

Dependent variable	Method used	p** value	Observations
Blood pressure	*t*	0.0038 0.006	Variable used to construct the dependent variable
Glucose	*t*	0.000	Variable used to construct the dependent variable
Triglycerides	*t*	0.000	Variable used to construct the dependent variable
Waist circumference	*t*	0.000	Variable used to construct the dependent variable. P value obtained for both men and women.
HDL-C	*t*	0.000	Variable used to construct the dependent variable. P value obtained for both men and women.
Sedentary life	CMH	0.067	
Age	EEF	0.016	It only refers to women
Gender	EEF	0.006	
Family background-obesity	CMH	0.015	It could be considered as a false relationship, given that it does not remain when it is controlled by family backgrounds of HDL-C and HTG.
Diagnosis	EEF	0.0097	Re-categorized variable
Antipsychotics	EEF	0.081	Re-categorized variable
Antidepressants	EEF	0.085	Re-categorized variable
BZD	EEF	0.073	Re-categorized variable
Clonazepam	CMH	0.096	Dichotomous variable (absence/presence)

**The 1-p value represents the likelihood of rejection of the null hypotheses, but it does not indicate precedence in the significant variables. That is, the fact that a variable has a significance greater than another does not indicate that one of them is more important than the other (even less when a study has not been performed that analyzes the interactions of the variables, except when specified to the contrary).

contrary, among persons who do not have a family background of HBP, the backgrounds of obesity do not show a statistically significant relationship with the presence of MS. Among persons who do not have family backgrounds of HBP or DM, the presence of backgrounds of obesity is statistically related (97.6% CI) with MS. However, if there is any family background of HBP, DM or both, the presence of obesity is not statistically related with the presence of MS.

On using all the diagnostic categories, it cannot be determined if there is or is not (statistically) a relationship between MS and the suffering of the patients. When these diagnostic categories were recatagorized by their psychopathological compatibility, a total of 8 groups were obtained in which there were significant differences between some conditions and the presence or not of the MS (Figure 4).

The null hypothesis of nonexistence of a relationship between the presence of MS and diagnoses (regrouped in the previously explained way) with 99% CI is rejected, finding the following relationships (that can be seen in the previous figure).

Among the patients with cognitive disorders or substance-use related disorders, it is difficult to find persons suffering MS. On the contrary, among patients who have epilepsies (exclusively), or personality disorders and epilepsy or anxiety disorders, the percentage of patients with MS is more than twice that of the general mean. That is, there is a positive relationship between the syndrome and these psychopathologies. There is a negative relationship between personality or anxiety disorders (exclusives). However, a more profound study in this sense would be necessary to confirm these relationships.

Regarding the relationship between the treatment used for the previous 6 months and the presence of MS, the variables were recategorized as follows: among the antipsychotics (AP), a direct relationship was observed between the presence of the atypical AP and the presence of MS. Because of this, the variable was recategorized into: absence, typical, typical and other psychopharmaceuticals (in which the cases of atypical, atypical with other psychopharmaceuticals, both and both and other psychopharmaceuticals were included). When the variable was studied in this way, with a 91.9% confidence interval, significant relationships were found in negative relationship between the presence of MS and not having taken any psychopharmaceutical drugs in the last 6 months; positive relationship between having MS and having taken typical AP only in the last 6 months; positive relationship between having MS and having taken atypical AP in the last 6 months, this relationship being less strong than the previous; negative relationship between having SM and having taken typical AP and other psychopharmaceuticals in the last 6 months. On the other hand, no statistically significant relationships were found between the MS and having followed treatment with most of the antidepressants (AD). However, when the persons who followed treatment only with SSRI AD were compared with those who followed any other treatment or none, with 91.5% CI, a significant relationship was found between following a treatment based on only SSRI AD and the presence of MS. Among the patients who were under treatment with the anti-seizure drug (ASD), there was a greater proportion of patients with MS. However, this relationship is not statistically significant. Equally, patients who were under a Benzodiazepines (BZD)-based treatment had, to a greater extent, MS. In this case, the relationship is significant, rejecting the null hypothesis of nonexistence with 92.7% CI. When studying the previous results, the presence or absence of a psychopharmaceutal treatment (whichever) was compared, finding a positive relationship between that treatment and MS, with 91.9% CI. Herein, a general panorama is presented, summarizing the variables with statistical significance (Table 4).

DISCUSSION

The metabolic syndrome has become one of the public health problems in Mexico, as was mentioned in the introduction of this document. A total of 39.7% of the population will have MS in according to the recent epidemiological estimations.[9] The prevalence of MS in this study was 14% of the population studied, and therefore the prevalence of MS in the sample was not greater than that observed in the general population. Obesity and sedentary life were, in this study, the statistically significant factors of association to develop MS, obesity with 93% CI. Among persons with backgrounds of Diabetes Mellitus, there does not seem to be a relationship with the presence of MS. However, the syndrome is associated with 94.5% CI with obesity and hypertension. In the case of patients who do not have a family background of hypertension, although they were obese, there was no statistical relationship with the syndrome. When the 3 variables were combined to measure their influence, hypertension and diabetes mellitus were more indicative of MS then obesity per se.

When the different variables studied were compared, it was clearly seen that regardless of whether the patients had or did not have any mental disorder, the prevalence of MS in our country has conditioning factors that are applied to the entire population regardless of the subject's socioeconomic, scholastic level, civil status, occupation and other demographic variables. The principal characteristic for the development of the syndrome are having a sedentary life and obesity, and when these factors are present combined to familial hereditary backgrounds, they result in the presentation of metabolic risk. This situation may be related to unhealthy forms of styles of life of the mental

patients and the use of psychopharmaceuticals.[22-27] MS has a greater prevalence (37.50%) in persons whose ages range from 31 to 45 years and of 18.3%-39.4% in those whose age range is 40 to 49 years.[28] Equally, there is also greater prevalence in the female gender that has already been reported in other investigations.[29] Based on all of the above, in these population groups, preventive measures should be focused on in order to counteract the consequences for the health. In relationship to the age variable, it has been found that female gender, ages 40 to 59 years, tend to suffer the metabolic syndrome in a greater degree than the rest of the patients, with a confidence interval of 98.4%.

In this study, a positive relationship was found between psychopharmaceutical-based treatments and the presence of MS, with a significant confidence interval (91.9%). When it was compared with specific medications such as SSRIs, an equally significant correlation (91.5%) was found and when compared with BZD, it was also significant (92.7%). We do consider, as reported in many studies that evaluate the association of the use of psychopharmaceuticals and the presentation of MS, that our study reflects this association. It finds weight increase to be an important feature prior to this increase, with all the complications entailed in the fatty acid mobilization, alterations in glucose levels, blood pressure, which is also a validated condition in different reports in the literature.[30-33] However, considering that the hepatic function is decreased in patients with MS due to the presence of inflammatory cytokines that favor steatosis and pro-oxidant synthesis, this inducing apoptosis of the hepatocytes, activation of the hepatic stellate cells and fibrosis[34] and consequently a functional alteration of the P450 cytochromes, this would explain the alteration in the metabolism of the psychopharmaceuticals, such as antipsychotics, whose use is associated to significant weight grain and increase of body fatty deposits.[35] In our study, significant correlations were observed between Systemic Arterial Hypertension, Diabetes Mellitus and HDL cholesterol and MS, similar to that reported by controlled studies that evaluate the metabolic effects of atypical and typical antipsychotics.[36] In this sense, increased risk is reported in patients receiving antipsychotic treatment.[37]

Based on the results of this investigation, it is essential to determine the presence or absence of risk factors for MS in the evaluation of psychiatric patients, on which a consensus has been reached,[38, 39] considering the increase of cardiovascular and metabolic risk that may be precipitated in this type of patient. Among the professionals who should use the therapeutic measures aimed at decreasing cardiovascular risk, in this sense, non-pharmacological treatment (diet, physical activity) and pharmacological treatment of the metabolic syndrome significantly reduces the cardiovascular risk.[40, 41]

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