T. Sánchez-Araña Moreno[1]
R. Touriño González[2]
J. L. Hernández Fleta[3]
P. León Pérez[4]

Prevalence of the metabolic syndrome among schizophrenic patients hospitalized in the Canary Islands

[1] Day Unit
Department Psychiatriy
Hospital de la Merced
Osuna (Seville) (Spain)
[2] Centros de Día. Psychiatry Department
Hospital Universitario Insular de Gran Canaria
Universidad de Las Palmas de Gran Canaria (Spain)
[3] Mental Health Unit of Canalejas
Psychiatry Department
Hospital Universitario de Gran Canaria Dr. Negrín
Universidad de Las Palmas de Gran Canaria
(Spain)
[4] Short Study Hospitalization Unit
Psychiatry Department
Hospital Universitario de Gran Canaria Dr. Negrín
Universidad de Las Palmas de Gran Canaria
(Spain)

Introduction. Schizophrenic patients have a higher standardized mortality rate than that expected for the rest of the population. The prevalence of the metabolic syndrome is high among them, this increase coronary risk twofold to fourfold. This study aims to find out the prevalence of the metabolic syndrome among patients with schizophrenia and schizoaffective disorder who have been admitted to an acute psychiatric ward and the sociodemographic, evolutive and psychopharmaceutical variables related to it. We also hope to establish the extent of coronary risk and its relationship with the metabolic syndrome.

Method. Cross-sectional observational study including 136 adult patients over 18 years of age. They were admitted in the year 2004 to the Hospital Universitario de Gran Canaria Dr Negrín, with the diagnosis of schizophrenia or SCID-I validated schizoaffective disorder. The metabolic syndrome and coronary risk were defined according to NCEP-ATP III criteria.

Results. The prevalence of the metabolic syndrome in the population studied is 36 % (95 % CI: 29.4 to 45.6). The metabolic syndrome is associated to an older age ($p < 0.05$). Abdominal obesity is more prevalent among women ($p < 0.05$). Coronary risk in the next 10 years is moderate in 52.3 % of cases and high in 2.9 %. Increase in risk is associated to antipsychotic intake and to suffering metabolic syndrome ($p < 0.05$).

Conclusions. The prevalence of the metabolic syndrome among schizophrenic patients is high and it entails moderate to high coronary risk.

Key words:
Schizophrenia. Metabolic Syndrome. Coronary risk. Prevalence.

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Prevalencia del síndrome metabólico en pacientes esquizofrénicos hospitalizados en Gran Canaria

Introducción. Los pacientes esquizofrénicos tienen una tasa estandarizada de mortalidad más elevada que la esperada para el resto de la población. El síndrome metabólico tiene una alta prevalencia entre ellos, que aumenta entre dos y cuatro veces el riesgo coronario. El objetivo del presente estudio es conocer la prevalencia del síndrome metabólico en pacientes con esquizofrenia y trastorno esquizoafectivo ingresados en una unidad de agudos y las variables sociodemográficas, evolutivas y psicofarmacológicas que se relacionan con ella. Se pretende también conocer el riesgo coronario y su relación con el síndrome metabólico.

Método. Estudio observacional transversal. Se incluyen 136 pacientes, mayores de 18 años, ingresados durante el año 2004 en el Hospital Universitario de Gran Canaria Dr. Negrín con diagnóstico de esquizofrenia o trastorno esquizoafectivo validado mediante la SCID-I. Síndrome metabólico y riesgo coronario se han definido según criterios del NCEP-ATP III.

Resultados. La prevalencia de síndrome metabólico en la población estudiada es del 36 % (intervalo de confianza [IC] del 95 %: 29,4 a 45,6). El síndrome metabólico se asocia con una mayor edad ($p < 0,05$). La obesidad abdominal se asocia con el sexo femenino ($p < 0,05$). El riesgo coronario en los próximos 10 años es moderado en el 52,3 % de los casos y alto en el 2,9 %. El incremento del riesgo se asocia con la toma de antipsicóticos y con el padecimiento del síndrome metabólico ($p < 0,05$).

Conclusiones. La prevalencia del síndrome metabólico en la población de pacientes esquizofrénicos estudiados es alta y supone un riesgo coronario moderado-alto.

Palabras clave:
Esquizofrenia. Síndrome metabólico. Riesgo coronario. Prevalencia.

INTRODUCTION

The mortality of schizophrenic patients is twofold to fourfold greater than that expected for the rest of the po-

Correspondence:
Tomás Sánchez-Araña Moreno
Unidad de Día
Hospital de la Merced
Av. Constitución, 2
41640 Osuna (Sevilla) (Spain)
E-mail: TSAM567@gmail.com

pulation[1]. At present, the increased mortality among these patients is fundamentally due to suicide and medical diseases, among which cardiovascular ones stand out[2,3]. Therefore, it is estimated that life expectancy in these patients decreases by 9 to 12 years[4-5].

Metabolic syndrome is an association of multiple risk factors for the development of cardiovascular disease, it being observed that it is associated to obesity and insulin resistance in the majority of the patients[6]. Although there is currently no universally accepted definition of the metabolic syndrome, different groups of experts have proposed different criteria in an attempt to define this clinical disease. The most accepted criteria are those of the World Health Organization (WHO)[7], of the European Group for the Study of Insulin Resistance (EGIR),[8] of the National Cholesterol Education Program (NCEP-ATP III)[6,9] and those recently agreed on by the International Diabetes Federation (IDF, 2005)[10].

The clinical importance of the metabolic syndrome is due to its association with an elevated risk of coronary disease and diabetes, that increases mortality twofold to fourfold in regards to the general population[11,12].

In Spain, using the NCEP-ATP III criteria[6], the prevalence of metabolic syndrome is 20.8 % in men and 30.9 % in women[13]. The prevalence of the metabolic syndrome in the general population of the Canary Islands using the same criteria is estimated to be 24 %, there being no differences according to gender or the different islands of the archipelago. A greater prevalence of the syndrome is also associated with increased age and low socioeconomic level[14].

Furthermore, we know that schizophrenic patients have up to four times more risk than the rest of the population of suffering the so-called metabolic syndrome[15]. Some habits favored by the negative symptoms such as sedentary life style and unbalanced diet[16-17] as well as metabolic alterations associated to schizophrenia, such as an increase in insulin and cortisol resistance and glycemia, are increased by the side effects of a large number of antipsychotic drugs[18,19]. This complex interaction results in a high prevalence of cardiovascular risk factors such as obesity, dyslipidemia, hypertension and diabetes, all of them components of the metabolic syndrome, that contribute to the increase of morbidity-mortality and to the decrease in life expectancy of these patients[18].

Several authors coincide that patients with schizophrenia, regardless of whether they are receiving antipsychotic treatment or not, have greater vulnerability for abdominal obesity and glucidic metabolism abnormalities[20-22]. Some studies have found significantly higher levels of fasting glycemia, insulin resistance and cortisolemia in patients with a first episode of schizophrenia who have never been treated with antipsychotic drugs than in the controls paired by gender, age, life style and anthropometric parameters[23,24]. Other works also show that abdominal obesity is more frequent among schizophrenic patients who have never been treated than in the rest of the population, with estimations that they have an increase in intraabdominal fat of up to 3 times greater than in the case of the controls[25-28].

Different studies, including American and European ones, estimate the prevalence of the metabolic syndrome to be between 19.4 % and 64 %[29-34]. This prevalence varies according to the different diagnostic criteria used to define the metabolic syndrome, that is, the ethnic group, gender, age distribution, sedentary life, diet and probably antipsychotic treatment[35,36].

There are no studies published on the prevalence of the metabolic syndrome in the population with schizophrenia up to now in Spain. This study aims to discover the prevalence of the metabolic syndrome in schizophrenic or schizoaffective patients admitted to the psychiatry department of the Hospital Universitario de Gran Canaria Dr. Negrín (University Hospital of the Canary Islands Dr. Negrin) during the year 2004, as well as the sociodemographic, evolutive and psychopharmacological variables related with it. It also aims to discover the coronary risk and its relationship with the metabolic syndrome.

METHOD

The population studied is made up of patients who were admitted to the Short Stay Hospitalization Unit of the Hospital Universitario de Gran Canaria Dr. Negrín during 2004 and who fulfilled the enrollment criteria. These consisted in: DSM-IV-TR[37] diagnosis of schizophrenia or schizoaffective disorder validated by the Structured Clinical Interview for axis I (SCID-I) in its clinical version38 and age range from 18 to 75 years.

The study was approved by the scientific and ethics committee of the hospital and all the patients enrolled in it signed the informed consent.

Of the 149 patients initially selected, 10 were excluded because they did not agree to sign the informed consent and 3 because it was impossible to validate the diagnosis. Finally, the population studied was made up of 136 individuals.

Metabolic syndrome was defined by the NCEP-ATP III9 criteria (table 1). Abdominal circumference was measured with an non-extendable tape measure, the individual in standing position, using half of the distance between the lower rib margin and iliac crest as reference. Blood pressure was measured three times, each one separated by two days. This was done manually, by placing an inflatable cuff connected to a mercury sphygmomanometer, calibrated between 0 and 300 mmHg on the dominant arm at the height of the heart. Pressure was measured with the subject in sitting position after 10 minutes of rest. The average of the three measurements was used as the final result. Glycemia, HDL

Table 1 Criteria of metabolic syndrome according to the NCEP-ATP III (Grundy et al., 2004)

Abdominal obesity (abdominal circumference in men >102 cm and in women > 88 cm)
Hypertriglyceridemia > 150 mg/dl
Cholesterol HDL (men < 40 mg/dl and women < 50 mg/dl)
Blood pressure > 130/85 mmHg
Baseline glycemia > 100 mg/dl

It is considered that a patient suffers metabolic syndrome when 3 or more of the criteria are fulfilled.

cholesterol and triglycerides values were measured by serum biochemistry test after 12 hour fasting. The Quetelet formula (kg/m^2) was used to obtain Body Mass Index (BMI) and we used the proposal of the consensus of the Spanish Society for the Study of Obesity (SEED, 2000)[37] for the definition of overweightness and obesity.

During admission, we used a questionnaire especially designed for this study that collected sociodemographic data (age, gender, civil status: single-married-other, living with: alone-family-others, educational level: basic-primary school-secondary school-university graduate, pension its: yes-no and family economic condition: < or > 276.30 euros/month [minimum interprofessional salary]), evolutional data (age of onset of disorder, evolution time in years, the number of previous admissions, personal medical background and family medical background according to ICD-10) related with psychopharmacological treatment and toxic consumption. Abuse or dependence on different toxics was defined according to the DSM-IV-TR[38] criteria and was validated by the clinical version of SCID-I[39]. To quantify smoking habit, the average number of cigarettes/day smoked during the last three months was estimated. In relationship to compliance with the medication, we evaluated the three months prior to the enrollment of the patient in the study and we considered those patients who had taken 70 % or more of the medication prescribed during the period evaluated as compliers. The information was obtained from the patients themselves and, when possible, was compared with the family.

The NCEP-ATP III tables[5] were used to calculate coronary risk.

The Global Assessment of Functioning Scale (GAFS)[38], which is a descriptive instrument that provides a single score on patient functioning, was used to evaluate global activity.

The chi squared test was used in qualitative variables. Grade of association between qualitative variables was calculated with the odds ratio. After verifying a normal distribution in continuous variables, the Student's *t* test was used. Confidence interval was established at 95 % for all the analyses. Logistic regression was used in the multivariate analysis and the presence of metabolic syndrome was included as dependent variable and those variables in which the crude analyses had statistical significance ($p < 0.05$) were used as co-variables. However, it was considered appropriate to exclude the BMI covariable because there was a high agreement between the mentioned variable and abdominal obesity which, as we know, is one of the elements that makes up the metabolic syndrome. The SPSS 12.1 statistical program for Windows was used.

RESULTS

Description of the population studied

The population studied was made up of 136 individuals (89 men and 47 women) with a mean age of 39.1 years (± 9.2). A total of 81.6 % of the patients were single, 77.9 % lived with their family of origin and 71.3 % were pensioners due to mental disease. The education level in most of the cases was basic (38 %) and family income was an average of 783.1 ± 688.2 euros/month. The patients studied had an average of 17.4 (± 9.1) years of evolution of their schizophrenia. Furthermore, average psychiatric admissions in the last 5 years were 2.1 (± 1.9).

A total of 75.7 % of the population studied reported personal background of medical disease and 45.4 % had a background of first grade hypertension, 32.4 % dyslipidemia and 27.2 % diabetes. The mean Body Mass Index (BMI) in the population studies was 26.5 (± 6.7). A total of 33 % of the patients studied were overweight and 21.8 % obese.

It was found that 67.6 % of the patients smoked, the average consumption being 25.4 cigarettes/day (± 21.2) and 54.4 % smoked more than 20 day/day. After tobacco, the most consumed toxics are alcohol (33.8 %) and cannabinoids (21.3 %).

A total of 89.8 % of the patients studied complied with the treatment with antipsychotics and benzodiazepines consumption (72.8 %) was also elevated. There were 14 patients who did not follow any type of treatment during the three months prior to hospital admission.

In the Global Assessment of Functioning Scale (GAF), the mean score of the patients studied is 33.86 (± 9.52). It corresponds to a behavior influenced by delusional ideas and/or serious alterations of communication or judgment and/or incapacity to function in all the areas.

Metabolic syndrome

The total prevalence in the population studied is 36 % (95 % CI: 29.4 to 45.5). In regards to the prevalence of the different components of the metabolic syndrome in the pa-

tients studied, 61.2 % fulfill criteria for arterial hypertension, 57.3 % for abdominal obesity, 34.5 % for the low levels of high density lipoprotein cholesterol (HDL-C), 24.3 % for hypertriglyceridemia and finally 8.1 % fulfill criteria for hyperglycemia. In regards to the number of criteria of metabolic syndrome, 24.6 % of the population studied fulfill only one criteria, 32.4 % to criteria, 21.7 % three criteria, 12.3 % for criteria and finally 2 % five criteria.

In regards to sociodemographic and evolutional variables we found a statistically significant association (< 0.05) between older age and metabolic syndrome (table 2). Regarding the prevalence according to gender of the different components that make up the metabolic syndrome, there is a statistically significant association of the female gender with abdominal obesity ($p < 0.05$).

We did not find any statistically significant association of the metabolic syndrome with toxic consumption (tobacco, alcohol, cannabis, opiates or cocaine). Regarding the taking of medication, we also did not find any statistically significant association between the taking of the different psychodrugs and suffering the metabolic syndrome.

Coronary risk

The average coronary risk estimated for the study population according to the NCEP-ATP III tables is 7.52 % at

Table 2 Sociodemographic, evolutional and metabolic syndrome variables

	Metabolic syndrome		Total	p	Adjusted OR (95 % CI)
	No	Yes			
Gender					
Men	55 (62.3 %)	32 (36.7 %)	87	0.72 (NS)	
Women	32 (65.3 %)	17 (34.6 %)	49		
Age (mean ± SD)	37.8 ± 9.4	41.3 ± 8.4	136	< 0.05	1.010 (0.938 -1.089)
Civil state					
Single	73 (65.8 %)	38 (34.2 %)	111	0.46 (NS)	
Married	2 (40 %)	3 (60 %)	5		
Others	12 (60 %)	8 (40 %)	20		
Study levels					
Basic	33 (67.4 %)	16 (32.6 %)	49	0.90 (NS)	
Primary school	22 (62.8 %)	13 (37.2 %)	35		
Secondary	24 (63.1 %)	14 (36.9 %)	38		
University	8 (57.2 %)	6 (42.8 %)	14		
Living arrangement					
Alone	12 (54.5 %)	10 (45.5 %)	22	0.13 (NS)	
Family	72 (67.3 %)	34 (32 %)	106		
Others	3 (37.5 %)	5 (62.5 %)	8		
Pensioner					
No	32 (82.1 %)	7 (17.9 %)	39	0.14 (NS)	
Yes	55 (56.7 %)	42 (43.3 %)	97		
Family socioeconomic level					
< 276.30 euros/moth	43 (66.2 %)	22 (33.8 %)	65	0.61 (NS)	
> 276.30 euros/moth	44 (61.2 %)	27 (38.8 %)	71		
Onset age (years) (mean ± SD)	21.8 ± 5.7	21.2 ± 3.9	136	0.46 (NS)	
Evolution (years) (mean ± SD)	15.8 ± 8.5	20.1 ± 9.4	136	0.60 (NS)	
Previous admissions (mean ± SD)	2.0 ± 1.7	2.3 ± 2.2	136	0.44 (NS)	
Family background of hypertension	40 (64.5 %)	22 (35.5 %)	62	0.90 (NS)	
Family background of dyslipidemia	29 (66 %)	15 (34 %)	44	0.74 (NS)	
Family background of diabetes	24 (64.9 %)	13 (35.1 %)	37	0.89 (NS)	
BMI (kg/m^2)	24.6 ± 4.8	29.9 ± 8.0	136	< 0.05*	
GAFS (mean ± SD)	33.7 ± 9.8	33.9 ± 8.9	136	0.91 (NS)	

NS: non-significant; GAFS: global assessment of functioning scale. * Variable not included in adjusted analysis.

10 years (± 6.06). This corresponds to a moderate risk. A total of 52.3 % of the patients studied had moderate risk and 2.9 % had high coronary risk.

The likelihood that the patients who suffer metabolic syndrome will suffer a coronary event at 10 years is 10.16 % (± 5.32); while that they will not suffer it is 6.03 % (± 5.98). This difference is statistically significant ($p < 0.05$).

Furthermore, the patients who take antipsychotic drugs have a coronary risk at 10 years of 7.98 % (± 5.83) compared to 3.50 % (± 6.75) for those who do not take them. This difference is also statistically significant ($p < 0.05$).

DISCUSSION

The results obtained show an elevated prevalence of the metabolic syndrome: 36 % (95 % CI: 29.4 to 45.6). In the general population of the Canary Islands, the prevalence of the metabolic syndrome is estimated to be 24.5 % (95 % CI: 19.5 to 29.7)[14].

The values existing in the few studies on prevalence of the metabolic syndrome in schizophrenic patients range from 19.4 % to 63 %[29-34]. However, the prevalence found in our study, in spite of the fact that the mean age was less than in most of the works published, is similar to the majority of the European studies[15,29-31], and to that of some American studies[32,33].

Regarding the distribution of the different components of the metabolic syndrome in the population study, we found that arterial hypertension is the most prevalent component, it being approximately 61 % followed by abdominal obesity, by low HDL-c, hypertriglyceridemia and finally by elevated glycemia (fig. 1). A similar result was obtained by Hernández in the estimation made for the general population of the Canary Islands[14], it being shown that the prevalences of different components of the metabolic syndrome in both works are similar even though arterial hypertension and abdominal obesity are more prevalent in our study (fig. 1).

When we compare the number of criteria of metabolic syndrome fulfilled by the schizophrenic patients studied in the work of Hernández performed in the general population of the Canary Islands[14], we observe that there is a greater proportion of schizophrenic patients with two criteria (fig. 2). This information allows us to approach the health care burden that the future health care system would have to support, understanding that it is likely that those individuals who fulfill two diagnostic criteria of the metabolic syndrome, as long as the prevalence of this increases with age, will fulfill another criteria in the future and thus they will be defined as affected by the syndrome.

In the patients studied according to the NCEP-ATP III criteria,[9] we found a 61.2 % prevalence for arterial hypertension, which accounts for an increase of almost 20 % in regards to the estimation made for the general population of the Canary Islands[14]. Furthermore, the prevalence values found for arterial hypertension in the different studies conducted in schizophrenic patients are very different and range from 19 % to 57.7 %[40]. Thus, it is not easy to compare them, which contributes to the lack of unanimity regarding whether arterial hypertension is more frequent among the patients. The result obtained in our study seems to follow the line given by different authors who maintain that the prevalence of arterial hypertension in the patients with schizophrenia could be somewhat more elevated than in the rest of the population[31,33,34,41-43].

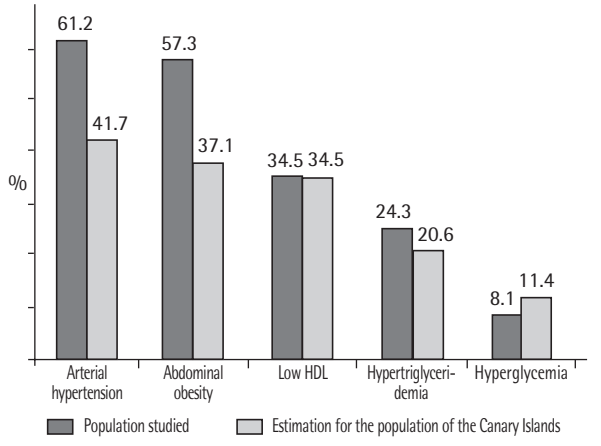

Figure 1 *Prevalence of the different components of the metabolic syndrome in the schizophrenics studied and in the population of the Canary Islands (Hernández, 2005).*

On the other hand, the high prevalence of abdominal obesity found in the population studied (57.3 %) accounts for an increase that exceeds 20 % in regards to the general population of the Canary Islands. However, this prevalence agrees with that found in the different studies conducted in

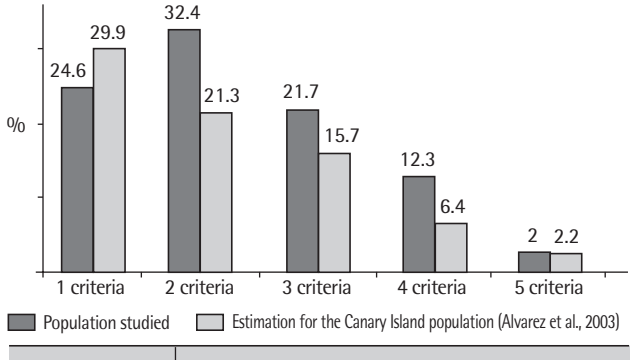

Figure 2 *Percentage of patients studied and of the general population of the Canary Islands who fulfill any defining criteria of the metabolic syndrome according to the NCEP-ATP III.*

schizophrenic patients[30,31,43-45]. By gender, we found a 78.7% prevalence in the case of women, the association of abdominal obesity with female gender being statistically significant ($p < 0.05$). This association has already been described by different authors[31-34]. Values for obesity in schizophrenia range from 42% to 90% according to the studies and is, in most of the cases, one of the components of the syndrome that has the greatest prevalence among schizophrenics. These results confirm abdominal type obesity as a basic milestone of the metabolic syndrome in these patients[6,10,28,46].

Regarding the prevalences of hypertriglyceridemia and low HDL-c in the schizophrenic patients studies, they are practically the same as those estimated for the general population of the Canary Islands. However, although the results of the different studies performed in schizophrenic patients show great difference in the values of hypertriglyceridemia and HDL-c, our results are similar to those of different European works[15,30,31], which are those which have the lowest figures.

Even though some studies suggest that the prevalence of elevated glycemia in schizophrenics could be twice that in the general population[42,47,48], the prevalence of elevated glycemia obtained in the patients studied seems to agree with different studies conducted in schizophrenic patients which also do not find significant differences when the prevalence of hyperglycemia is compared with their respective reference populations[15,33,34,44]. It could be thought that the fact that we are dealing with a young population in our case, with a limited population size and with limited family background, could justify the results found.

As Heiskanen et al.[29], Kato et al.[34] and Basu et al.[44], we also found a statistically significant association ($p < 0.05$) among those patients who suffer the syndrome with higher values of blood pressure (both systolic and diastolic) of baseline glycemia, of total cholesterol, of triglycerides and of abdominal circumference. Furthermore, a significant association ($p < 0.05$) of the metabolic syndrome with lower values of HDL-c was also found.

The association of the metabolic syndrome with increase of age has been reviewed in different prevalence studies conducted in general populations[49-52], including the Canary Islands[14,52]. In regards to the different studies conducted in schizophrenic patients, all of them, except for those of Cohn et al[45]. and Hägg et al[31], share the increase of prevalence with age. We have found an association of the syndrome with older age that was also statistically significant ($p < 0.05$).

As occurs with the data estimated for the general population of the Canary Islands, significant differences in the schizophrenics studies were also not found in the prevalence of the metabolic gender by genders. Except for the works of McEvoy et al.[33] and Kato et al.[34], who did find a significant association with the female gender, the result of our study agrees with that of the remaining epidemiological studies conducted in schizophrenic patients, that also did not find significant differences in prevalence by gender.

However, in the population studied, the order of frequency of the different components making up the metabolic syndrome by genders is different. In the case of the male, the most frequent is arterial hypertension (52.8%), followed in the first place by abdominal obesity (46%), by low HDL-c (33.7%), hypertriglyceridemia (29.2%) and finally the elevated glycemia (9%). In the case of the woman, the most frequent component, with a wide difference, is abdominal obesity (78.7%), followed by arterial hypertension (46.8%), low HDL-c (36.1%), hypertriglyceridemia (14.9%) and finally elevated glycemia (6.4%).

Regarding the evolutional variables, we did not find any associations with the metabolic syndrome, thus coinciding with the works of Saari et al.[15] and Heiskanen et al.[29] In regards to BMI in the crude analysis, we found, as did the studies of Kato et al.[34] and Hagg et al.[31], a significant association of the metabolic syndrome with a more elevated BMI. This association, in the case of our study, is partially expected given the high agreement existing between abdominal obesity and BMI.

We did not find any association of toxic consumption with the metabolic syndrome in schizophrenic patients, which coincides with Meyer et al.[32] However, we believe that the high percentage of smokers (67.6%) in these patients is significant. It doubles that of the general population of the Canary Islands (31.7% according to the Health Survey of the Canary Islands 2004[53]). This result coincides with the data published in the literature in this regards, that estimates that the percentage of smokers among schizophrenic patients is twice that estimated for the general population[54-56].

Regarding psychopharmacological treatment, in the crude analysis we found a statistically significant association ($p < 0.05$) among those patients who suffer metabolic syndrome and those who take antipsychotics or benzodiazepines. However, when the multivariate analysis was made later, these associations were not significant. At present, only the recent works of Newcomer and Haupt[35] and of Lamberti et al.[57] establish an association between the metabolic syndrome and antipsychotic treatment. However, there is firm evidence of the relationship of antipsychotic treatment with the majority of the metabolic syndrome components[58,59]. In the population studied, taking antipsychotics is fundamentally associated with abdominal obesity and alteration of lipid profile (hypertriglyceridemia and decrease of HDL-c). This result may be due to the fact that some antipsychotics cause weight gain, that is fundamentally accumulated in the abdomen[60-62] and alter the lipid profile[63-66]. In the case of benzodiazepines, it is likely that in the crude analysis antipsychotic treatment will act as a confounding

factor since 99% of the patients who take benzodiazepines also take antipsychotics.

Another one of the secondary objectives of our study has been to estimate coronary risk for the next 10 years in the patients of the population studied and its relationship with the metabolic syndrome. The group of patients studied who suffer metabolic syndrome has almost twice the likelihood of having a coronary event at 10 years than those who do not suffer it, this difference being significant ($p < 0.05$). This result shows a greater risk than that estimated by Goff et al.[42] for schizophrenic patients and coincides with the data collected in the literature that associates the metabolic syndrome with a coronary risk that is twice or three times that expected for the rest of the population[12,67,68]. Furthermore, the patients who take any type of antipsychotic have a coronary risk at 10 years that is twofold greater than those who do not take them ($p < 0.05$). This increases in risk could be a consequence of endocrinological alterations secondary to the medication that favors the development of the metabolic syndrome[58,59,69].

As methodological limitations of the study, we stress those characteristic of cross-sectional studies, the limited population size and lack of data on the dietary habits or sedentary life. On the other hand, the fact that the population studied is made up of hospitalized patients prevents the results obtained from being generalizable to the rest of the out-patient schizophrenic population. In addition, we consider that the methodological design of the study does not make it possible to assure compliance with the psychopharmacological treatment since the only source we have had to obtain information on some occasions has been the patient.

With this study, we aim to contribute to better epidemiological knowledge of the metabolic syndrome and of the cardiovascular risk factors in the schizophrenic population through the contribution of data on the prevalence of the metabolic syndrome and indirect coronary risk. If we associate the prevalence data of the metabolic syndrome found in the population studied with cardiovascular risk determined by this syndrome, we will immediately understand its clinical importance. The tendency of these patients to suffer obesity, hypertension and dyslipidemia and the influence of antipsychotic treatment on most of the elements that make up this syndrome are a reason for alarm that converts the fight against the metabolic syndrome into an essential objective of cardiovascular prevention in these patients.

REFERENCES

1. Brown S. Excess mortality of schizophrenia. A meta-analysis. Br J Psychiatry 1997;171:502-8.
2. Curkendall SM, Mo J, Glasser DB, Rose Stang M, Jones JK. Cardiovascular disease in patients with schizophrenia in Saskatchewan, Canada. J Clin Psychiatry 2004;65:715-20.
3. Enger C, Weatherby MS, Reynolds RF, Glasser DB, Walker AM. Serious cardiovascular events and mortality among patients with schizophrenia. J Nerv Ment Dis 2004;192:19-27.
4. Newman SC, Bland RC. Mortality in a cohort of patients with schizophrenia: a record linkage study. Can J Psychiatry 1991; 36:224-39.
5. Harris EC, Barraclough B. Excess of mortality of mental disorders. Br J Psychiatry 1998;177:11-53.
6. Executive summary of the Third Report of the National Cholesterol Education Program (NCEP). Expert Panel on detection, evaluation and treatment of high blood cholesterol in adults (Adult Treatment Panel III). JAMA 2001;285:2486-97.
7. World Health Organization. Definition, diagnosis and classification of diabetes mellitus and its complications. Report of a WHO consultation, 1999.
8. Balkau B, Charles MA, Drivsholm T, Borch-Johnsen K, Wareham N, Yudkin JS, et al. European Group For The Study Of Insulin Resistance (EGIR). Frequency of the WHO metabolic syndrome in European cohorts, and an alternative definition of an insulin resistance syndrome. Diabetes Metab 2002;28:364-76.
9. Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB, et al. Coordinating Committee of the National Cholesterol Education Program. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines. J Am Coll Cardiol 2004;44:720-32.
10. International Diabetes Federation: The IDF consensus worldwide definition of the metabolic syndrome. Consulted on September 20, 2005 in: www.idf.org/webdata/docs/Metabolic_syndrome_definition. pdf.
11. Ford ES. The metabolic syndrome and mortality from cardiovascular disease and all-causes: findings from the National Health and Nutrition Examination Survey II Mortality Study. Atherosclerosis 2004;173:309-14.
12. Citrome L. Metabolic syndrome and cardiovascular disease. J Psychopharmacol 2005;19(Suppl. 6):84-93.
13. Lorenzo C, Serrano-Ríos M, Martínez-Larrad MT, Gabriel R, Williams K, Gómez-Gerique et al. Central adiposity determines prevalence differences of the metabolic syndrome. Obes Res 2003;11:1480-7.
14. Hernández Díaz JF. Prevalencia y características del síndrome metabólico en las islas Canarias. Doctorate thesis. Universidad de la Laguna. Departamento de Medicina y Salud pública, 2005.
15. Saari KM, Lindeman SM, Viilo KM, Isohanni MK, Jarvelin MR, Lauren LH et al. A 4-fold risk of metabolic syndrome in patients with schizophrenia: the Northern Finland 1966 Birth Cohort study. J Clin Psychiatry 2005;66:559-63.
16. McCreadie RG. Diet, smoking and cardiovascular risk in people with schizophrenia: descriptive study Br J Psychiatry 2003;183: 534-39.
17. Connolly M, Kelly C. Lifestyle and physical health in schizophrenia. Advan Psychiatr Treat 2005;11:125-32.
18. Thakore JH. Metabolic syndrome and schizophrenia. Br J Psychiatry 2005;186:455-6.
19. Toalson P, Ahmed S, Hardy T, Kabinoff G. The Metabolic Syndrome in Patients With Severe Mental Illnesses. Prim Care Companion J Clin Psychiatry 2004;6:152-8.
20. Thakore JH. Metabolic disturbance in first-episode schizophrenia. Br J Psychiatry Suppl 2004;47:76-9.

21. Dixon L, Weiden P, Delahanty J, Goldberg R, Postrado L, Lucksted A, et al. Prevalence and correlates of diabetes in national schizophrenia samples. Schizophr Bull 2000;26:903-12.
22. Henderson DC, Ettinger ER. Schizophrenia and diabetes. Int Rev Neurobiol 2002;51:481-501.
23. Ryan MC, Collins P, Thakore JH. Impaired fasting glucose tolerance in first-episode, drug-naive patients with schizophrenia. Am J Psychiatry 2003;160:284-9.
24. Subramaniam M, Chong SA, Pek E. Diabetes mellitus and impaired glucose tolerance in patients with schizophrenia. Can J Psychiatry 2003;48:345-7.
25. Thakore JH, Mann JN, Vlahos I, Martin A, Reznek R. Increased visceral fat distribution in drug-naive and drug-free patients with schizophrenia. Int J Obes Relat Metab Disord 2002;26:137-41.
26. Ryan MC, Flanagan S, Kinsella U, Keeling F, Thakore JH. The effects of atypical antipsychotics on visceral fat distribution in first episode, drug-naive patients with schizophrenia. Life Sci 2004;74:1999-2008.
27. Zhang ZJ, Yao ZJ, Liu W, Fang Q, Reynolds GP. Effects of antipsychotics on fat deposition and changes in leptin and insulin levels. Magnetic resonance imaging study of previously untreated people with schizophrenia. Br J Psychiatry 2004;184:58-62.
28. Kato MM, Currier MB, Villaverde O, González-Blanco M. 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;7:115-20.
29. Heiskanen T, Niskanen L, Lyytikainen R, Saarinen PI, Hintikka J. Metabolic syndrome in patients with schizophrenia. J Clin Psychiatry 2003;64:575-9.
30. De Hert M, Van Winkel R, Van Eyck D, Hanssens L, Wampers M, Scheen A, et al. Prevalence of the metabolic syndrome in patients with schizophrenia treated with antipsychotic medication. Schizophr Res 2006;83:87-93.
31. Hagg S, Lindblom Y, Mjorndal T, Adolfsson R. High prevalence of the metabolic syndrome among a Swedish cohort of patients with schizophrenia. Int Clin Psychopharmacol 2006;21:93-8.
32. Meyer JM, Nasrallah HA, McEvoy JP, Goff DC, Davis SM, Chakos M, et al. The Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) Schizophrenia Trial: clinical comparison of subgroups with and without the metabolic syndrome. Schizophr Res 2005;80:9-18.
33. McEvoy JP, Meyer JM, Goff DC, Nasrallah HA, Davis SM, Sullivan L, 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.
34. Kato MM, Currier MB, Gómez CM, Hall L, González-Blanco M. Prevalence of metabolic syndrome in Hispanic and Non-Hispanic Patients With Schizophrenia. Prim Care Companion J Clin Psychiatry 2004;6:74-7.
35. Newcomer JW, Haupt DW. The metabolic effects of antipsychotic medications. Can J Psychiatry 2006;51:480-91.
36. Sánchez-Araña T, Touriño R, Hernández JL, León P. High prevalence of metabolic syndrome in schizophrenic patients: a review of literature. Psiq Biol 2006:13:127-35.
37. Sociedad Española para el Estudio de la Obesidad (SEEDO). Consenso para la evaluación del sobrepeso y la obesidad y el establecimiento de criterios de intervención terapéutica. Med Clin 2000;115:587-97.
38. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. Fourth edition. Text revision (DSM-IV-TR). Washington, 2000.
39. First MB, Spitzer RL, Gibbon M, Williams JB. Structured Clinical Interview for DSM-IV Axis I Disorders-Clinician version (SCID-CV). Washington: American Psychiatric Press Inc, 1997.
40. Newcomer JW. Medical risk in patients with bipolar disorder and schizophrenia. J Clin Psychiatry 2006;67(Suppl. 9):25-30.
41. Rodríguez O, Delgado M, Apolinaire JJ. Riesgo cardiovascular en pacientes esquizofrénicos con seguimiento ambulatorio en atención primaria de salud, 2005. Consulted on December 4, 2005. In: //psiquiatria.com/artículos/psicosis/esquizofrenia/21818.
42. Goff DC, Sullivan LM, McEvoy JP, Meyer JM, Nasrallah HA, Daumit GL, et al. A comparison of ten-year cardiac risk estimates in schizophrenia patients from the CATIE study and matched controls. Schizophr Res 2005b;80:45-53.
43. Meyer J, Loh C, Leckband SG, Boyd JA, Wirshing WC, Pierre JM, et al. Prevalence of the metabolic syndrome in veterans with schizophrenia. J Psychiatr Pract 2006;12:5-10.
44. Basu R, Brar JS, Chengappa KN, John V, Parepally H, Gershon S, et al. The prevalence of the metabolic syndrome in patients with schizoaffective disorder-bipolar subtype. Bipolar Disord 2004;6:314-8.
45. Cohn T, Prud'homme D, Streiner D, Kameh H, Remington G. Characterizing coronary heart disease risk in chronic schizophrenia: high prevalence of the metabolic syndrome. Can J Psychiatry 2004;49:753-60.
46. Carr DB, Utzschneider KM, Hull RL, Kodama K, Retzlaff BM, Brunzell JD, et al. Intra-abdominal fat is a major determinant of the National Cholesterol Education Program Adult Treatment Panel III criteria for the metabolic syndrome. Diabetes 2004;53:2087-94.
47. Henderson DC, Ettinger ER. Schizophrenia and diabetes. Int Rev Neurobiol 2002;51:481-501.
48. Bushe C, Holt R. Prevalence of diabetes and impaired glucose tolerance in patients with schizophrenia. Br J Psychiatry Suppl 2004;47:67-71.
49. Serrano M, Ascaso JF, Blázquez E, Cabezas J, Carmena R, Escobar F, et al. Grupo de Trabajo Resistencia a la insulina de la Sociedad Española de Diabetes. Resistencia a la insulina y su implicación en múltiples factores de riesgo asociados a diabetes tipo 2. Med Clin 2002;119:458-63.
50. Martínez MJ, Martínez MT, Serrano M. Síndrome de resistencia a la insulina y síndrome metabólico: similitudes y diferencias. Síndrome metabólico: concepto, fisiopatología y epidemiología. Cardiovasc Risk Factors 2003;12:89-95.
51. Ford ES. The metabolic syndrome and mortality from cardiovascular disease and all-causes: findings from the National Health and Nutrition Examination Survey II Mortality Study. Atherosclerosis 2004;173:309-14.
52. Álvarez EE, Ribas L, Serra L. Prevalencia del síndrome metabólico en la población de la Comunidad Canaria. Med Clin 2003;120: 172-4.
53. Servicio del Plan de Salud e Investigación del Servicio Canario de Salud. Encuesta de Salud de Canarias 2004. Consejería de Sanidad y Consumo del Gobierno de Canarias. Santa Cruz de Tenerife, 2004. Consulted on December 9, 2005. In: http: //www.gobiernodecanarias.org/sanidad/scs/psc.htm.

54. Llerena A, de la Rubia A, Penas-Lledo EM, Díaz FJ, de León J. Schizophrenia and tobacco smoking in a Spanish psychiatric hospital. Schizophr Res 2003;60:313-7.
55. Ortega JM, Gurpegui M, Díaz FJ, de León J. Tabaco y esquizofrenia. Adicciones 2004;16(Suppl. 2):177-90.
56. De León J, Díaz FJ. A meta-analysis of worldwide studies demonstrates an association between schizophrenia and tobacco smoking behaviors. Schizophr Res 2005;76:135-57.
57. Lamberti JS, Olson D, Crilly JF, Olivares T, Williams GC, Tu X, et al. Prevalence of the metabolic syndrome among patients receiving clozapine. Am J Psychiatry 2006;163:1273-6.
58. Masand PS, Mago R. Second-generation Antipsychotics and the Metabolic Syndrome. Curr Psychiatry Rep 2005;7:153-4.
59. Newcomer JW. Clinical considerations in selecting and using atypical antipsychotics. CNS Spectr 2005;10(Suppl. 8):12-20.
60. Wirshing DA. Schizophrenia and obesity: impact of antipsychotic medications. J Clin Psychiatry 2004;65(Suppl. 18):13-26.
61. Haddad P. Weight change with atypical antipsychotics in the treatment of schizophrenia. J Psychopharmacol 2005;19(Suppl. 6): 16-27.
62. Homel P, Casey D, Allison DB. Changes in body mass index for individuals with and without schizophrenia, 1987-1996. Schizophr Res 2002;55:277-84.
63. Meyer JM. Effects of atypical antipsychotics on weight and serum lipid levels. J Clin Psychiatry 2001;62(Suppl. 27):27-34.
64. Casey DE, Haupt DW, Newcomer J, Henderson DC, Sernyak MJ, Davidson M, et al. Antipsychotic-Induced weight gain and metabolic abnormalities: implications for increased mortality in patients with schizophrenia. J Clin Psychiatry 2004;65(Suppl. 7):4-20.
65. Meyer JM, Koro CE. The effects of antipsychotic therapy on serum lipids: a comprehensive review. Schizophr Res 2004;70:1-17.
66. Henderson DC. Schizophrenia and comorbid metabolic disorders. J Clin Psychiatry. 2005;66(Suppl. 6):11-20.
67. Isomaa B, Almgren P, Tuomi T, Forsen B, Lahti K, Nissen M, Taskinen MR, Groop L. Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes Care 2001;24: 683-9.
68. McNeill AM, Rosamond WD, Girman CJ, Golden SH et al. The metabolic syndrome and 11 year risk of incident cardiovascular disease in the atherosclerosis risk in communities study. Diabetes Care 2005;28:385-90.
69. American Diabetes Association, American Psychiatric Association, American Association of Clinical Endocrinologists, North American Association for the Study of Obesity. Consensus development conference on antipsychotic drugs and obesity and diabetes. J Clin Psychiatry 2004;65:267-72.