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ORIGINAL ARTICLE

Nutritional status, food intake and cardiovascular disease risk in individuals with schizophrenia in southern Brazil: A case–control study☆

Daniela Nunes[a,b], Bianca Eskinazi[b], Fernanda Camboim Rockett[b,c], Vera Beatriz Delgado[d], Ingrid Dalira Schweigert Perry[b,e,*]

[a] *Residência Integrada Multiprofissional em Saúde com ênfase em Saúde Mental, Hospital de Clínicas de Porto Alegre, Porto Alegre, Brazil*
[b] *Centro da Pesquisa em Nutrição e Dietética, Hospital de Clínicas de Porto Alegre/Universidade Federal do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil*
[c] *Post-Graduation Program in Medicine, Medical Sciences, Universidade Federal do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil*
[d] *Servicio de Enfermería Psiquiátrica, Hospital de Clínicas de Porto Alegre, Porto Alegre, Brazil*
[e] *Servicio de Medicina Interna, Universidade Federal do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil*

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KEYWORDS
Schizophrenia;
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Obesity;
Overweight;
Food intake

Abstract
Objectives: To verify food consumption patterns and presence of risk anthropometric parameters in schizophrenic patients, trying to assess some modifiable cardiovascular risk.
Method: Twenty-five schizophrenic outpatients, attended at the Hospital de Clínicas de Porto Alegre, Brazil, and 25 healthy controls matched by sex, age and body mass index (BMI) were included. Demographic (age, sex and socioeconomic status), anthropometric (weight, height and waist circumference), clinical (antipsychotics) and dietary consumption data (food frequency questionnaire) were obtained.
Results: There was a 40% frequency of overweight and 40% of obesity as verified by BMI, and 80% of increased risk of metabolic complications as measured by waist circumference. Most of the patients (68%) used atypical antipsychotics and no association was found between the distribution of the nutritional status according to BMI and type of antipsychotic used. There was a higher intake of total calories, calories and protein per kilogram of body weight, percentage of carbohydrates, and lower intake of omega-6, phytosterols, vitamin A and α-tocopherol by cases. Cholesterol and sodium intake did not differ between groups (365 ± 152 mg of

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* Corresponding author.
E-mail address: atputp@gmail.com (I.D. Schweigert Perry).

cholesterol in cases and 313 ± 146 mg in controls; (3499 ± 1695 mg sodium by cases and 2874 ± 800 by controls).
Conclusion: In this sample of schizophrenic patients there was a higher intake of calories and lower consumption of α-tocoferol and phitosterols, compared to controls. There was also elevated sodium, and cholesterol intake, and high frequency of overweight and central obesity.

PALABRAS CLAVE
Esquizofrenia;
Enfermedades cardiovasculares;
Obesidad;
Sobrepeso;
Ingesta de alimentos

Estado nutricional, ingesta alimentaria y riesgo de enfermedad cardiovascular en individuos con esquizofrenia en el sur de Brasil: estudio de casos-controles

Resumen
Objetivos: Verificar los patrones de ingesta alimentaria y la presencia de parámetros antropométricos de riesgo en pacientes esquizofrénicos, al mismo tiempo que tratamos de valorar algunos factores de riesgo cardiovascular modificables.
Métodos: Se incluyeron 25 pacientes ambulatorios esquizofrénicos, atendidos en el Hospital de Clínicas de Porto Alegre, Brasil, y a 25 individuos de control, sanos, emparejados por sexo, edad e índice de masa corporal (IMC). Se obtuvieron las características demográficas (edad, sexo y posición socioeconómica), antropométricas (peso, estatura y perímetro de la cintura), clínicas (antipsicóticos) y datos del consumo de alimentos (cuestionario de frecuencia de alimentos).
Resultados: Hubo una frecuencia de sobrepeso del 40% y de obesidad del 40%, según lo verificado por el IMC, y un aumento del riesgo de complicaciones metabólicas del 80%, según lo determinado por el perímetro de la cintura. La mayoría de pacientes (68%) utilizaban antipsicóticos atípicos y no se encontró una asociación entre la distribución del estado nutricional de acuerdo con el IMC y el tipo de antipsicótico usado. Entre los casos se identificó una mayor ingesta de calorías totales, calorías y proteínas por kilogramo de peso corporal, porcentaje de hidratos de carbono y una menor ingesta de ácidos grasos omega 6, fitoesteroles, vitamina A y α-tocoferol. La ingesta de colesterol y de sodio no difirió entre el grupo de casos (365 ± 152 mg de colesterol en los casos y 313 ± 146 mg en los individuos de control; 3.499 ± 1.695 mg de sodio entre los casos y 2.874 ± 800 entre los individuos de control).
Conclusión: En la muestra de pacientes esquizofrénicos del presente estudio se observó un mayor consumo de calorías y un menor consumo de α-tocoferol y fitoesteroles, comparado con individuos de control. También fue evidente una ingesta elevada de sodio y colesterol y una alta frecuencia de sobrepeso y obesidad centrípeta.

Introduction

Schizophrenia is a chronic psychiatric illness, involving psychopathological manifestations of thought, perception, emotion, movement and behavior, causing considerable social functioning damage.[1] People with schizophrenia have a mortality rate two times higher and 20% lower life expectancy than the general population because of higher prevalence and severity of clinical conditions. Despite suicide has been considered as the main cause of death, these patients often suffer from common diseases, cardiovascular diseases are the leading cause of death, as the general population.[2]

Obesity, which has a high prevalence in patients with schizophrenia and is associated with the disease itself or the use of antipsychotics,[3] is a major risk factor for the development of cardiovascular disease in these patients, since it is closely related to the development of dyslipidemia, insulin resistance, diabetes and hypertension. Although it is known that food intake pattern has great influence in the etiology of these diseases in the general population, there is little research describing food patterns and food preferences among patients suffering from schizophrenia.[4]

One of the few studies focusing on these aspects showed that individuals with schizophrenia consumed more high fat and sugar food when compared with healthy controls. In contrast, they consumed less milk and dairy products, fresh vegetables and fruits.[5]

Excess of dietetic energy, simple carbohydrates, saturated fatty acids (SFA), cholesterol and sodium are considered a risk factor for chronic diseases and obesity.[6] On the other hand, the consumption of fiber, phytosterols, antioxidants, and unsaturated fatty acids, especially omega-3, is related to the prevention of different diseases, with effects on cardiovascular health.[7,8]

In addition to these aspects, it is possible that dietary factors aggravate or relieve the symptoms of schizophrenia. Christensen and Christensen[8] found that there is an association between low intake of total fat and animal fat sources that are mainly composed of SFA and improvement of disease prognosis. Additionally, it was shown that low intake of omega-3 fatty acids especially eicosapentaenoic acid (EPA) is associated with more severe symptoms of schizophrenia.[9]

Thus, we highlight the relevance of studies to verify food consumption patterns and presence of risk anthropometric

parameters, especially among populations that show some vulnerability, such as psychiatric disorders, trying to assess modifiable cardiovascular risk.

Materials and methods

A case–control study was developed. Twenty-five individuals diagnosed with schizophrenia for at least a year (according to International Classification of Diseases-10[1] by a psychiatrist) and in treatment in outpatient psychiatric service at the Hospital de Clínicas de Porto Alegre, in Porto Alegre, Rio Grande do Sul (RS), Brazil, aged between 18 and 59 years, of both genders were consecutively included and paired with twenty-five healthy subjects according to age, sex and body mass index (BMI). Controls subjects were recruited among patient's friends and volunteers and had no metabolic disturbances or psychiatric illness.

Subjects diagnosed with mental retardation, illiterate or those that were already participating in a nutritional intervention program were excluded from the study.

The study subjects were informed about procedures and objectives of the study, and authorized the participation by signing the consent form. The study was conducted after approval of the Ethics Committee in Research of Hospital de Clínicas de Porto Alegre, RS, Brazil (Protocol #11-0106) and thus meets the standards of the Declaration of Helsinki.

Data collection occurred between April and September 2011. The socio-demographic variables (age, sex, socioeconomic status), clinical (antipsychotic used), anthropometric (weight, height and waist circumference–WC) and dietary (food intake) were collected by interview and physical examination.

Participants had their weight measured on a digital scale (Urano®, Canoas, RS, Brazil), with a maximum capacity of 300 kg, and accuracy of 100 g. They were instructed to stand erect, barefoot, wearing light clothes and positioned in the center of the scale. Height was measured using a portable stadiometer, with a length of 2.1 m and an accuracy of 1 mm (Sanny®, São Bernando do Campo–SBC, São Paulo–SP, Brazil), with subjects standing barefoot with parallel feet, ankles together, in a straight position, the arms along the body and the head positioned on Frankfort plan. WC measurement was performed with the individual standing upright, abdomen relaxed, arms at sides and feet together, using a flexible and inextensible tape measuring 200 cm (Sanny®, SBC, SP, Brazil). The measurement was taken at natural waist of the individual, which is the narrowest part of the trunk. BMI was calculated by dividing total body weight (in kg) by the squared height (in m^2), and the nutritional status classification was according to cut-off points of the World Health Organization (WHO). WC measurement was also classified according to WHO, representing high risk for cardiovascular and metabolic complications when $\geq$94 or $\geq$80 cm in men and women, respectively.[10]

Food consumption for the last month was estimated using a validated and reproducible food frequency questionnaire (FFQ) containing 127 food items, considered suitable for semi-quantitative assessment of dietary intake of the adult population of the metropolitan area of Porto Alegre, RS, Brazil.[11] The monthly frequency of consumption of each food was multiplied by the nutrient content of the respective portion, divided for thirty days, which resulted in the average daily consumption. The total caloric intake and quantities related to macronutrients and micronutrients were calculated individually through NUTRIBASE software Clinical Edition version 7.18.

The evaluation of the purchasing power of individuals was performed using the Brazil Economic Classification Criterion (ABEP). According to the score obtained, it is estimated the household income of each individual and therefore their earning power, classifying it into five groups–A to E–the first representing the richest portion of society and, the last, the poorest.

Categorical variables are presented as frequencies and percentages and continuous variables as mean and standard deviation (SD) or median and interquartile range. The χ^2 test was used to test the association between categorical variables and Student *t*-test or Mann–Whitney *U* test to compare the mean or median, respectively. Parametric or non parametric tests were used depending on the normality of the distribution of data. Data were analyzed using SPSS 18.0–Statistical Package for Social Sciences and were considered significant when $p \leq 0.05$.

Results

The socio-demographic and anthropometric characteristics from the studied population are shown in Table 1, with no difference between groups regarding age, gender, WC and BMI. The average age of the entire sample was 38.9 ± 10.9 years, BMI mean was $28.0 \pm 5.5\,kg/m^2$, and predominantly classified as overweight and obesity. Regarding central obesity as measured by the WC, about 70% of participants had risk of metabolic complications. Although the economic class B were associated with controls and class D was associated with cases, a high frequency of patients and controls were in economic class C (Table 1). Obesity was present in 40% of the patients. When considered together with the overweight, this percentage rises to 80%, values close to the observed high waist circumference (Table 1).

Regarding the use of drugs, 68% of patients used atypical antipsychotics, 28% typical and 4% used both. No association was found between the distribution of the nutritional status according to BMI and type of antipsychotic used (χ^2; NS). Despite this, nine of 10 obese patients were taking atypical antipsychotic, and 6 among 10 overweight patients were taking atypical antipsychotic alone or associated with typical (data not shown).

Data related to food intake are shown in Table 2. There was a higher intake of total calories, calories and protein per kilogram of body weight, percentage of carbohydrates and trans fatty acids (Trans FA) by cases. On the other hand, there was lower intake of SFA, polyunsaturated fatty acids (PUFA), monounsaturated fatty acids (MUFA), omega-6, phytosterols, vitamin A and α-tocopherol and no alcohol intake by the cases. The consumption of simple carbohydrates, although it do not differ between groups when adjusted

Table 1 Socio-demographic and anthropometric characteristics of outpatients with schizophrenia and healthy subjects.

Characteristics	Cases (n = 25)	Controls (n = 25)	p^* value
Age, years (mean ± SD)	40.5 ± 9.2	37.2 ± 12.4	0.290
Sex (frequency and %)			
Male	15 (60%)	13 (52%)	0.569
Female	10 (40%)	12 (48%)	
ABEP-CCEB (frequency and %)			
B	0	**4 (16%)**	0.041
C	15 (60%)	18 (72%)	
D	**9 (36%)**	3 (12%)	
E	1 (4%)	0	
BMI, kg/m^2 (mean ± SD)[a]	29.09 ± 6.30	26.91 ± 4.39	0.162
<18.5	1 (4%)	0	0.484
18.5–25	4 (16%)	8 (32%)	
25–30	10 (40%)	11 (44%)	
30–35	6 (24%)	5 (20%)	
35–40	3 (12%)	1 (4%)	
≥40	1 (4%)	0	
WC (frequency and %)[b]			
≥94 cm for men; ≥80 cm for women	20 (80%)	15 (60%)	0.123
<94 cm for men and <80 cm for women	5 (20%)	10 (40%)	

ABEP-CCEB = Associação Brasileira de Pesquisa, Critério de Classificação Econômica Brasil (ABEP, 2011), BMI = body mass index, SD = standard deviation, WC = waist circumference.

* χ^2 test for ABEP-CCEB, WC and BMI (values in bold are significant by residue analysis); *t*-Student test for other variables.

[a] BMI ≤ 18.5 = malnutrition; 18.5–25 = normal weight; 25–30 = overweight; 30–35 = grade 1 obesity; 35–40 = grade 2 obesity, ≥40 = grade 3 obesity.

[b] Cut-off points established by the WHO (2008).

for total energy, is higher in patients when considered in absolute values, with intake of 151 g (59–349) by cases and 111 g (45–303) by controls ($p = 0016$). The same has occurred with the consumption of vitamins B_6, B_{12}, folate, zinc and selenium ($p = 0.038$, 0.034, 0.023, 0.006 and 0.018, respectively).

Regarding the consumption of total fat, SFA, MUFA and PUFA, although it is higher in control group when adjusted for total energy (as it can be seen in Table 2), it does not differ between groups when considered in absolute values (data not shown). However, the highest consumption of trans FA by cases (Table 2) remains considering absolute values, with intake of 0.17 g (0–1.24) by this group and 0.05 g (0–0.25) by controls ($p = 0.001$). Cholesterol intake did not differ between groups regardless of the form of expression, being 365 ± 152 mg of cholesterol in cases and 313 ± 146 mg in controls ($p = 0.226$). The same has occurred with the consumption of fiber and vitamin C. As regards the consumption of omega-6 and omega-3, both absolute consumption in grams ($p = 0.854$ and 0.691, respectively), and the omega-6:3 ratio (Table 2) do not differ between groups, however, when considered relative to total energy, omega-6 fatty acids are more consumed by controls (Table 2). Independent of the way of expression, EPA does not differ between groups ($p = 0.464$ for absolute values in grams). The same happens with sodium (3499 ± 1695 mg by cases and 2874 ± 800 by controls, $p = 0.104$).

Discussion

The high frequency of overweight and obesity in outpatients with schizophrenia found in this study, is also described in a study with hospitalized patients in the metropolitan area of Porto Alegre, Brazil, where the excess weight was found to be 57.2%.[12] On the other hand, in investigations in Europe and North America, about 36% of schizophrenic patients were overweight, on the first, 20% were obese[13] and on the second, held in Canada,[14] the value of 36% refers only obesity, whereas that in Canadian population in general, the prevalence drops to 14%.[14] Brazilian Ministry of Health data shows a 32% prevalence of overweight and 8% of obesity in the general population, data from this study suggest that obesity has become a more common problem among individuals with schizophrenia than in the rest of the population.

Besides the high frequency of overweight and obesity observed in the sample, the high central obesity points to the possible impact on cardiovascular health of patients, which is often associated with conditions such as dyslipidemia, hypertension, insulin resistance and diabetes that favor cardiovascular events, particularly coronary heart disease.[15]

Although there is evidence that schizophrenia per se and/or the use of antipsychotics are associated with the large weight gain in this population,[3] there was not a significant association between the type of antipsychotic used and overweight in our study. However, most patients who had

Table 2 Consumption of energy and nutrients in schizophrenia outpatients and their controls.

Daily intake	Cases (n = 25) mean ± SD or median (IQR)	Controls (n = 25) mean ± SD or median (IQR)	*p* value*
Energy (kcal)	3305 ± 1113	2692 ± 661	0.023
kcal/kg/body weight	41 ± 15	34 ± 6	0.037
Carbohydrate (% of energy)	56.7 ± 4.8	50.4 ± 7.4	0.001
Sugar (% of energy)	19.2 ± 5.0	18.3 ± 5.7	0.477
Protein (% of energy)	18.3 ± 2.8	17.2 ± 3.9	0.274
Protein (g/kg/body weight)	1.8 ± 0.6	1.5 ± 0.4	0.024
Fat (% of energy)	24.9 ± 3.4	30.0 ± 7.4	0.004
SFA (% of energy)	8.8 ± 1.3	10.1 ± 2.6	0.030
PUFA (% of energy)	4.5 ± 1.2	5.9 ± 2.5	0.016
MUFA (% of energy)	9.1 ± 1.7	11.5 ± 3.7	0.005
Trans FA (% of energy)	0.068 ± 0.057	0.026 ± 0.023	0.002
Cholesterol (mg/1000 kcal)	110.8 ± 25.3	117.8 ± 54.0	0.563
ω-6 PUFA (g/1000 kcal)	3.3 (2.7–3.7)	3.7 (2.9–5.6)	0.048
ω-3 PUFA (g/1000 kcal)	0.3 (0.2–0.4)	0.5 (0.3–0.8)	0.118
ω-6:ω-3 ratio	8.9 ± 4.1	8.8 ± 4.8	0.940
EPA (mg/1000 kcal)	2.3 (0–26.2)	8.3 (1.5–23.5)	0.257
Dietary fiber (g/1000 kcal)	12.3 ± 2.9	12.5 ± 3.2	0.864
Alcohol (% of energy)	0	1.42 (0–7)	–
Phitosterols (mg/1000 kcal)	21.9 (17.1–28.2)	57.4 (17.5–79.7)	0.005
Vitamin A (RAE μg/1000 kcal)	309.2 ± 251.7	513.8 ± 303.4	0.013
Vitamin C (μg/1000 kcal)	58.8 ± 34.2	67.7 ± 45.4	0.391
α-tocopherol (mg/1000 kcal)	1.9 ± 0.5	2.4 ± 0.9	0.036
Vitamin B_6 (mg/1000 kcal)	0.82 ± 0.15	0.82 ± 0.20	0.937
Vitamin B_{12} (μg/1000 kcal)	2.32 (1.64–2.97)	2.09 (1.62–3.03)	0.479
Folate (μg/1000 kcal)	229.5 ± 43.6	216.4 ± 74.5	0.452
Sodium (mg/1000 kcal)	1029 ± 232	1074 ± 211	0.475
Zinc (mg/1000 kcal)	6.4 ± 1.7	5.9 ± 1.3	0.298
Selenium (μg/1000 kcal)	53.3 ± 9.3	52.7 ± 15.8	0.876

IQR = interquartile range (25th–75th percentile); EPA = eicosapentaenoic acid; kcal = kilocalories; SFA = saturated fatty acids; MUFA = monounsaturated fatty acids; PUFA = polyunsaturated fatty acids; ω-6 = omega-6 fatty acids; Trans FA = trans fatty acids.

* Mann–Whitney *U* test for ω-3 and ω-6 fatty acids, EPA and vitamin B_{12}. Student *t*-test was used for the other variables.

used atypical antipsychotic were overweight. The potency and characteristics of antipsychotics side effects are quite varied. Reports indicate an increase in body weight by more than 50% of patients with schizophrenia who receive these drugs,[16] however, atypical antipsychotics are associated with significantly greater weight gain in both short and long-term use, when compared with typical.[16] According to Leitão-Azevedo et al.,[17] to medication effects, is adding the increasing epidemic of excess weight that occurs in the general population, which causes more damage to these patients who already suffer from the inherent problems of disease, such as disability, early retirement and reduced quality of life.

Despite the metabolic side effects of medications contribute significantly to the high levels of excess weight, total and central obesity were also observed in patients with schizophrenia who were not taking antipsychotics,[18,19] demonstrating matters relating to lifestyle, where the eating habits and inactivity are included could serve to exacerbate this problem.

It is important to note that even before the use of antipsychotics, patients with schizophrenia suffer from different types of metabolic[20] and anthropometric[21] disturbances that might interfere in these results.

The results of this study show a higher energy intake among schizophrenic patients when compared with healthy controls. In a study, Amani[5] has demonstrated higher consumption of sugary drinks by patients with schizophrenia, which could possibly contribute to obesity, although the consumption analysis has been performed focusing on food groups and not on caloric or nutrient intake, which hinders the purpose of comparison with the present study.

Unlike Archie et al.,[14] we did not observe higher consumption of total fat by patients in our study. We found a high ratio of omega-6:3, which could mean excess of the former and deficit of the latter. This situation would be a concern since a diet deficient in omega-3 (especially EPA), in patients with the disease, was associated with worsening of psychotic symptoms[22] and with complications derived from the higher cardiovascular risks in this population.[23] However, the absolute values of both are within the recommendations.[24] Additionally, the higher consumption of trans FA (which have a similar effect to SFA in the elevation of LDL-cholesterol) by patients, although concern it still remains below 1% of the recommended daily energy intake.[25] However, we found low intake of phytosterols, whose effect is related to the intestinal absorption competition with cholesterol and, therefore, to the modulation of total plasma cholesterol.[25] On the other hand, the consumption of SFA, although representing less than 10% of total caloric intake (value that is associated with better plasma levels), is still above the optimal values (<7%) when in the presence of hypercholesterolemia.[25]

Allied to this fact, cholesterol intake was also high among patients as well as controls. According to the IV Brazilian Guidelines on Dyslipidemias and Atherosclerosis Prevention[6], cholesterol consumption should be less than 300 mg/day, since its excessive intake is associated with increased low density lipoprotein (LDL).[7]

Total carbohydrate consumption remains within the recommendations. However, sugars consumption should not exceed 10% of daily energy intake (in addition to the amount present in natural foods). Smaller recommendations are made in case of need for weight reduction or high triglyceride levels.[25]

Hyperhomocysteinemia, an important and independent risk factor for vascular disease, thrombosis and atherosclerosis, including coronary artery disease, reflects deficiency of folate, vitamin B_6 and B_{12}.[26] Haidemenos et al.[27] suggest that hyperhomocysteinemia is a risk factor for schizophrenia itself, since it is considered a neurotoxic amino acid in high concentrations. The recommendations of these vitamins were reached in the studied group.[24]

Estimated daily intake of sodium among schizophrenic subjects was elevated, amounting to approximately 9 g of sodium chloride. The current recommendation from the American Heart Association[28] is 6 g of salt per day. High sodium intake has been associated with high prevalence of hypertension, which shows an important influence on cardiovascular morbidity and mortality.[29]

On the other hand, the present study shows indicative of adequate fiber intake, a protection factor for cardiovascular disease. The recommended fiber intake is 25–40 g/day, in the form of vegetables, beans, whole grains and fruits.[25] Data from the present study differ from those found by Amani,[5] in which the lower intake of fruits and fresh vegetables suggests a smaller consumption of fibers.

Although epidemiological and intervention studies evaluating the cardiometabolic effect of antioxidants present controversies, they indicate some beneficial associations.[30] Despite vitamin A has shown reduced intake by the case group when adjusted for energy, both groups reached the Dietary Reference Intakes (DRIs). On the other hand, vitamin C, zinc and selenium also reach the DRIs. Nevertheless, the intake of α-tocopherol is below the recommendations.[24]

It is necessary to consider that although there was difference in the energy intake between cases and controls, both did not differ in relation to BMI, which may generate some questions about the accuracy of reports. It must be considered that there are limitations on the applicability of the tools for food intake assessment. Cognitive deficits of schizophrenia, as well as lack of knowledge and understanding of health care may have led to overestimated food intake reports, when compared to people without the disease. The underreporting of energy consumption in the assessment of dietary intake by the controls can also be expected.

Obesity among patients with mental illness has not received due attention by researchers, which shows lack of studies evaluating interventions on the increasing prevalence of obesity, cardiovascular risk and metabolic diseases in this population.[19] According to Archie et al.[14], many of the weight management strategies used in the general population could be applicable to individuals with mental illness, but little is known about the effect of these strategies or if there is need for adaptation for this population. The authors suggest that many patients may be ready to consider changes in lifestyle. Mental health workers often neglect the change in diet and physical activity as viable interventions for this population. Although there are few studies, some show that modest improvements can be acquired through interventions in lifestyle.[31,32]

This is an exploratory study with some limitations such as an unspecific FFQ for this population, interference of cognitive and subjective factors on the FFQ and the failure

to match by socioeconomic status which can be a significant source of unaccounted variation. New studies should be done with larger samples sizes.

In conclusion, our preliminary study points to a high intake of calories, sodium, cholesterol, and low consumption of α-tocoferol and phitosterols by this group of schizophrenic patients. These aspects as well as the high frequency of overweight and central obesity are potentials cardiovascular risks and justify changes in lifestyle, with emphasis on improvement of food consumption patterns.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the responsible Clinical Research Ethics Committee and in accordance with those of the World Medical Association and the Helsinki Declaration.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data and that all the patients included in the study have received sufficient information and have given their informed consent in writing to participate in that study.

Right to privacy and informed consent. The authors have obtained the informed consent of the patients and/or subjects mentioned in the article. The author for correspondence is in possession of this document.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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