Annals of Clinical Psychiatry, 18[2]:99–105, 2006

ISSN: 1040-1237 print / 1547-3325 online
DOI: 10.1080/10401230600614538

Dietary Intake Profile of Patients with Schizophrenia

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Background. *The increasing prevalence of overweight and obesity has become a priority public health issue in the United States. Forty to 62% of people with schizophrenia are obese or overweight (1,2). High morbidity and mortality in schizophrenia may be attributed to an unhealthy lifestyle such as poor diet, lack of exercise, smoking, and substance abuse (3). Obesity is associated with greater risk of developing hypertension, type 2 diabetes, coronary heart disease, stroke, death, and reduced quality of life compared with that found in the general population (4,5). We performed a cross-sectional study evaluating the dietary intake of patients with schizophrenia or schizoaffective disorder treated with atypical antipsychotic agents.*

Methods. *Dietary intake of 88 patients from an urban community mental health clinic was measured using a four-day dietary record. Nutritional variables included total energy intake, fat, protein, carbohydrate, cholesterol, fiber, sucrose, folate, calcium, sodium, zinc, alcohol and caffeine. Data were compared to the general population using data matched for age, gender, and ethnicity from the National Health and Nutrition Examination Survey (NHANES), 1999–2000.*

Results. *The Body Mass Index (BMI) of the schizophrenia group (M = 31.3, SD = 12.67) was significantly greater than the NHANES group (M = 28.3, SD = 6.62) (*p = *.001). The schizophrenia group consumed significantly fewer calories, carbohydrate, protein, total fat, saturated fat, monounsaturated fatty acid (MUFA), polyunsaturated fatty acid (PUFA), fiber, folate, sodium and alcohol and significantly more caffeine than the NHANES group.*

Conclusions. *The findings may suggest that obesity in schizophrenia patients is not solely related to food consumption, but perhaps other effects including medication side effects and reduced physical activity. Education and interventions for the schizophrenia population should focus more on overall lifestyle factors such as physical activity and healthy food choices.*

Keywords diet, nutrition, obesity, schizophrenia

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INTRODUCTION

The increasing prevalence of overweight and obesity has become a priority public health issue in the United States. The Body Mass Index (BMI) distribution in individuals with schizophrenia appears to be greater than that of individuals without schizophrenia (6). Homel et al. evaluated BMI levels and the prevalence of overweight and obesity among schizophrenic individuals versus non-schizophrenic individuals among nationally representative samples in the United States adult population during the period of 1987 to 1996, which is the period in which the use of atypical antipsychotic medications increased. The results showed that the mean BMI for individuals with schizophrenia (M = 27.98, SD = 6.26) was significantly higher than individuals who did not have schizophrenia (M = 25.74, SD = 4.60) during that time period (7). Obesity, often a co-morbid condition with schizophrenia, increases the risk of lipid abnormalities, hypertension, cardiovascular disease, insulin resistance, and type 2 diabetes (8,9).

Weight gain is a significant side effect of several antipsychotic agents, possibly due to the effects on neurotransmitter systems such as serotonergic, dopaminergic, cholinergic and histaminergic systems. Some studies suggest that 40% to 80% of patients taking antipsychotic medication experience weight gain that exceed ideal body weight by 20% or greater (10). Alison et al. (2) performed a meta-analysis of weight change after 10 weeks of treatment in clinical trials. Eleven of 12 antipsychotic medications showed some degree of weight gain, ranging from 0.04 kg for ziprasidone to 4.45 kg for clozapine (2). We found that clozapine-treated schizophrenia patients' weight gain did not level off until 42 months into treatment (11). Antipsychotic induced weight gain has been estimated to increase mortality rates over a 10-year period (12). Further, evidence suggests that antipsychotic weight gain has a larger effect on visceral adiposity leading to greater obesity related medical risks (12). A community-based study of 102 schizophrenia patients in Scotland, assessed diet, smoking, weight and exercise habits to determine cardiovascular disease (CVD) risk and compared them with the general population. Results indicated that patients with schizophrenia made poorer dietary choices, consumed fewer servings of fruits and vegetables, were less physically active, were more obese or overweight and smoked more compared to the general population (13). Another study of 102 schizophrenia patients found that they consumed diets higher in fat and lower in fiber than the reference population (3). However, Strassnig et al. found that although schizophrenia patients as a group ate more food, the relative percentage of calories from carbohydrates, protein, and fat were no different than the reference population (14).

METHODS

The study was approved by the institutional review boards of the Massachusetts General Hospital and the Massachusetts Department of Mental Health. Eighty-eight schizophrenia or schizoaffective disorder subjects signed written informed consent and agreed to participate. Weight and height were measured using standard equipment. Body Mass Index (BMI) was calculated by weight (kg)/height (m^2). A quantitative interviewer-administered activity questionnaire (Modifiable Activity Questionnaire or MAQ) was used to assess both leisure and occupational activity components. This questionnaire assesses current (past year and past week) occupational and leisure activities, as well as extreme levels of inactivity due to disability. Total physical activity averaged over the past year can be determined as the sum of the past year leisure hours per week and past year occupational hours per week. The MAQ was formerly the Pima Indian Physical Activity Questionnaire (15).

Four-Day Dietary Intake

Dietary intake was measured using a four-day dietary record and patients recorded their food and beverage consumption for four consecutive days (three week days and one weekend day). To ensure accuracy, records were reviewed by trained dietary interviewers. Interviewers used neutral probing techniques, food models, and measuring tools to ensure completeness. We provided our patients with a list of everyday items to help them estimate their portion sizes. Some examples included one cup of mashed potatoes is equivalent to the size of your fist. A teaspoon of butter is about the size of the tip of your thumb and three ounces of meat is about the size and thickness of a deck of playing cards. Patients were given a list of seven ways to size up their servings including pictures to help them with estimating how much food they consumed. Estimated intake of individual nutrient totals were calculated by the Minnesota Nutrient Database (NDS) (16).

Food Frequency Questionnaire

Within our sample, 43 patients were also administered the Block Food Frequency Questionnaire (FFQ) (17). The FFQ used national dietary data to construct the food list, portion sizes, and nutrient database. Interviewers asked the frequency and portion size of specific food items consumed over the past month. The Block FFQ is eight pages and queries 106 foods. It asks usual portion size as "small," "medium," or "large," providing reference medium portion sizes. In addition, it includes 13 dietary supplement questions, six questions on restaurant eating, five summary questions, eight questions on fat use or low-fat foods, and seven demographic/health-related questions (17). Analysis of the FFQ provides information on nutrient intake, food groups and dietary habits.

NHANES

Nutrition data from the schizophrenia group were compared to that of the National Health and Nutrition Examination

Survey (NHANES), 1999–2000. The NHANES is a stratified, multistage probability sample of the civilian, non-institutionalized U.S. population. A sample consisting of 723 people was matched to the schizophrenia group for age, gender and ethnicity. NHANES includes a household interview and a complete physical exam conducted in a mobile examination center (MEC). Dietary information was collected by a trained dietary interviewer in the MEC using an automated microcomputer-based interview and coding system via a multi-pass, 24-h dietary recall method. Body weight and height were measured using standardized procedures (18).

Statistical Analyses

In order to create a comparative sample that was similar to the schizophrenia population in terms of age, gender and racial distribution, the NHANES data were reduced from the original 9,965 records to 723. Records within the NHANES database were randomly selected within demographic categories for deletion. Independent sample t-tests and ANOVA's were used when appropriate to compare mean values in the schizophrenia group to NHANES, and to compare differences in age, gender, BMI, and medication within the schizophrenia group.

A multivariate analysis of variance was used to see if there was an overall significant difference between schizophrenia patients and NHANES when controlling for BMI and total caloric intake in the analysis of nutrients and food intake. Bivariate correlations using the Pearson r were used to assess physical activity with the MAQ and food intake. All p-values are two-tailed and a value <0.05 was considered evidence for statistical significance.

RESULTS

Data from 88 patients with a DSM-IV diagnosis of schizophrenia or schizoaffective disorder and 723 participants of the NHANES survey were analyzed. The mean age was 45 ± 10 years for the schizophrenia group and 44 ± 19 years for the NHANES group. Forty-two (47.7%) of the schizophrenia patients were receiving olanzapine, 25 (28.4%) clozapine, 15 (17%) risperidone, three (3.4%) quetiapine, one (1.1%) ziprasidone and two were (2.2%) med-free. The BMI of the schizophrenia group (M = 31.3, SD = 12.67) was significantly greater than the NHANES group (M = 28.3, SD = 6.62), (t (809) = 3.55, p = .001). Sociodemographic data are shown in Table 1.

Table 1 Sociodemographic Data Comparing Patients with Schizophrenia and NHANES Controls

Characteristic	Patients with Schizophrenia (n = 88)	NHANES (n = 723)
Age (years), mean (±SD)	45 (10)	44 (19)
Gender, n (%)		
Male	63 (71.6%)	503 (69.6%)
Female	25 (28.4%)	220 (30.4%)
Weight (lbs), mean (±SD)	199.7 (52.9)	
BMI (kg/m^2), mean (±SD)	31.3 (12.7)	28.3 (6.6)
Ethnicity, n (%)		
Caucasian	62 (70.5%)	507 (70.1%)
African descent	24 (27.3%)	194 (26.8%)
Hispanic	1 (0.01%)	17 (2.4%)
Other	1 (0.01%)	5 (0.7%)
Psychiatric Diagnosis, n (%)		
Schizophrenia	65 (73.9%)	
Schizoaffective	23 (26.1%)	
Length of Mental Illness (yrs) mean (±SD)	15 (9)	
Smoking Status, n (%)		
Smokers	36 (60%)	
Nonsmokers	24 (40%)	
Medications, n (%)		
Olanzapine	42 (47.7%)	
Clozapine	25 (28.4%)	
Risperidone	15 (17%)	
Quetiapine	3 (3.4%)	
Ziprasidone	1 (1.1%)	
Med-free	2 (2.2%)	

Analysis of the four-day food record (schizophrenia group) and the 24 hour recall (NHANES group) showed that the schizophrenia group consumed significantly less calories (t(809) = –4.54, p < .0001), carbohydrate (t(809) = –4.45, p < .0001), protein (t(809) = –3.71, p < .0001), total fat (t(809) = –3.30, p = .001), saturated fat (t(809) = –2.29, p = .022), monounsaturated fat (t(809) = –3.35, p = .001), polyunsaturated fat (t(809) = –3.85, p < .0001), fiber (t(809) = –2.62, p = .009), folate (t(809) = –4.38, p < .0001), sodium (t(809) = –4.00, p < .0001), and alcohol (t(809) = –2.30, p = .022), and significantly more caffeine than the NHANES group (t(809) = –2.10, p = .036) (Table 2).

In the schizophrenia group, men consumed a significantly greater amount of calories (t(86) = 2.53, p = .013), protein (t(86) = 2.49, p = .015), total fat (t(86) = 2.73, p = .008), saturated fat (t(86) = 2.63, p = .010), monounsaturated fat (t(78.9) = 3.37, p = .001), polyunsaturated fat (t(75.7) = 2.26, p = .027), cholesterol (t(86) = 3.13, p = .002), and zinc (t(86) = 2.05, p = .002). There was no significant difference between schizophrenia men and women for percent calories obtained from carbohydrate, fat, saturated fat, protein, alcohol, saturated fatty acid, monounsaturated fatty acid, and polyunsaturated fatty acid. Additionally, there was no significant difference between racial and ethnic groups for dietary intake measures (Table 3).

Schizophrenia patients in the age group of 31–40 years consumed significantly greater caffeine than the 41–50 years age group (F(3,83) = 2.94, p = .045). Clozapine-treated patients consumed significantly more calcium than those on olanzapine or risperidone (F (2, 81) = 5.39, p = .006). No significant differences were found in the schizophrenia group when stratified by BMI. Classification of body mass index (BMI) was: obesity (≥30 kg/m^2), overweight (25–29.9 kg/ m^2), ideal weight (18.5–24.9 kg/ m^2),

Table 2 Nutrition Data Comparing Patients with Schizophrenia Using a Four-day Food Record and NHANES Controls Using a 24-Hour Food Recall

	Patients with Schizophrenia		NHANES		
	n = 88	SD	n = 723	SD	p-value
Energy (kcal)	1943	913	2630	1384	0.00001
Carbohydrate (g)	236.7	104.6	323.7	179.7	0.00001
Calories from CHO (%)	50.5	10.1			
Protein (g)	72.9	38.0	95.0	54.5	0.00001
Calories from protein (%)	15.0	3.3			
Total Fat (g)	75.0	40.1	96.5	59.7	0.001
Calories from fat (%)	34.8	7.9			
Saturated Fat (g)	26.9	16.7	32.3	21.2	0.022
Calories from SFA (%)	12.2	3.4			
MUFA (g)*	28.2	15.5	37.4	24.4	0.001
Calories from MUFA (%)	13.1	3.5			
PUFA (g)**	13.7	8.0	19.5	13.8	0.00001
Calories from PUFA (%)	6.7	3.1			
Cholesterol (mg)	276.4	204.9	334.9	292.2	0.069
Total Fiber (g)	13.6	6.3	16.9	11.9	0.009
Sucrose (g)	45.6	32.8			
Folate (mcg)	294.4	142.5	418.9	262.2	0.00001
Sodium (mg)	3096.8	1449.4	4121.3	2369.5	0.00001
Calcium (mg)	798.3	480.6	926.4	635.0	0.068
Zinc (mg)	10.1	5.9	14.9	25.1	0.074
Caffeine (mg)	326.9	860.5	222.7	353.8	0.036
Alcohol (g)	1.8	5.1	17.2	62.9	0.022

*Monounsaturated fatty acid.
**Polyunsaturated fatty acid.

Table 3 Demographic and Nutrient Intake Comparison of Males and Females in Patients with Schizophrenia Using a Four-day Food Record

	Male (N = 63)	Female (N = 25)		
Source	*M (SD)*	*M (SD)*	*t*	p-values
Age of onset	24.3 (8.1)	28.4 (9.9)	–1.94	0.056
BMI (kg/m^2)	29.1 (5.6)	37.1 (21.3)	–1.86	0.074
Waist/hip ratio (U)	0.99 (0.1)	1.0 (0.1)	–0.52	0.605
Skinfold % body fat	26.3 (8.0)	36.3 (5.4)	–4.96	0.000
Weight (lbs)	198.0 (39.3)	204.0 (78.3)	–0.37	0.715
Energy (calorie)	2093.4 (958.6)	1562.5 (663.4)	2.53	0.013
Protein (g)	79.1 (39.6)	57.4 (28.9)	2.49	0.015
Total Fat (g)	82.0 (43.0)	57.1 (24.2)	3.43	0.001
SUFA (g)	29.8 (17.9)	19.8 (10.5)	2.63	0.010
MUFA (g)	30.8 (16.8)	21.5 (8.9)	3.37	0.001
PUFA (g)	14.6 (8.8)	11.3 (5.0)	2.26	0.027
Cholesterol (mg)	317.4 (216.9)	172.9 (122.4)	3.13	0.002
Sodium (mg)	3356.6 (1496.5)	2442.2 (1098.4)	2.77	0.007
Zinc (mg)	10.9 (6.3)	8.1 (4.2)	2.05	0.043
Sucrose (g)	47.5 (35.0)	40.6 (26.8)	0.87	0.385
Carbohydrate (gm)	247.2 (105.0)	210.3 (101.0)	1.50	0.137
Caffeine (mg)	374.3 (1002.1)	202.6 (198.1)	0.83	0.409

and underweight (<18.5 kg/ m^2). While 45% (n = 40) of the schizophrenia subjects were obese and 28% (n = 25) were overweight there was no significant difference in energy or nutrient intake in these two groups compared to the ideal weight or underweight groups.

The schizophrenia subgroup that completed the FFQ (n = 43) had a mean BMI of 35.3 ± 6.8 m/kg^2 and a mean age of 42 ± 10 years. Intake of sucrose was relatively high (*M* = 45.5 g, *SD* = 32.83) and the percentage of calories from sweets was 19.3% (*SD* = 12.6) indicating a large consumption of cake, cookies, candy and sweetened beverages. Figure 1 shows that as a group they consumed less than the United States Dietary Assessment's (USDA) recommendations for vegetables, fruits, grains, meat and dairy (19). Less than one serving of the fruit and vegetable groups were consumed per day. On average, this subgroup consumed four servings of fats per day. The total caloric intake from the four- day food record was similar (M = 1928 kcal, SD = 863 kcal) to the total caloric intake of the food frequency questionnaire (M = 2011 kcal, SD = 646 kcal) and they were positively correlated: (r = .358, p = .018).

A multivariate analysis of variance was used to determine significant differences between schizophrenia patients (four-day food record) and NHANES (24 hour recall) when controlling for BMI in the analysis of nutrients and food intake. Weight (F(1) = 4.2, p = 0.04) and skinfold (F(1) = 10.7, p = 0.002) were the only significant variables. Smoking status correlated with cholesterol intake (r = .263, p = .042) and caffeine intake (r = .357, p = .005) only. For the schizophrenia group, skinfold % body fat correlated with % caloric intake from protein (r = .254, p = .031) and negatively correlated with % caloric intake from carbohydrate intake (r = –.254, p = .031).

When controlling for energy intake, patients with schizophrenia consumed significantly more caffeine than NHANES (F = 8.071, p = .005). Results of the MAQ, a quantitative activity questionnaire, indicates that patients with schizophrenia engaged in physical activity an average of 10.86 hours/wk (SD = 10.87). A bivariate correlation using the Pearson r was used and the MAQ was positively correlated with calcium, (r = 0.246, p = 0.022), while the age of onset was negatively correlated with the MAQ (r = –0.262, p = 0.019). MAQ was not correlated with gender, race, antipsychotic agent, age, weight, BMI, total caloric intake, or smoking status (p = .098).

We divided the sample and compared the bottom 25th percentile to the top 75th percentile in relation to the MAQ. Using an independent sample T-test we found smoking history statistically significantly higher for the group in the 75th percentile, (t(31) = –2.39, p = .023). Patients with schizophrenia who were more active also smoked more. Calcium was also statistically significantly higher for the patients in the 75th percentile, (t(45) = –2.21, p = .032) suggesting that the more active schizophrenia patients consumed more calcium. Age of onset of schizophrenia was statistically significant comparing patients in the 25 percentile and the 75 percentile of the MAQ, (t(42) = 2.89, p = .006). Patients with schizophrenia who had a later age of onset were less active than patients who had an earlier age of onset.

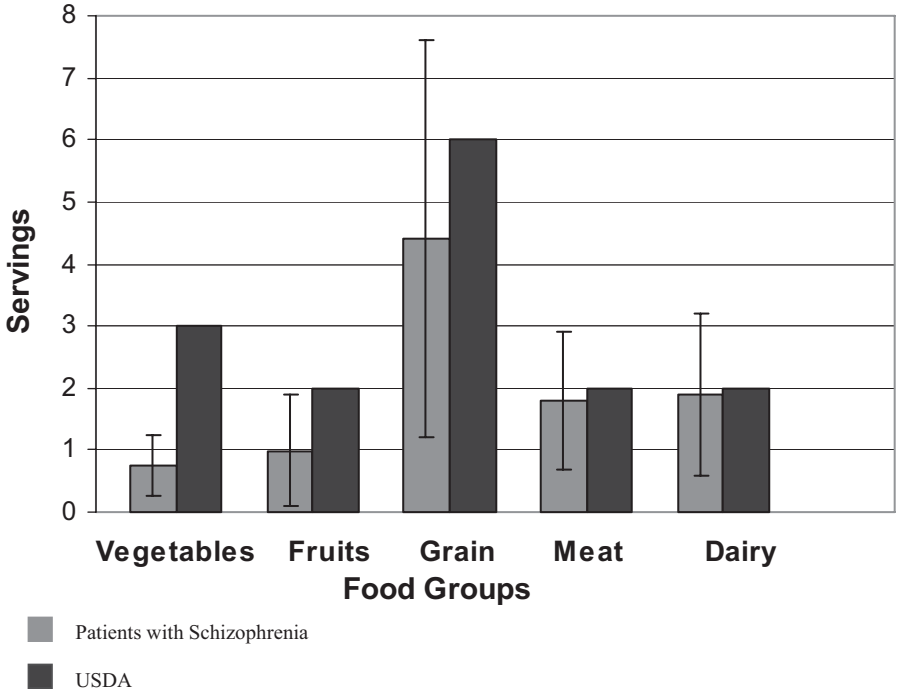

Figure 1 Intake of food groups in 88 schizophrenia patients compared to the United States Dietary Assessment.

DISCUSSION

Although the schizophrenia group consumed significantly less total energy than the NHANES group, the two groups appear to consume similar percentages of calories from carbohydrates, protein and fat. This indicates that the general dietary profile of patients with schizophrenia is similar to the general population from the NHANES. Overall schizophrenia subjects consumed less food. However, the results from the FFQ suggest that the nutritional quality of their diet is actually quite poor. Only a mean of two servings of fruits and vegetables were consumed per day compared with the recommendation of five a day and sweets comprised almost 20% of their diet. In fact, patients with schizophrenia did not meet the USDA's recommendations for vegetables, fruits, and grains. Additionally, reviewing the food records of the schizophrenia group, a pattern of missed meals may account for the reduction in total caloric intake. Our schizophrenia patients often sleep 10 hours or more secondary to the sedative effects of psychotropic medications. While these missed meals result in a reduction in total caloric intake, it may also result in a reduction of energy expenditure. This may explain why the schizophrenia group's mean caloric intake was significantly lower than the NHANES group while their BMI's were greater. Our findings are consistent with a comparison study of 30 schizophrenic patients and normal controls matched for age, gender, smoking and employment status (20). Schizophrenia patients consumed significantly less calories, fiber, vitamins (retinol, carotene, vitamin C, and vitamin E), alcohol and fewer servings of fruit. However, our findings differ from Strassnig et al. which found increased dietary intake in schizophrenia subjects compared to matched NHANES subjects (14). One key difference is that they used a 24 hour recall and we used a four-day food record to assess dietary intake. The advantage of the four-day food record is that it provides a mean dietary intake over four days, which includes one weekend day. Subjects' diet may vary greatly comparing weekdays and weekends. For instance, subjects living in group homes or independently may have less structured time, increased opportunities to sleep, and miss meals resulting in lower dietary intake.

In regards to diet, the cognitive deficits of schizophrenia may make this population prone to choosing easy, obtainable foods that are high in saturated fats and low in fiber. The same cognitive deficits may play a role in areas of motivation, which may keep the patient inactive (21). Some antipsychotic agents may also impair glucose metabolism, induce fatigue and sedation, thereby decreasing energy output. Antipsychotic agents contribute to hypertension, hyperlipidemia, hyperglycemia, insulin resistance and obesity (22–26). More research should focus on individual foods consumed and the quality of the diet along with energy expenditure. Finally, dietary intake may also be influenced by socioeconomic factors. Increased unemployment, social isolation, and high hospitalization rates keep our patients at lower socio-economic status. This inhibits patients from having the ability to afford higher quality food. Fast food and prepared food are usually less expensive and more accessible than healthier foods for this patient population.

Our findings show that men with schizophrenia consume more calories, protein, total fat, saturated fat, monounsaturated fat, polyunsaturated fat, cholesterol, and zinc than

women with schizophrenia. However, women with schizophrenia had a higher BMI, weighed more, and had a higher waist/hip ratio even though these were not statistically significant. Women with schizophrenia might have lower activity levels or there might be gender specific differences in medication metabolism and energy expenditures. Alternatively, we could look at issues of self-report specifically with women. Women might under report the food they consumed due to societal factors.

In regard to calcium's relationship to activity we found that the more active schizophrenia patients consumed more calcium. People who consume more calcium tend to have a lower weight and have a healthier lifestyle (27). Calcium intake and increased physical activity, especially for women, help prevent osteoporosis (28–31). More research needs to focus on the relationship between calcium and activity and both need to be encouraged with this patient population.

While the average American, as represented by NHANES, tends to consume more energy than our population of schizophrenia patients, the mean BMI of the NHANES group is overweight while the schizophrenia group is obese. Diet is a major modifiable risk factor for obesity and obesity-related medical conditions. Factors other than diet may contribute to obesity in patients with schizophrenia, such as lack of physical activity and an overall slower metabolism.

It is possible the patients with schizophrenia tend to have less active lifestyles. They partake in less leisure activity, and most are unemployed, thus, have no work-related exercise. Medications may also contribute to sedation and lead to metabolic abnormalities. Additionally, depression, anxiety, negative symptoms and overall apathy associated with schizophrenia may decrease energy expenditure. By increasing physical activity in this population, psychiatric symptoms and overall self-esteem may improve in addition to a positive metabolic effect.

Interventions that include diet, exercise and behavioral counseling have been successful in limiting patients' weight gain (32–34). To help reduce negative health consequences resulting from being overweight or obese, emphasis should be on patient education, specifically, on healthy dietary choices. Further, there is a need for weight control interventions that include a physical activity component in the schizophrenia population.

We found when looking at the MAQ, patients who had a later age of onset were less active, though we would expect them to have higher levels of functioning and to be more active. We also found that patients with schizophrenia who were more active also smoked more. The increased activity rate found in smokers in this group could be best explained by looking at the effects of nicotine on symptoms and medication side effects associated with schizophrenia. Nicotine may decrease the sedative effects of antipsychotic medication and their blood levels (35–37) and therefore lead to more activity in patients that smoke. However, McCreadie found that in regard to fruit and vegetable intake, current smokers compared with nonsmokers were consuming fewer portions per week of fruit and vegetables (13). A raised BMI at any age and in both genders is associated with an increased mortality (38). However, the combination of obesity with smoking presents an even greater risk for coronary heart disease (39). Interventions should not only focus on diet and exercise but also smoking cessation programs should be included for overweight and obese patients who are current smokers.

Limitations

Results of this cross sectional study must be interpreted with caution. The sample may not be representative of the general schizophrenia population as subjects were involved in a research study that focused on their health. Differences also exist when comparing 4-day food records with 24-hour recall. Food records provide an overall picture of one's diet yet misreporting of portion size, food type and preparation methods occurs. Patients with schizophrenia may be at an even greater risk for making reporting errors. However, study staff had contact with patients and residential program staff during the time period when food records were being recorded. The advantage of the 24-h recall is the use of the multiple-pass approach for interviewing which ensures more accurate recall, yet one may be reporting on an atypical day.

CONCLUSIONS

The U.S. Department of Health and Human Services' *Dietary Guidelines for Americans 2005* recommendations are based on scientific evidence for lowering risk of chronic disease and promoting health (40). The recommendations encourage Americans to eat fewer calories, be more active, and make wiser food choices. They also recommend that people consume a variety of nutrient-dense foods and beverages within and among the basic food groups while choosing foods that limit the intake of saturated and trans fats, cholesterol, added sugars, salt and alcohol. For people who aim to lose weight, recommendations include decreasing calorie intake while maintaining an adequate nutrient intake and increasing physical activity (40).

However, clinicians need to assist patients with schizophrenia in choosing healthier food options. Simply providing this patient population with dietary recommendations is not sufficient. The quality of food served at mental health institutions, group homes, and day treatment programs needs to reflect the recommendations from the U.S. Department of Health and Human Services. Patients must be trained to make the best dietary choices based on the types of food that are readily available to them. The forces that are against patients with schizophrenia regarding weight and diet are far greater than the general population. The disease itself along with its treatments lends itself to a lifestyle of poor diet and diminished activity levels. The quality of food and the options for physical activity for this population need to be modified for long-term improvements in the health of patients with schizophrenia.

ACKNOWLEDGMENTS

This study was supported by a 2003 National Alliance for Research on Schizophrenia and Depression (NARSAD) Young Investigator Award (Henderson), Great Neck, NY.

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