Effect of the Different Stages of Serious Mental Illness on Dietary Habits

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People with serious mental illnesses (SMI) – such as schizophrenia, schizoaffective disorder, bipolar disorder, or major depressive disorder – have been shown to have a poorer diet than those who do not have SMI. Patients with these conditions have been shown to consume greater amounts of sugar and fat, and fewer fruits and vegetables, compared to other people their age. However, there has been a lack of research on how the duration of mental illness affects diet habits. Since poorer dietary habits have been associated with poorer health outcomes, such as obesity, high blood pressure, diabetes, cardiovascular disease, and premature mortality, gaining a better understanding of the dietary habits between people earlier vs. later in the course of a serious mental illness could help with better designing interventions and treatments to help prevent the deterioration of dietary habits. Therefore, the objective of this study was to collect data on dietary habits in SMI patients and those who are at high risk for SMI and already in treatment for psychiatric issues. A self-report questionnaire was used to inquire about food intake, diagnosis, and demographics. Data analysis was done using parametric and non-parametric statistical methods (depending on the distributions of scores). Multivariate linear regression analyses adjusted for sex and psychiatric medication type were conducted on hypothesis-driven variables. Data from 25 patients at-risk for an SMI and 25 patients with chronic SMI were analyzed. For the most part, the two groups did not differ in dietary habits. A notable exception to this was that the chronic patient group tended to eat more than the younger group. Weight was related to the number of meals eaten for both patient groups. These data suggest that similar dietary interventions might be useful for SMI patients, regardless of age.

Keywords: Serious mental illness; dietary habits; schizophrenia; schizoaffective disorder; bipolar disorder; major depressive disorder; clinical high risk; psychosis; nutrition; eating behavior; metabolic health

Introduction

It has been known that patients diagnosed with serious mental illnesses (SMI) – such as those with schizophrenia, schizoaffective disorder, bipolar disorder or major depressive disorder – have unhealthy diets compared to psychiatrically healthy individuals, but there is limited data on whether dietary habits are worse in people with chronic mental illness compared to younger people with psychiatric symptoms who are at high risk for the development of one of these conditions[1].

Literature Review

In the general population, dietary behaviors vary across the lifespan. Research has demonstrated age-related differences in eating frequency, dietary composition, and associations with body mass index[2]. Older adults often have distinct nutritional requirements, including lower energy needs but higher protein and micronutrient demands to preserve muscle mass and bone health. Despite these specific needs, compliance with nutritional recommendations in older populations is frequently suboptimal and influenced by sociodemographic and lifestyle factors[3]. These findings suggest that dietary habits in older adults are shaped not only by biological aging but also by external factors.

SMI affects many areas of daily life. For example, people with an SMI diagnosis experience difficulties with household activities, relationships, and work[4]. Several prior studies have documented adverse dietary patterns among individuals with established SMI. One cross-sectional study compared the dietary and physical activity of 130 individuals diagnosed with schizophrenia with 250 BMI- (body mass index), age-, gender-, and race-matched controls from the National Health and Nutrition Examination Surveys (NHANES)[5]. Schizophrenia patients consumed significantly greater amounts of sugar and fat and had higher levels of glycosylated hemoglobin (HbA1c) and insulin compared to matched controls. Another cross-sectional study compared nutrition and exercise behaviors, while controlling for patient socioeconomic and clinical factors, between individuals with

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no SMI and patients diagnosed with bipolar disorder (BPD)[6]. Patients with BPD reported poorer exercise habits compared to those with no SMI. They also self-reported suboptimal eating behaviors, having fewer than two daily meals. An epidemiological research study found that individuals with major depressive disorder tend to have poor diets. They observed that high consumption of fruits, vegetables, nuts, and legumes is associated with reduced risk of depression[7]. In that report, the authors talked about how high consumption of processed carbohydrates could increase the risk of depression. Recent clinical research has observed that personal history of major depressive disorders may cancel the beneficial effects of healthy food choices on inflammation and mood[7].

In addition to eating a poor quality diet, diet of people with SMI is affected by adverse eating behaviors[8]. These adverse eating behaviors include night eating, fast eating, and continuous snacking[1]. In addition, SMI patients' dietary habits are affected due to both the symptoms and the secondary effects that come with their diagnoses (e.g., poverty, poor access to healthy food and good health care) as well as medication[8]. People who have received antipsychotic medication report increased appetite, decreased satiety, and increased cravings for sweet beverages. Thus, both the mental illness and the treatment have been shown to have led to deterioration in the physical health and life skills of patients[9].

An important and unaddressed question in the literature is whether dietary habits among people with SMI remain stable over time or worsen as people get older and their illness becomes a chronic condition. One way to study this is to investigate young people in psychiatric treatment who do not yet have, but are at high risk for, a psychotic disorder such as schizophrenia or schizoaffective disorder, or a mood disorder such as bipolar disorder or major depressive disorder. Most people in this clinical high risk for psychosis (CHR) group already have significant issues with depression, anxiety, substance use, and in many cases, post-traumatic stress disorder[10]. Even among the approximately 70% of this group who never develop a psychotic disorder, many remain at risk for transient psychotic episodes and impaired functioning over time, as well as for mood disorders[11–13]. To date, research on dietary habits in clinical high risk (CHR) for psychosis patients has been limited. In one of the only studies done, it was found that CHR patients consumed significantly more alcohol than the general population[14]. They also found that their diet was characterized by lower-than-normal levels of fiber intake and increased levels of saturated fat intake. Therefore, even at this early stage in the illness course, dietary habits may already be suboptimal.

However, differences between CHR and chronic SMI populations may develop through various mechanisms. First, prolonged illness duration may contribute to greater functional decline, shown through impairment in motivation, executive functioning, and independent living skills, which can interfere with eating routines[4,9]. In addition, cumulative exposure to psychiatric medication has been associated with metabolic changes including increased appetite and weight gain, which may reinforce maladaptive dietary patterns[15]. Chronic psychiatric illness may also result in long-term socioeconomic disadvantages and environmental constraints that limit patients' access to healthier food options[8]. These illness-related mechanisms may operate independently of normative aging processes, making it necessary to distinguish chronicity effects from simple age-related dietary changes.

This study compared CHR and chronic SMI groups to determine if their dietary habits differ. It was hypothesized that patients with a chronic mental illness (e.g., greater than five years) will have poorer dietary habits than younger psychiatric patients who are at-risk for SMI, as shown in eating fewer fruits and vegetables, skipping more meals, and consuming more sugary beverages.

Methods

Participants

This study recruited patients from the Strong Ties Clinic (chronic SMI patients) and the INTERCEPT Program (at-risk for psychotic disorder patients) at the University of Rochester Medical Center. At Strong Ties, the patients were typically referred from inpatient units, and outpatient programs that decide that the patients need a team with expertise and resources to address chronic SMI (e.g., medication, psychotherapy, family therapy, case management, supported employment). For INTERCEPT, patients are referred by pediatricians, psychiatrists, family medicine doctors, school guidance counselors, parents, and even themselves. Patients were assigned to one of the two study groups (chronic vs at-risk) based on their stage of illness. The major groups of SMI diagnosis were schizophrenia, schizoaffective disorder, bipolar disorder, and major depressive disorder. These diagnoses have been shown to be associated with changes in metabolic measures, some of which can be attributed to diet[16]. At-risk patients were younger and with fewer years of illness than chronic patients, but with symptoms that were progressively worsening, placing them at-risk for SMI. This group typically was characterized by an emergence of distressing new symptoms (e.g., auditory hallucinations) but with retention of some insight about the unreality of those symptoms, and a decline in everyday function. Other new symptoms often include reduced motivation, social isolation, diminished expression, depression, and anxiety[17]. All patients in the at-risk group met research criteria for being at clinical high risk for the development of a psychotic disorder[18].

This study included a total of 50 participants, 25 were pa-

tients at-risk for a SMI and 25 were patients with chronic SMI. In the at-risk for SMI group, 6 (24%) were female and 19 (76%) were male. The racial distribution was predominantly White (64%), followed by Biracial/Multiracial (24%), Black or African American (8%), and Asian (4%). Educational backgrounds varied, with 20% having some high school education, 32% holding a high school diploma, and 28% having some college experience. The majority (68%) were taking psychiatric medication, while 52% were on medical disease medication. Psychiatric polypharmacy, including second-generation antipsychotics, was present in 4% of this group, and 44% exhibited medical disease medication polypharmacy. In the chronic SMI group, 10 (40%) were female and 15 (60%) were male. Racial demographics were more diverse, with 40% identifying as Black or African American, 40% as White, 12% as Hispanic/Latinx, and 4% as Asian or Biracial/Multiracial. Educational backgrounds varied, with 8% having some high school education, 24% holding a high school diploma, and 28% having some college experience. The majority (80%) were taking psychiatric medication, and 52% were on medical disease medication. Psychiatric polypharmacy, including second-generation antipsychotics, was more prevalent in this group (32%), while 56% exhibited polypharmacy for medical conditions.

Procedure

Patients who participated in this study were given the digital questionnaires (see below) on REDCap. There were research assistants in the clinics for patients who needed some assistance when filling out the questionnaire. The questionnaire took about 10–15 minutes to fill out.

Measures

Participants completed a 54-item self-report dietary questionnaire designed to assess food intake, beverage consumption, and general eating behaviors. Items were adapted from Eating Habits-Questions List and the My Health Habits Pre-Survey [19,20]. Additional items were developed to ensure adequate coverage of the issues expected in the study population. The instrument was not formally validated in this population.

Food intake was measured using frequency-based response options assessing consumption of major food groups, including fruits, vegetables, poultry, fish, red meat, processed meat, whole grains, refined grains, dairy products, and sweets. Response options ranged from "never" to "five or more servings per day". Participants also reported the frequency of skipped meals, including breakfast, lunch, and dinner. Beverage consumption was assessed separately, with participants indicating both frequency and typical serving size for water, soda, milk, coffee, 100% juice, sugar-sweetened beverages, tea, energy drinks, and alcohol. Alcohol use included frequency and number of standard drinks consumed on drinking days. Visual portion guides were provided to improve estimation accuracy.

The questionnaire also assessed perceived barriers to healthy eating, changes in diet over the past year, and open-ended comments regarding dietary habits. Clinical information collected included primary and secondary psychiatric diagnoses, age at diagnosis, physical health conditions, current medications, and medication adherence. Demographic variables included age, sex, race, education level, years of schooling, height, weight, and household income.

Analysis

Means and standard deviations were calculated for questionnaire scores for each group. Prior to analyses, normality and variances were compared between groups for each variable. Independent samples t tests were used if the scores were normally distributed. Independent samples t tests assuming unequal variance were performed in other cases. Assumptions of normality were met for all outcome variables. When confounding variables were identified via correlational analyses, an analysis of covariance (ANCOVA) was conducted using group as the between-groups variable, and the potential confounding variable as the covariate. Correlational analyses were used to quantify the strength of relationships between duration of mental illness and scale scores, both within the group and in the sample as a whole.

Results

An ANCOVA was conducted with height as the covariate and weight as the dependent variable. The effect of height was significant, $F(1,47) = 12.16$, $p = 0.001$, indicating that height accounted for 20.6% of the variance in weight, as was expected. However, the main effect of group, indicating higher weights in the chronic group, remained significant after controlling for height, $F(1,47) = 5.95$, $p = 0.018$, with a partial eta squared value of 0.11, suggesting that group membership accounted for 11% of the variance in weight, a medium effect size (Table 2).

A series of independent samples t-tests were conducted to compare dietary intake between at-risk for SMI patients and chronic SMI patients. For beverage intake, "how often" was defined as how many times on average, while "how much" was defined as fluid ounces drank on average for each instance of having a drink. Two variables showed statistically significant differences between the groups. The chronic patient group tended to eat more meals per day, $t(48) = 2.432$, $p = 0.022$ (see Table 3). The chronic patient group also consumed more fluid ounces of tea per day, $t(48) = 2.117$, $p = 0.041$. Means and standard deviations for these variables are displayed in

Table 1 Demographic characteristics of the two patient groups racial composition, educational background, and medication usage.

Baseline Characteristics	At-Risk for SMI		Chronic SMI		Full Sample	
	n	%	*n*	%	*n*	%
Age (Mean | SD)	20.560	3.124	43.960	11.208	32.260	14.352
Gender						
Female	6	24	10	40	16	32
Male	19	76	15	60	34	68
Race						
Asian	1	4	1	4	2	4
Black or African American	2	8	10	40	12	24
White	16	64	10	40	26	52
Hispanic/Latinx	0	0	3	12	3	6
Biracial/Multiracial	6	24	1	4	7	14
Highest Educational Level						
Some High School	5	20	2	8	7	14
High School	8	32	6	24	14	28
Some College	7	28	7	28	14	28
Associate Degree	0	0	3	12	3	6
Bachelor's Degree	5	20	5	20	10	20
Graduate Degree	0	0	2	8	2	4
Taking Psychiatric Medication?						
No	2	8	1	4	3	6
Yes	17	68	20	80	37	74
Missing	6	24	4	16	10	20
Taking Medical Disease Medication?						
No	6	24	8	32	14	28
Yes	13	52	13	52	26	52
Missing	6	24	4	16	10	20
Psychiatric Medications						
Second generation antipsychotic	1	4	2	8	3	6
Clozapine	1	4	0	0	1	2
Antidepressant	6	24	1	4	7	14
Mood stabilizer	1	4	0	0	1	2
Anti-anxiety medication	1	4	2	8	3	6
Other	2	8	1	4	3	6
Psychiatric polypharmacy incl. second generation antipsychotic	1	4	8	32	9	18
Other psychiatric combination	6	24	7	28	13	26
Missing	6	24	4	16	10	20
Medical Medication Polypharmacology						
No medical disease medication polypharmacy	8	32	7	28	15	30
Medical disease medication polypharmacy	11	44	14	56	25	50
Missing	6	24	4	16	10	20
Other Medications						
None	5	20	7	28	12	24
Diabetes med	0	0	1	4	1	2
High blood pressure med	0	0	1	4	1	2
Some combinations of the listed	0	0	2	8	2	4
Other medication for a medical disease	9	36	5	20	14	28
Other+list	5	20	5	20	10	20
Missing	6	24	4	16	10	20

Table 2 Results of the ANCOVA examining group differences in weight, controlling for height.

	df	Sum of Squares	Mean Square	*F*	*p*	Partial η^2
Group	1	13,038	13,038	5.95	**0.018**	0.11
Height (covariate)	1	26,641	26,641	12.16	**0.001**	0.21
Group × Height	1	4,244	4,244	1.98	0.166	—
Residuals	46	98,730	2,146	—	—	—

Table 4. There were no significant differences between food intake, as displayed in Table 5.

Table 3 General eating habits by at-risk SMI patients and chronic SMI patients.

	At-Risk ($n = 25$)		**Chronic** ($n = 25$)				
	M	*SD*	*M*	*SD*	$t(48)$	*p*	Cohen's *d*
Meals per day	2.00	0.500	3.48	3.002	2.432	**0.022**	0.69
Snacks per day	2.20	1.291	3.80	3.851	1.970	0.058	0.55
Skip Breakfast	2.84	1.434	3.48	1.295	1.656	0.104	0.47
Skip Lunch	2.84	1.214	3.52	1.327	1.891	0.065	0.53
Skip Dinner	4.40	0.816	4.68	0.627	1.360	0.181	0.38

Table 4 Beverage intake by at-risk SMI patients and chronic SMI patients.

	At-Risk ($n = 25$)		**Chronic** ($n = 25$)				
	M	*SD*	*M*	*SD*	$t(48)$	*p*	Cohen's *d*
Water							
How often?	7.44	2.022	7.40	1.756	-0.075	0.941	-0.02
How much?	4.88	2.213	5.12	2.027	0.404	0.688	0.12
Soda							
How often?	6.56	2.123	6.56	2.347	0.000	1.000	0.00
How much?	4.70	1.418	5.59	1.734	1.686	0.102	0.57
Milk							
How often?	3.48	2.485	3.40	2.345	-0.117	0.907	-0.03
How much?	4.50	1.978	3.69	1.740	-1.274	0.212	-0.43
Coffee							
How often?	6.48	2.044	6.60	2.432	0.189	0.851	0.05
How much?	5.28	1.934	5.75	1.844	0.728	0.472	0.25
Juice with no added sugar							
How often?	2.60	2.291	2.88	2.088	0.452	0.654	0.13
How much?	5.25	1.545	4.06	1.769	-1.891	0.070	-0.71
Sugary juice							
How often?	8.12	1.130	8.00	1.756	-0.287	0.775	-0.08
How much?	5.85	1.144	4.56	1.740	-1.952	0.073	-0.91
Tea							
How often?	2.08	1.352	3.28	2.492	2.117	**0.041**	0.60
How much?	4.69	2.213	4.73	1.751	0.054	0.958	0.02
Energy drink							
How often?	8.28	1.275	8.16	1.573	-0.296	0.768	-0.08
How much?	4.25	1.753	4.14	1.773	-0.117	0.908	-0.06
Alcohol							
How often?	8.16	1.179	8.40	1.354	0.668	0.507	0.19
How much?	2.09	1.300	3.17	3.125	0.806	0.451	0.51

In addition to independent samples *t*-tests, multivariate linear regression analyses were conducted only for the primary hypothesis-driven variables to reduce the risk of Type I error. These models adjusted for sex and psychiatric medication type. The association between chronic status and number of meals per day remained significant after adjustment, indicating that this difference was not fully attributable to sex or medication. After covariate adjustment, chronic SMI status

Table 5 Food intake by at-risk SMI patients and chronic SMI patients.

	At-Risk ($n = 25$)		**Chronic** ($n = 25$)				
	M	*SD*	*M*	*SD*	$t(48)$	*p*	Cohen's *d*
Fruit	4.04	2.031	4.48	1.982	0.775	0.442	0.22
Vegetable	4.20	1.500	4.92	2.120	1.386	0.173	0.39
Poultry	4.32	1.030	4.04	1.767	-0.684	0.498	-0.19
Fish	2.04	0.978	2.52	1.262	1.503	0.140	0.43
Red meat	3.96	1.338	3.92	1.579	-0.097	0.923	-0.03
Processed meat	6.56	1.261	6.96	1.814	0.905	0.370	0.26
Whole grain	3.56	1.981	4.24	2.185	1.153	0.255	0.33
Refined grain	4.52	1.636	4.64	2.119	0.224	0.824	0.06
Dairy products	5.20	1.893	4.88	2.068	-0.571	0.571	-0.16
Sweets	5.20	2.062	5.12	1.810	-0.146	0.885	-0.04

was significantly associated with drinking less sugary juice ($B = -1.32$, $SE = 0.61$, $p = 0.049$); this association was not detected in the unadjusted *t*-test analyses (Table 6). Chronic status was also associated with more frequent skipping of lunch ($B = 1.13$, $SE = 0.44$, $p = 0.015$), more frequent skipping of dinner ($B = 0.50$, $SE = 0.24$, $p = 0.047$), and a greater number of meals per day ($B = 1.66$, $SE = 0.69$, $p = 0.021$). No significant group differences were observed for fruit intake, vegetable intake, sugary juice frequency, or skipping of breakfast. Overall, dietary patterns were not strongly explained by covariates or group. Importantly, inclusion of sex and psychiatric medication type did not eliminate the significant associations observed, indicating that these differences were not fully attributable to medication exposure or sex.

Correlations were run on those variables that were found to be significant: meals eaten and tea frequency. When doing bivariate correlation tests, weight was related to the number of meals eaten, $r = 0.28$, $p = 0.049$ (Table 7). A nonparametric Spearman correlation revealed a stronger association, $\rho = 0.45$, $p < 0.001$. The correlation between weight and tea frequency was not significant for either test. Since height is correlated with weight, partial correlation tests were run, controlling for height, to see if there was a stronger correlation after the adjustment. When controlling height, the relationship weakened and was no longer statistically significant ($r = 0.18$, $p = 0.21$). Tea frequency remained non-significant after adjusting for height.

Bivariate correlations were run to examine relationships between duration of illness and food, beverage, and general eating habits for all 50 patients. There were no significant correlations between duration of illness and specific food or beverage habits (Table 8 and Table 9). However, general eating habits were related to duration of illness. The longer someone has been diagnosed with an illness, the more meals and snacks they have per day while skipping lunch more often (Table 10).

Table 6 Multivariable linear regression analyses adjusted for sex and psychiatric medication.

		B	*SE*	*t*	*p*
Servings of Fruit	Intercept	5.28	1.21	4.37	<0.001
	Group (Chronic)	0.57	0.66	0.86	0.396
	Sex	-0.93	0.66	-1.41	0.167
	PsychMedType	-0.001	0.12	-0.01	0.993
	$R^2 = .061$, Adj. $R^2 = -.017$				
Servings of Vegetables	Intercept	4.21	1.13	3.72	<0.001
	Group (Chronic)	0.93	0.62	1.49	0.145
	Sex	-0.56	0.62	-0.90	0.372
	PsychMedType	0.11	0.11	1.00	0.326
	$R^2 = .114$, Adj. $R^2 = .040$				
Sugary Juice Frequency	Intercept	7.45	0.69	10.81	<0.001
	Group (Chronic)	0.04	0.38	0.12	0.909
	Sex	0.43	0.38	1.16	0.255
	PsychMedType	0.03	0.07	0.38	0.707
	$R^2 = .046$, Adj. $R^2 = -.034$				
Sugary Juice Amount	Intercept	6.10	1.39	4.40	<0.001
	Group (Chronic)	-1.32	0.61	-2.17	**0.049**
	Sex	0.67	0.72	0.93	0.369
	PsychMedType	-0.08	0.11	-0.72	0.482
	$R^2 = .332$, Adj. $R^2 = .178$				
Skip Breakfast	Intercept	2.88	0.86	3.36	0.002
	Group (Chronic)	0.55	0.47	1.17	0.249
	Sex	-0.22	0.47	-0.47	0.644
	PsychMedType	0.07	0.08	0.85	0.404
	$R^2 = .074$, Adj. $R^2 = -.003$				
Skip Lunch	Intercept	4.59	0.81	5.69	<0.001
	Group (Chronic)	1.13	0.44	2.56	**0.015**
	Sex	-0.72	0.44	-1.63	0.113
	PsychMedType	-0.13	0.08	-1.67	0.103
	$R^2 = .199$, Adj. $R^2 = .132$				
Skip Dinner	Intercept	4.43	0.45	9.95	<0.001
	Group (Chronic)	0.50	0.24	2.06	**0.047**
	Sex	-0.19	0.24	-0.77	0.444
	PsychMedType	0.02	0.04	0.44	0.664
	$R^2 = .131$, Adj. $R^2 = .058$				
Number of Meals per Day	Intercept	2.90	1.25	2.33	0.026
	Group (Chronic)	1.66	0.69	2.42	**0.021**
	Sex	-0.06	0.68	-0.09	0.932
	PsychMedType	-0.14	0.12	-1.13	0.265
	$R^2 = .148$, Adj. $R^2 = .077$				

Table 7 Correlations (controlling for height) on statistically significant variables.

Variable	**Bivariate** r	p **(Pearson)**	**Spearman** ρ	p **(Spearman)**	**Partial** r	p **(Partial)**
Number of meals per day	0.28	**0.049**	0.45	<**0.001**	0.18	0.21
Tea frequency	0.12	0.41	0.16	0.27	0.08	0.59

Table 8 Bivariate correlation between duration of illness and food intake on all 50 patients.

	Duration of Illness			**Duration of Illness**	
Fruit	Correlation	0.204	Processed meat	Correlation	-0.033
	Significance	0.165		Significance	0.823
Vegetable	Correlation	0.093	Whole grain	Correlation	0.237
	Significance	0.532		Significance	0.105
Poultry	Correlation	-0.159	Refined grain	Correlation	-0.089
	Significance	0.279		Significance	0.547
Fish	Correlation	0.273	Dairy products	Correlation	-0.008
	Significance	0.060		Significance	0.957
Red meat	Correlation	0.172	Sweets	Correlation	-0.173
	Significance	0.244		Significance	0.239

Table 9 Bivariate correlation between duration of illness and beverage intake on all 50 patients.

	Duration of Illness			**Duration of Illness**	
Water			Tea		
How often?	Correlation	-0.031	How often?	Correlation	0.102
	Significance	0.832		Significance	0.492
How much?	Correlation	0.005	How much?	Correlation	-0.014
	Significance	0.974		Significance	0.943
Soda			Energy drink		
How often?	Correlation	-0.037	How often?	Correlation	0.129
	Significance	0.805		Significance	0.382
How much?	Correlation	0.305	How much?	Correlation	-0.249
	Significance	0.070		Significance	0.391
Milk			Alcohol		
How often?	Correlation	0.095	How often?	Correlation	0.200
	Significance	0.523		Significance	0.172
How much?	Correlation	-0.161	How much?	Correlation	-0.123
	Significance	0.364		Significance	0.649
Coffee			Sugary juice		
How often?	Correlation	0.271	How often?	Correlation	-0.200
	Significance	0.062		Significance	0.174
How much?	Correlation	0.132	How much?	Correlation	-0.169
	Significance	0.471		Significance	0.476
Juice (no added sugar)					
How often?	Correlation	0.006			
	Significance	0.967			
How much?	Correlation	-0.315			
	Significance	0.110			

Table 10 Bivariate correlation between duration of illness and general eating habits on all 50 patients.

		Duration of Illness
Meals per day	Correlation	0.305
	Significance	**0.035**
Snacks per day	Correlation	0.488
	Significance	<**0.001**
Skip Breakfast	Correlation	0.238
	Significance	0.103
Skip Lunch	Correlation	0.317
	Significance	**0.028**
Skip Dinner	Correlation	-0.137
	Significance	0.354

Discussion

The hypotheses motivating the present study were that patients with a chronic mental illness (e.g., greater than five years) would have poorer dietary habits than younger psychiatric patients who are at-risk for SMI, as shown in eating less fruits and vegetables, skipping more meals, and consuming more sugary beverages. This study showed that chronic SMI patients generally eat more meals and drink more tea than younger patients. Why chronically ill patients are more likely to skip meals at conventional lunch and dinner times, but to nevertheless eat more meals per day is a novel finding that requires replication and explanation. Also, the finding that chronically ill patients consumed more tea requires fur-

ther study. Specifically, our data does not allow us to know whether the tea consumption is of healthy varieties (e.g., green tea, unsweetened tea), or unhealthy types (e.g., sweetened iced tea). Therefore, it is unclear at this point whether the increased tea drinking in chronic patients reflects evidence of an unhealthy or a healthy habit. For the most part, however, the two groups did not differ on most variables. These null findings should be interpreted cautiously due to several study limitations, which are discussed below. However, and importantly, the overall lack of differences between groups does not mean that the clinical implications of poor eating habits are similar in both groups. This is because older patients are more likely to have effects of slowing metabolism over time, as well as increases in weight, and an accumulation of effects of acute or chronic diseases. Thus, eating the same poor diet is likely to have more negative effects in, for example, an older and overweight patient with comorbid diabetes than in an otherwise physically healthy 20-year-old patient. On the other hand, active nutritional counseling for young patients (which is rarely available in psychiatric clinics) could possibly prevent some of the problems noted above, and so it would be helpful to offer all patients the opportunity to receive counseling about their diet.

Despite the lack of a control group, these findings can be interpreted within the context of prior published research on changes in dietary habits from adolescence to adulthood. Past research has shown that young people's eating habits include adequate consumption of fruits and vegetables, regular meals, and unhealthy snacking[21]. In this study, there was a significant positive correlation between duration of illness and snacks per day, which is consistent with past research. Another study has concluded that as people get older, they eat less and consume less energy-dense sweets and fast foods while consuming more grains, vegetables, and fruits[22]. The finding that older patients consumed fewer sugary drinks than younger patients is consistent with the normal development pattern. However, there were opposite patterns in meals eaten, presumably because of the impact of living with mental illness, such as side effects of medication that can affect metabolism and lead to more eating than is typical for age-matched non-psychiatrically ill peers. Therefore, these data suggest that mental illness interferes with the normal trajectory of improving eating habits and eating a healthier diet as the duration of illness increases.

Limitations

There are limitations of this study that are important to note. One limitation is the use of a self-report questionnaire to determine food intake, beverage intake, and general eating habits. Questions require patients to recall specific amounts of what they ate or drank. Though there were images for reference, patients may make errors in reporting portion size. They may over- or underreport the amount. Additionally, while the questionnaire was adapted from existing instruments and included some original items, no formal reliability statistics or pilot testing were conducted in this population. The validity and reliability of the measures remained untested, representing a significant limitation.

Second, this study had a relatively small sample size ($n = 50$) and examined multiple food groups, beverages, and eating behaviors. Therefore, the likelihood of Type I error is increased, and the marginally significant findings should be interpreted with caution. To mitigate this, effect sizes are reported alongside their p-values to provide context for the magnitude of observed differences. The results are intended to provide preliminary evidence and highlight potential patterns in dietary habits, rather than make definitive conclusions.

Third, there was no control group. Without a control group, it is difficult to determine whether the observed findings represent deviations from age-matched samples. Therefore, replication of this study should include age-matched controls. Nevertheless, the similarities differences between the two patient groups are revealing, especially within the context of normal developmental effects on eating habits, as noted above. It is also important to recognize that CHR and chronic SMI groups differ in age, by definition, and so within the present study design is it not possible to completely disentangle effects of age vs effects of mental illness. Age is associated with changes in dietary behavior and metabolic health, so the observed differences between CHR and chronic SMI may reflect a combination of illness chronicity and age-related factors.

Additionally, as shown in Table 1, the groups differed in racial composition. Race may correlate with socioeconomic status and access to healthy foods. Although income data were collected, they were not included in the analyses due to the uneven distribution of income across the groups. Not controlling for income and related socioeconomic factors may have influenced the observed group differences, and this limitation should be considered when interpreting the results. Medication effects were another important limitation variable. Our study treated medication variables primarily descriptively. While medication was included as a covariate in the regression models, we did not have sufficient sample size or variability to fully examine the independent impact of each specific medication. Therefore, medication status (either total dose of one or more medication types, and/or lifetime history of medication use) effects on eating habits in the populations studied need to be clarified.

Future Directions

In the future, this study should be replicated in a larger sample, with age-matched control groups for the two patient groups.

Additional control groups of people living with medical illnesses would also be helpful to disentangle the effects of disability vs the effects of psychiatric disorders. Future studies should also measure symptom severity to examine how eating habits might affect symptom severity, and how symptom severity might affect eating habits.

Conclusion

Finally, there are some clinical implications of the data. First, it would be beneficial if clinicians regularly monitor nutrition and eating habits with their patients to help provide more comprehensive care. Adding nutritional and lifestyle counseling could help younger patients avoid bad habits that could bring on diabetes, obesity, and other negative consequences associated with serious mental illness and treatment with antipsychotic medication. Actively doing counseling with older patients could also help improve the quality of life in this group.

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Supplementary information

The online version contains supplementary material available at https://nhsjs.com/?p=42292