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BODY COMPOSITION OF ADULT MALE PATIENTS ADMITTED TO A PSYCHIATRIC HOSPITAL IN LIMPOPO, SOUTH AFRICA

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ABSTRACT

Patients with mental health problems may be at an increased risk of being overweight or obese when compared to the general population. Therefore, this study aimed to evaluate the body composition of adult male patients admitted to a psychiatric hospital in Limpopo province of South Africa. For this purpose, a quantitative, descriptive cross-sectional study was conducted among 169 male psychiatric patients. Data was analysed in Social Sciences Statistical Package (SPSS) version 23 using descriptive and inferential tests such as chi-square test and logistic regression analysis. It was found that more than half of the patients (55.6%) had a normal baseline body mass index on admission to hospital, while most of the patients (41.1%) were overweight post-admission. However, most patients (61.3%) had a low waist-to-hip ratio post-admission. Most patients (94.0%) had moderate lean body mass and fat mass (50.3%) post-admission. A statistically significant relationship was found between the body mass index and fat mass of the psychiatric patients (p=0.00). Second-generation antipsychotic medications are the most frequently used among patients (44.6%). Furthermore, patients using second generation antipsychotics such as Risperdal, Epilim and Rivotril were mostly overweight or obese compared to those using first or mixed generation antipsychotics. A statistically significant relationship was found between antipsychotic medication initiation post-admission and the body mass index of the patients (p=0.01). Moreover, the body mass index of the psychiatric patients increased post-admission, and this may be due to the use of antipsychotic drugs that are known to increase body weight and fat mass. The findings of this study highlight the importance of interventions to mitigate the increase in body mass index and fat mass among male psychiatric patients on antipsychotic medication. These interventions may include lifestyle modifications such as dietary changes and an increase in physical activity. This will benefit the overall health of psychiatric patients.

Key words: body mass index, fat mass, lean body mass, antipsychotic medication

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INTRODUCTION

Mental illness affects 450 million people worldwide [1]. Furthermore, mental health problems account for 5% of the total burden of diseases and 19% of all disability in Africa [2]. In South Africa, public mental health expenditure is estimated at R15.3 million annually representing 5% of the total public health budget, with almost half of total expenditure allocated to mental health issues at the level of mental health institutions [3].

Obesity remains a major health problem among people living with mental health problems on antipsychotic medications and this increases the risk of cardiovascular disease among this population [2]. Moreover, individuals with mental health problems are twice as likely to be overweight or obese compared to the general population [4]. Studies have revealed that this may be related to the use of antipsychotic medication to manage mental health disorders [2].

Antipsychotic medications have adverse metabolic consequences and long-term use of these medications results in alteration in the body weight and muscle composition of patients [5]. However, there are not many reports on how the body composition of patients with mental health problems varies [5]. There are two groups of antipsychotic medication, the first is first-generation antipsychotics, or typical antipsychotic medications, and the second is second-generation antipsychotics, or atypical antipsychotic medications. First-generation antipsychotics medications include Haloperidol, Chlorpromazine and Serenace among others and second-generation antipsychotic medications include Risperdal, Clozapine, and Olanzapine among others [4].

Interestingly, previous research has found that patients with mental health problems had an average body weight gain of 2.45 kg during inpatient mental health treatment due to antipsychotic medications such as antidepressants, anxiolytics, and mood stabilizers [6]. However, it should be noted that not all antipsychotic drugs led to weight gain and some of these medications have been shown to reduce appetite, leading to a decrease in body weight [7]. Some studies carried out among patients with mental health problems revealed that they had a lower body mass index (BMI), compared to patients without mental health problems [8]. Therefore, there are inconsistencies in the literature regarding body weight of psychiatric patients. This could be because there are other factors that can affect body weight in psychiatric patients besides antipsychotic medication such as dietary intake and physical activity. Nevertheless, weight gain induced by antipsychotic medications and elevated BMI are important issues affecting 80% of those who receive antipsychotic medications for mental health problems [9].

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A hospital-based study in Indonesia found that male psychiatric patients on antipsychotic medication had higher fat mass and lower lean body mass compared to healthy controls [5]. Similarly, a community-based study revealed that people with mental health problems tend to have abdominal obesity measured by waist circumference, and these individuals also had a greater fat mass, and lower lean body weight [10]. A study conducted in South-East Nigeria, found that people with serious mental health problems tend to have a higher level of subcutaneous fat than the healthy adult population [7]. This can be the result of a poor diet, a sedentary lifestyle, and the effects of antipsychotic medication [7]. From this it is evident that psychiatric patients experience changes in their body composition which can affect their health status.

The current study is important to add to the existing body of literature regarding the body composition of patients on antipsychotic medication in an African setting and particular in South Africa for which there is a paucity of published research. The current study describes the trends in antipsychotic medication and body composition. Therefore, the aim of the current study was to assess body composition of adult male patients on antipsychotic medication admitted to a psychiatric hospital in the Limpopo province of South Africa. The research question was what is the body composition of adult male patients is admitted to a psychiatric hospital.

MATERIALS AND METHODS

Study approach and design

A quantitative descriptive cross-sectional study was used to assess the body composition of adult male patients admitted to a psychiatric hospital in the Limpopo province of South Africa.

Study population and sampling strategy

The study population consisted of 300 adult male patients admitted to a psychiatric hospital in Limpopo, South Africa. The hospital provides long-term care for chronic patients with mental health problems. Most of the patients admitted to this hospital have schizophrenia, bipolar, delusion, paranoid personality disorder, and severe depression, while others include alleged mentally disturbed criminal offenders whose charges involve serious violence and are held in the forensic ward of the psychiatric hospital. Based on the population size, a sample size of 169 was calculated using the online Raosoft sample size calculator with a 5% margin of error and a 95% confidence level [11]. The Raosoft sample size calculator is widely used in research to determine appropriate sample size, ensuring that results are generalizable to the study population. Patients who participated in the study were admitted for a minimum of six months and the longest hospitalization was nine years.

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Data collection

For those adult male patients who provided informed consent, their body weight and height were recorded from their files in the hospital. These anthropometric measurements were performed by nursing staff on admission of the patients and before they started using antipsychotic medication post-admission. Furthermore, post-admission the patients' height, body weight, waist circumference and hip circumference was measured by a registered dietitian who is the primary investigator in this study (HU). The primary investigator also assessed the patients' lean body mass and fat mass during hospitalization using the InBody 120 scale, which is a body composition analyzer [12]. Data on the patient's use of antipsychotic medications was also collected from the patients' clinical record book.

Reliability

The study methods such as measurements of body weight, height, waist and hip circumference [13], lean body mass and fat mass were applied consistently, and the procedures were standardised for each patient. The measurements were also performed by a registered dietitian.

Validity

The validity of this study was ensured by using data management software (Lookin'Body) [12] that the primary investigator used to store data (body weight, height and BMI) that was automatically transferred from the Inbody120 scale. The software is compatible with the Inbody120 bioelectrical impedance analyzer scale via Bluetooth. The InBody body composition analyser has been found to be reliable in assessing body composition. It does produce small individual error and can be used to assess body composition when it is not possible to use DEXA; however, it is susceptible to systematic and proportional bias [14]. Furthermore, anthropometric measurements were taken twice for accuracy.

Data analysis

Data on the sociodemographic characteristics, antipsychotic medication use, and body composition were entered into a Microsoft Excel spreadsheet and then imported to the Social Sciences Statistical Package (SPSS) version 23 for analysis. Descriptive statistics such as frequencies and percentages were calculated.

The patients fat mass was classified as low if their fat mass was less than 15 kg, moderate for a fat mass 15 – 44 kg, high for a fat mass greater than 44 kg [15]. A lean body mass less than 32 kg was considered low, a lean body mass of 32 – 45 kg was considered moderate and a lean body mass greater than 45 kg was considered high [15]. The Pearson chi-square test was used to assess the association between sociodemographic characteristics of the patients and their body mass index, waist-to-hip ratio, fat mass and lean mass. A p-value of less than 0.05

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was considered statistically significant. Additionally, logistic regression analysis was carried out to assess the effect of BMI and age on the total lean mass and total fat mass. A p-value of less than 0.05 was considered statistically significant.

Ethical considerations

All adult male patients gave their informed consent before participating in the study that was conducted in accordance with the Declaration of Helsinki, and the study protocol was approved by the Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC/H/41/2019: PG).

RESULTS AND DISCUSSION

Socio-demographic characteristics

The majority of the patients (31.4%) in the current study were aged 41 to 50 years old. This is contrary to a study conducted in the United States of America among mental health patients in a psychiatric hospital, most of these patients were aged 18 to 44 years old [16]. However, mental illness affects all the age groups (teenagers, adults and geriatrics) and adults were found to be the most affected population [17].

Body composition

Table 1 presents the body composition of the male patients, specifically describing the BMI, waist-to-hip ratio, lean body mass and fat mass. Most male patients (55.6%) had a normal baseline BMI, while less than half (41.1%) were overweight post-admission. Also, most patients had moderate lean body mass (94.0%) and fat mass (50.3%) post-admission.

The current study showed an increase in body weight post-admission as evidenced by the increase in the BMI from 22.5% at baseline to 41.1% post-admission. This finding is similar to Hilton, Ham [18] who found that the BMI increased among psychiatric patients post-admission due to body weight increase. In addition, the increase in body weight of the patients in the current study may be due to an increase in fat mass as evident that the number of patients with a high fat mass (Table 2). These results are similar to the previous research which also found that fat mass was high among patients with mental illness [5]. This increase in body weight and fat mass may be due to the antipsychotic medication use which is associated with the regulation of metabolism by the hormones leptin, ghrelin and adiponectin [7].

A concern in the current study is that some patients (5.3%) were admitted to hospital in an underweight state according to the BMI. This is similar to the findings of Marthoenis, Martina [5] in which 17% of patients were underweight on admission to hospital and this reduced to 10.3% post-admission. The higher prevalence of underweight among patients admitted to hospital might be attributed to their poor socio-economic status [5, 19]. This implies that the psychiatric patients may not be

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able to afford adequate nutrition before hospitalization, whereas during their hospital treatment, the patients are provided with nutritious diets that aim to meet energy and nutrient requirements. Therefore, their body weights might increase post-admission. It should be noted that this increase in body weight, especially fat mass is associated with adverse health outcomes such as increased risk of non-communicable diseases including cardiovascular disease and type 2 diabetes [20].

In the current study a few patients had high lean body mass, this is similar to the findings of Huhn, Nikolakopoulou [8] who also found that few male patients on antipsychotic medication had a high lean body mass. This may be related to the age of the patients in the current study, as it is known lean body mass levels tends to diminish with advancing age [21]. Furthermore, hospital-based study in a Sultanate of Oman (West Asia) found that patients with mental health problems on antipsychotic medication had a low lean body mass [22]. To further emphasize this point, in a multiple regression model with age, BMI and dose in chlorpromazine equivalents, schizophrenia was a significantly associated with, higher body fat percentage, lower muscle mass, and lower body water among males [5].

Use of antipsychotic medication

Table 2 details the use of antipsychotic medication among male patients, specifically describing the use of first-generation, second-generation and a mix of first- and second-generation use. Less than half of the patients (44.6%) used second-generation antipsychotic medication. The most popular second-generation antipsychotic medication was Risperdal with 45.8% of male patients using it.

The use of second-generation antipsychotic medication which was popular among the patients in the current study as indicated in Table 2 has negative side effects such as excessive body weight gain therefore increasing the risk of obesity and non-communicable diseases [23, 24]. This is further emphasized by the findings in Table 4 which shows that patients using the second-generation antipsychotic medication were mostly overweight or obese, compared to those on the first or mixed generation antipsychotic medications. This finding is supported by previous research which documented that second-generation antipsychotic medication use has negative side effects which include excessive body weight gain, and thus increases the possibility of obesity, type 2 diabetes, and cardiovascular disease [25]. This may be because second-generation antipsychotic medications have been found to reduce brown adipose tissue thermogenesis and reduce lipolysis,while increasing white adipose tissues lipogenesis [26]. However, it should be noted that previous studies like the current study did not consider confounding factors such as dietary intake and level of physical activity which can affect body composition.

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Relationship between body composition, age and antipsychotic medication

Table 3 presents the relationship of age and antipsychotic medication use compared to lean body mass, fat mass and waist-to-hip ratio. Only one significant relationship was found between antipsychotic medication use and fat mass (p=0.02).

Relationship between antipsychotic medication use and baseline BMI and post-admission BMI

Table 4 indicates the relationship between baseline BMI and post-admission compared to antipsychotic medication use. A statistically significant relationship was found between antipsychotic medication initiation post-admission and the BMI of the patients (p=0.01). This relates to the findings of previous research that has suggested that body weight gain among people with mental disorders may be attributed to medication-induced sedentary lifestyles [27, 28].

Hospitalization is associated with changes in body composition and strength in older persons. These effects are especially evident for individuals hospitalized for eight or more days per year [29] and this would be true for patients in the current study who were hospitalized for a minimum of six months and longest stay was nine years. A recent systematic review reported that physical activity during hospitalization is not a priority [30]. A concern is that the longer the sedentary time and the higher the body fat content, the more severe the depression [31].

Relationship between BMI, fat mass and lean body mass

Table 5 indicates a statistically significant relationship between the BMI and fat mass of patients (p=0.00) but the relationship between the BMI and lean body mass was not statistically significance (p= 0.23).

Effect of BMI and age on total lean mass and total fat mass

A logistic regression was carried out to assess the effect of BMI and age on the total lean mass and total fat mass (Table 6). For total lean mass (post admission), BMI (p=0.00), age (p=0.02) was statistically significant, with the total lean mass more likely to be influenced by BMI and less likely by age. For both total fat mass (baseline) and post admission, BMI (P=0.00) was statistically significant and more likely to influence the total fat mass. It is interesting to note that both the logistic regression (Table 6) and the chi-square test (Table 5) found a significant influence or relationship between BMI and fat mass. Similarly, a recent study used a Pearson's correlation coefficient and found a significant relationship between BMI and fat mass, however the participants in this study were not hospital patients [32].

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CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

The findings of the current study revealed some significant alterations in body composition parameters such as body weight. Elevated body weight may contribute to various health complications, such as cardiovascular disease, type 2 diabetes, and metabolic syndrome. Furthermore, the altered body composition may impact the efficacy of psychiatric medications and overall treatment outcomes. It is crucial to recognize the potential impact of psychiatric medications on body composition. Antipsychotic medications have been associated with weight gain and metabolic side effects. Therefore, regular monitoring of body composition and metabolic parameters is essential for patients receiving these medications. Future research should explore the underlying mechanisms linking psychiatric disorders to altered body composition. Additionally, future research should employ longitudinal study design to make substantial conclusions on medication-induced weight gain. Interventions targeting lifestyle modifications structured weight management programs emphasizing dietary changes and physical activity, may be beneficial in improving the body composition and overall health outcomes in this population. Healthcare practitioners can also offer individualized nutrition counselling to patients. By addressing these issues, healthcare providers can optimize the management of psychiatric disorders and reduce the risk of the associated metabolic complications.

STRENGTHS AND LIMITATIONS

A strength of the current study is that included a comprehensive assessment of antipsychotic medication use such as the type of antipsychotic medication which is known to affect body composition. However, a limitation of the current study is that it did not assess the dietary intake and physical activity level of the patients which are factors that could have contributed to the increase in BMI observed among the patients. Furthermore, the study was conducted only among adult male patients limiting its generalizability to female patients. A limitation of the current study is that the cross-sectional design is appropriate for assessing body composition at a single point in time, but it limits the researchers from making conclusions about medication-induced weight gain a longitudinal study design would be more appropriate for this conclusion.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

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Table 1: Body composition

Variables	Number	Percentage
Baseline BMI (n = 169)		
Underweight	9	5.3
Normal	94	55.6
Overweight	38	22.5
Obese class 1	28	16.6
Post-admission BMI (n = 168)		
Underweight	4	2.4
Normal	41	24.4
Overweight	69	41.1
Obese class 1	54	32.1
Waist to hip ratio (n = 168)		
Low	103	61.3
Moderate	54	32.1
High	11	6.6
Lean body mass (n = 168)		
Low	8	4.8
Moderate	158	94.0
High	2	1.2
Fat mass (N = 167)		
Low	63	37.7
Moderate	84	50.3
High	20	12.0

Table 2: Use of antipsychotic medications

	Number (n = 168)	Percentage
First Generation	30	17.9
Second Generation	75	44.6
Mixed of first and second generation	63	37.5
First Generation AMP usage (n = 168)		
Haloperidol	111	66.0
Tegretal	29	17.3
Disipal	16	9.5
Chlorpromazine	7	4.2
Serenace	5	3.0
Second Generation AMP usage (n = 168)		
Risperdal	77	45.8
Epilim	45	26.8
Rivotril	20	11.9
Fluoxetine	12	7.1
Amisulpride	10	6.0
Clozapine	2	1.2
Olanzapine	2	1.2

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Table 3: Relationship of lean mass, fat mass, waist-to-hip ratio, age and type of antipsychotic medication

	Age (years) p-value=0.14					Antipsychotic medication p-value=0.36		
	18-30	**31-40**	**41-50**	**51-60**	**>60**	**1st Generation**	**2nd Generation**	**Mixed 1st and 2nd generation**
	n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Lean mass								
Low lean body mass	17 (13.8)	26 (27.0)	35 (28.9)	27 (21.9)	18 (14.0)	26 (21.0)	52 (42.0)	45 (36.0)
Moderate lean body mass	8 (18.1)	11 (25.0)	18 (40.0)	4 (9.0)	3 (6.8)	4 (9.3)	21 (48.0)	18 (41.0)
High lean body mass	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Fat mass								
	Age (years) p-value=0.18					Antipsychotic medication *p-value=0.02		
	18-30	31-40	41-50	51-60	>60	1st Generation	2nd Generation	Mixed 1st and 2nd generation
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Low fat mass	10 (28.0)	6 (17.0)	9 (25.7)	3 (20.3)	35 (8.0)	10 (28.2)	15 (42.1)	10 (28.4)
Moderate fat mass	16 (13.0)	25 (21.1)	40 (33.0)	21 (17.1)	17 (14.0)	19 (16.3)	48 (40.0)	51 (43.2)
High fat mass	0 (0.0)	6 (42.3)	4 (28.5)	3 (21.4)	0 (0.0)	14 (7.1)	11 (78.0)	2 (14.2)
Waist-to-hip ratio								
	Age (years) p-value=0.89					Antipsychotic medication p-value=0.17		
	18-30	31-40	41-50	51-60	>60	1st Generation	2nd Generation	Mixed 1st and 2nd generation
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Low waist-to-hip ratio	10 (38.5)	10 (27.2)	18 (34.8)	8 (25.8)	8 (38.3)	15 (50.9)	21 (28.2)	18 (28.9)

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Moderate waist-to-hip ratio	3 (11.5)	2 (5.4)	3 (5.7)	2 (6.5)	1 (4.8)	1 (3.3)	4 (5.4)	6 (9.5)
High waist-to-hip ratio	13 (50.0)	25 (67.2)	32 (60.4)	21 (67.7)	12 (57.1)	14 (46.6)	49 (66.3)	39 (61.7)

*p-value < 0.05 is statistically significant.

Table 4: Relationship between BMI on and during admission compared to antipsychotic medication use

BMI category	Baseline BMI on admission p-value=0.13			Post-admission BMI p-value=0.01*		
	1st generation Antipsychotic medication	2nd generation antipsychotic medication	Mixed 1st and 2nd generation antipsychotic medication	1st generation Antipsychotic medication	2nd generation antipsychotic medication	Mixed 1st and 2nd generation antipsychotic medication
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Underweight	1 (3.3)	3 (4.0)	4 (6.4)	0 (0.0)	3 (4.1)	1 (1.6)
Normal	21 (70.6)	36 (48.4)	37 (58.2)	14 (47.2)	13 (17.6)	14 (22.1)
Overweight	7 (22.3)	17 (22.9)	14 (22.2)	8 (27.0)	28 (37.8)	33 (52.4)
Obese class 1	1 (3.3)	19 (25.3)	8 (12.7)	8 (27.0)	30 (40.5)	15 (23.8)

Table 5: Relationship between BMI and fat mass, lean body mass

BMI during admission	Fat mass P-value=0.00*			Lean body mass P-value=0.23		
	Low Frequency (%)	Moderate Frequency (%)	High Frequency (%)	Low Frequency (%)	Moderate Frequency (%)	High Frequency (%)
Underweight	3 (8.5)	1 (0.8)	0 (0.0)	4 (3.2)	0 (0.0)	0 (0.0)
Normal	23 (65.0)	18 (15.5)	0 (0.0)	35 (28.4)	6 (13.6)	0 (0.0)
Overweight	8 (22.3)	61 (51.1)	0 (0.0)	49 (39.3)	19 (43.0)	1 (2.0)
Obese	1 (2.1)	39 (32)	14 (12.2)	35 (28.4)	19 (43.0)	0 (0.0)

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Table 6: Logistic regression results of BMI, total lean mass, total fat mass and total fat mass

Variables	p-value	[95% Conf. Interval]
Total Lean Mass (baseline)		
BMI (kg/m^2)	0.93	-1.21 - 1.31
Age (in years)	0.07	-0.44 - 0.86
Total Lean mass (post admission)		
BMI (kg/m^2)	0.00	0.07 - 0.54
Age (in years)	0.02	-0.18 - 0.01
Total Fat Mass (baseline)		
BMI (kg/m^2)	0.00	0.55 -1.45
Age (in years)	0.33	-0.08 -0.24
Total Fat Mass (post admission)		
BMI (kg/m^2)	0.00	0.55 - 1.45
Age (in years)	0.35	-0.85 - 0.23

* Significant. $p \leq 0.05$

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