PREVALENCE OF SOME CARDIOVASCULAR DISEASE RISK FA CTORS AMONG PA TIENTS ADMITTED AT MA THARI HOSPITAL //

A Dissertation submitted in part fulfillment for the award of the degree of Master of Medicine in Psychiatry, University of Nairobi.

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2008

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DECLARATION

I, Dr. **Moses R. Mwenda** hereby declare that this dissertation is my original work and that I have not presented the same to any other university for the award of a degree.

Signed .....

Date... ..... Aug. 2008

APPROVAL

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- My wife Mary for typing the concept, proposal and the final document.

Dedication

To all mentally ill patients, their relatives, and medical staff who toil to provide care to this vulnerable high-risk group.

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List of abbreviations

BMI	Basal Metabolic Index
BP	Blood Pressure
CAD	Coronary Artery Disease
CVD	Cardiovascular Disease
CHD	Coronary Heart Disease
CVRF	Cardiovascular Risk Factors
ECG	Electrocardiogram
EEG	Electroencephalogram
ELISA	Enzyme Linked Immunosorbent Assay
g	grammes
HC	Hip Circumference
HDLc	High Density Lipoprotein-cholesterol
HIV	Human Immunodeficiency Syndrome
Kg	Kilograms
LDLc	Low Density Lipoprotein-cholesterol
m	Meters
MmHg	Millimeters of mercury
OPD	Outpatient Department
SMI	Severe Mental Illness
SPSS	Statistical Package for Social Sciences
USA	United States of America
WC	Waist Circumference
WHR	Waist Hip Ratio
WHO	World Health Organization
AUDIT	Alcohol Use Disorder Identification Test
CDC	Centers for Disease Control
USA	United States of America
USD	United States Dollar

ABSTRACT

Severity of Cardiovascular diseases in terms of morbidity and mortality is on the increase in developing countries with mortality expected to reach 19 million by the year 2020. People with severe mental illness die prematurely, their illness, its treatment and their lifestyle resulting into poor physical health and co-morbid medical diseases. Much of the excess mortality is preventable through lifestyle and risk factor modification, early diagnosis and treatment of common diseases.

Objective: To determine the prevalence of some cardiovascular risk factors: hypertension, overweight/obesity, risky alcohol use, tobacco use, lack of exercise, and co morbid physical conditions amongst in patients at Mathari hospital and their social demographic features.

Design: a cross-sectional descriptive study.

Setting: Mathari hospital wards, Nairobi, Kenya.

Main outcome measures: prehypertension/hypertension, overweight/obesity, inadequate exercise, tobacco smoking risk, risky alcohol use.

Methodology: One hundred and sixty-one patients were sampled by stratified random method from the OPD register. A social-demographic health and lifestyle questionnaire administered after informed consent was obtained. A general physical examination was done including Blood pressure, weight, height, and waist and hip circumference using standard techniques. Cardiovascular risk taken as systolic BP =>130mmHg and diastolic=>85mmHg as per WHO criteria, overweight/obesity defined as BMJ>= 25kg/m2 Waist Hip Ratio (WHR) >= 0.80 females and >=0.95 males, Waist circumference (WC) of 80cm females and 95cm males. Risky smoking as current smokers or living with regular smoker in same dwelling, risky alcohol use determined by the AUDIT instrument for male >=4; and female >=3 score. Exercise adequacy as defined by Centers for Disease Control. Data collected, coded and analyzed using SPSS Version 12.

Results: prevalent CVRFs were prehypertension 14.3%, hypertension 17.4%, smoking 66.5%, inadequate exercise 64.4%, risky alcohol use 44.1%, Overweight/obesity 18.6% by BMI, 19.9% by WC and 35% by WHR. No patients were on current treatment for either diabetes or hypertension. Overweight/obesity and underweight occurred at almost similar prevalence 18.6% versus 17.4%. Physical co morbidity was 93.2%, mostly medication adverse effects. Age was significantly associated with WC, BP, alcohol,WHR, BMI ($P<0.05$). Gender was significantly associated with WC, WHR BMI, alcohol, and smoking ($p<0.05$). Exercise was significantly associated with WHR and WC ($p<0.05$). BMI, WHR and WC were all significantly associated with education and file diagnoses ($p<0.05$). Blood pressure was. significantly associated with WC and BMI, ($p<0.05$). Alcohol was significantly associated with income, file diagnoses, duration of psychiatric illness, and negatively with WC ($p<0.05$). Smoking risk was significantly associated with file diagnoses, current treatments and negatively with exercise, WC, WHR, and BMI ($p<0.05$).

Conclusion: Amongst inpatients with psychiatric illnesses at Mathari hospital, some cardiovascular risk factors and physical illnesses were found to be prevalent.

Recommendation: Psychiatric patients should be actively screened and followed up for all cardiovascular risk factors and physical illnesses including medication side effects. Integrated and interventional mental/physical health programmes are of great significance for this vulnerable population.

1.0 INTRODUCTION

Psychiatric disorders are the problem of the century. Mental illness now account for about 12.3% of the global burden of disease and this is expected to rise to 15% by the year 2020 (1). A quarter of the patients visiting a health service center have at least one mental, neurological or behavioral disorder but most of these are neither diagnosed nor treated (2). Having a mental illness has been and remains a barrier to effective medical care. People with mental illnesses have higher rates of physical co-morbidity; furthermore these physical problems are frequently misdiagnosed, under diagnosed, or totally missed. (3,4,5,6). Schizophrenia and most of other mental illnesses are associated with increased medical morbidity and mortality (7,8,9). Severity of Cardiovascular diseases in terms of CVD morbidity and mortality is on the increase in developing countries with mortality expected to reach 19 million by the year 2020 with the current trend where emphasis is on infectious diseases like Tuberculosis, Human Immunodeficiency Virus and Malaria (10). Psychiatric patients suffer excess mortality as compared to the general population (II).

2.0 JUSTIFICATION

Severe mental illnesses are associated with medical co-morbidity and their attended complications. Psychiatric populations are at increased risk of ill health and mortality compared to the general population (3,4,6,7). Although there is a clear evidence base acknowledging the poor physical health of people with mental illness, the potential for improving outcomes in patients with psychiatric illness has been largely neglected in both research and clinical practice. If the health care priorities remain, as they are now the morbidity/mortality from preventable disease is bound to increase and may overwhelm the existing infrastructure. Therefore, strategies are needed to stem progression in the population most vulnerable to cardiovascular disease. Data generated will assist in assessing the burden of some established (traditional modifiable) cardiovascular risk factors. It is hoped that the data will facilitate planning and conducting further detailed studies on cardiovascular disease in psychiatric populations and in setting up public health intervention programs for primary and secondary prevention of cardiovascular disease especially in developing countries like Kenya with extremely limited resources.

There are no sub-Saharan prevalence studies on cardiovascular risk factors among psychiatric populations. Most data available emanates from the developed world and this may not accurately reflect our situation due to major social-cultural, economic and environmental differences. This study looks at some cardiovascular risk factors among in patients at Mathari hospital and is an attempt to fill that gap in knowledge.

3.0 LITERATURE REVIEW

3.1 BACKGROUND

Definition of risk factor

A risk factor is a manifestation or a laboratory measurement that expresses the likelihood that an individual or a group will develop a disease over a defined period of time. A risk factor may play a causal role in the pathogenesis of a disease or it may be an associated marker. For example, low-density lipid (LDL) Cholesterol is a risk factor in CHD proven to be modifiable in intervention trials, whereas C-reactive protein is a risk marker for coronary heart disease but is not necessarily causal. Specific diseases have both modifiable and non-modifiable risk factors. Traditional modifiable risk factors for coronary heart disease include Obesity, Dyslipidacmia, Diabetes, Hypertension, Smoking and the psychological state (15). Non-traditional or novel risk factors include older age, male gender, proteinuria, blood homocysteine, C-reactive protein, left ventricular hypertrophy, oxidative stress and fibrinogen (16). The risk factors that influence development of CAD in white population are hypertension, hypercholesterolemia, low HDLc, cigarette smoking, Diabetes mellitus, age and male gender. It is uncertain if the same risk factors contribute to a similar extent in the black populations (17).

3.2 EPIDEMIOLOGY

CHD is the most common form of heart disease and single most important cause of premature death in the East and West of Europe. It is projected to become the major cause of death in all regions of the world by 2020 (10,12)

In Africa before 1980, CAD was reported as less than 0.5% of all cardiovascular disease (CVD)(14).

However, the incidence and prevalence of CAD is increasing in developing countries. The 1990 estimate for mortality in men and women due to ischaemic heart disease in sub-Saharan Africa was 1.9 million and 1.2 million respectively; the projected increase in the mortality in the year 2020 is 144% and 116% respectively (10).

3.3 CONVENTIONAL CARDIOVASCULAR RISK FACTORS AND MENTAL ILLNESS

Age and male gender.

Prevalence and mortality form CAD increase with age even in the USA black population and so is data from South Africa (17,18)

An International atherosclerosis project found little sex differences in advanced CAD in black population (14). However, CAD risk was higher in women using of hormonal contraceptives (20).

Diabetes

Diabetes is frequently seen to occur together with other cardiovascular risk factors and many type 2 diabetics are also hypertensive.

WHO recommends testing of diabetes at a younger age in case one displays other CVD risk factors (21).

Hyperglycemia is an under-recognised co-morbid complication of treatment with antipsychotic medication and it may contribute to the increased morbidity and mortality seen in schizophrenia (22). Dixon (2000), reporting on the USA's Schizophrenia Patient Outcomes Research Team (PORT) and National Health Interview Survey, studied the prevalence and correlates of diabetes in people with schizophrenia. The PORT survey interviewed 719 people with schizophrenia (mean age 43 years) about their physical health between 1991 and 1996. It found 14.9% lifetime diabetes and 10.8% self-reported current diabetes. This compared poorly with general population data from the National Health Interview Survey, in which diabetes rates in the general population were 1.2% (18- to 44-year-olds) and 6.3% (45- to 64-year-olds). Thus, in the USA in the mid-1990s (probably before the widespread use of atypical ant psychotics) the rate of diabetes in people with schizophrenia already exceeded that in the general population (23).

Thakore (2004) reported that more than 15% of their sample of drug-naive patients with first-episode schizophrenia had impaired fasting glucose compared with none of the matched healthy volunteers (24). In addition, a small study by Mukherjee (1996) reported a family history of type II diabetes in 18-19% of their sample of people with schizophrenia (25). Locally, some CVRF were found in Kenyan patients with mild tomoderate hypertension including diabetes (26).

Ndegwa (2004) found a prevalence of 11% frank diabetes and 20.7% glucose intolerance among psychiatric inpatients at Mathari hospital (27). Poor control of blood sugars in diabetics or in undiagnosed/untreated cases as happens in patients with severe mental illness is bound to worsen the situation (4,5).

Obesity

Obesity is an established risk factor to coronary artery disease (CAD). Obesity per se is associated with increased risk for hypertension, diabetes and cardiovascular sequelae. Waist Hip Ratio (WHR) is the measure of central fat distribution, which is related to obesity (28). The metabolic and circulatory changes associated with central obesity (as measured by WHR) lead to development of insulin resistance and greater risk of CAD (29). Lean men with BMI 25-29 shown to have 70% greater risk of CHD and 29-33 almost three-fold risk of CHD (30). Interventions to reduce adiposity and avoid excess weight may have positive effects on development of risk factors and adverse coronary events (31). A study that used the 1989 US National Health Interview Survey data comparing weights and heights of people with and without schizophrenia, in general, the results showed that those with schizophrenia were more obese than those without, and that the difference was

significant for women. Another study reviewed by Allison & Casey, of 151 people with schizophrenia, reported 51% of males and 59% of females to be clinically obese compared with 33% of people with other psychiatric disorders (32). Antipsychotic-related weight gain was first reported in association with chlorpromazine in the late 1950s, but it has remained overshadowed by other side effects such as extra pyramidal symptoms and tardive dyskinesia. Among the conventional antipsychotics, weight-gain liability appears to be greatest with low-potency drugs. Meta-analyses, clinical trials and clinical experience suggest that the atypical antipsychotics (quetiapine, olanzapine) can also cause marked weight gain during treatment. The biggest risk factors for emergent diabetes in schizophrenia patients is weight gain caused by anti psychotics especially the atypicals (33). Weight loss in patients with type 2 diabetes and also among schizophrenia patients is associated with improved glucose control, lipid profile and reduced coronary events (31,34).

Alcohol

Although ethanol in low doses causes a mild to moderate drop in blood pressure (by decreasing myocardial contractility and increasing peripheral vasodilatation) the consumption of three or more drinks per day results in a dose dependent increase in BP. Hence heavy drinking is an important contributor to hypertension. (35,36). The inverse association between moderate consumption of ethanol and CAD is well established (37,38). Alcohol increases HDLc levels and CAD risks (39).

Hypercholesterolemia

Results of Framingham Heart study documents that cholesterol levels in early adult hood predict cardiovascular mortality rate even 30 years later (40).
Elevated blood lipids, particularly triglycerides, are associated with some typical antipsychotic agents. Shortly after their introduction, phenothiazines were found to elevate serum triglyceride and total cholesterol levels. This compared with a minimal or slightly favorable effect seen with butyrophenones. Much has been written on the effects of specific atypical drugs on lipid profiles. Both clozapine and olanzapine have been shown to cause significant hypertriglyceridemia compared with the typicals. Some studies have reported a significant association between weight gain and triglyceride change for patients receiving atypical antipsychotic therapy, but other studies suggest a direct effect of clozapine and olanzapine on lipid levels not associated with weight gain (41).

The exact biochemical locus at which atypical exert their influence on triglyceride metabolism remains a source of speculation. However, it has been noted that the atypical that exert significant effects on fasting triglyceride levels are dibenzodiazepine-derived compounds - clozapine, olanzapine and quetiapine. They have the propensity to increase serum triglyceride levels with lesser effects on

cholesterol (41). Psychiatric patients are rarely or unlikely screened for cholesterol levels (42,43). Furthermore, they are also frequently likely to take unhealthy diets rich in saturated fats (44).

Hypertension

There is a recognized relationship between cardiovascular risk and a raised blood pressure. The Joint National Committee on hypertension (JNC) 7 criteria introduces a new class of pre-hypertension that specifically recognizes early the minimal elevations in blood pressure and cardiovascular risk and encourages lifestyle modification for anyone with systolic BP of 120mmHg or more and or diastolic BP 80mmHg or more (45). Most studies available on hypertension in psychiatric patients were done in the west (46,47). They give a prevalence of 15% to 18%. Local studies on hypertension in psychiatric patients are lacking. The studies on multiple risk factors in the general CVD affected population with diabetes, renal disease give a higher prevalence ranging from 61% to 65%(48,49,63)

Smoking.

Smoking has long been associated with high cardiovascular disease risk profile (50). The risk of death from CAD is doubled among smokers than among non-smokers (51). More significantly, emerging evidence have shown that there is risk of death due to CVD increase by 30% in non-smokers who live together with active smokers (passive smokers) (52). Even a more worrying revelation, the effects of even brief passive smoking are nearly as large as chronic active smoking, estimated at 80%-90% (53).

As in the general population, tobacco/cigarette smoking, substance abuse among psychiatric patients is a well-known phenomenon. Psychiatric patients have higher prevalence of smoking and smoke more cigarettes (42). Depression is independently linked to daily smoking and nicotine dependence. Researchers have found that people with a history of major depression have a three-fold elevation in risk of becoming a smoker. Depressed smokers are less likely to quit successfully and are more likely to have withdrawal symptoms during attempts to quit. Smokers with a history of depression have been shown to have an exaggerated belief in the positive effects of smoking. They also have less confidence in their ability to refrain from smoking (54,55)

The prevalence of smoking in schizophrenia greatly exceeds that in the general population **(75-92%** v. **30-10%).** Furthermore, heavy cigarette smoking is intimately associated with schizophrenia and it may have implications for the underlying neurobiology of the disease. Patients who smoke report increased cigarette

consumption, are more addicted to nicotine and have higher nicotine levels in the bloodstream. Smoking may be a marker for a more severe illness. Cigarette smoking induces hepatic microsomal enzymes, which increase the metabolism of psychotropic medication; therefore smokers usually require greater levels of antipsychotic medication than non-smokers to achieve similar blood levels (44).

Prevalence studies in the west give higher rates of smoking by psychiatric patients especially those with schizophrenia (56%- 88%) when compared with the general population (USA overall prevalence is 25%) and 55% in bipolar disorder (56,57). Studies on smoking by psychiatric patients are few in developing countries where social, cultural and familial factors influence smoking behavior. Most studies in Africa are on the general population and medical students. They found prevalence of 18% and 19% current and passive smoking respectively (58,59).

Exercise

Physical activity has been shown to prevent mortality from cardiovascular disease either directly or indirectly. The mechanisms by which it reduces morbidity and mortality are through modification of other cardiovascular risk factors especially reducing obesity, high blood pressure, hypercholesterolemia, and glucose intolerance (60). Centers for Disease Control (CDC) recommends at least moderately intense physical activity such as brisk walking done on a regular routine for a total of 30 minutes or longer on most days (61).

Brown (1999) and McCreadie (2003) found that people with schizophrenia tended to take only small amounts of exercise. Mental patients lead a predominantly sedentary lifestyle. The reason for this has not been elucidated but factors such as features of the illness, frequent exacerbations or sedative medication and lack of opportunity and general motivation may be relevant (44,62).

3.4 STUDIES ON MULTIPLE RISK FACTORS

In the general population most studies in the west which were echoed by local studies in patients with diabetes, hypertensive and renal patients as well as those undergoing coronary angiography showed dyslipidaemia to be the most prevalent risk factor followed by hypertension (48,49, 63) at ranging from 67.4% to 93.5% and 61.5% to 64.8% respectively (48,49). However, Kadiri (1997) in a study on middle aged Nigerians found low overall prevalence of less than 5% cardiovascular risk factors in a Nigerian population study (64).

A larger Italian study on 1,390 severe mentally ill in patients found dyslipidaemia and hypertension as the most prevalent risk factors at 40%, current smokers were 37.3%, overweight (male, 25.3%, female, 11.3%), and obesity (male, 3.3%, female, 5.8%), 7% had family history of stroke, 5.7% had family history of

CHD and 1.4% had clinical history of CHD. Clustering was prevalent in 16% where patients had two or more risk factors (65).

Davidson examined the prevalence of CVRF among 234 outpatients with SMI and found higher prevalence of smoking, overweight and obesity, lack of moderate exercise harmful alcohol consumption and salt intake, however there was no difference in prevalence on hypertension as compared to a community sample (42). A pilot study on 53 psychiatric patients by Merriman found a high prevalence of smoking at 52%, followed closely by abnormal waist circumference (48.8%), overweight (37.7%), obesity (34%), and hypertension (6.1%)(47).

Vaghela (2001), in a study on cardiovascular risk factors associated with type 2 diabetes mellitus at Kenyatta National Hospital found a prevalence of 64.8% hypertension 5% were undetected and all partially controlled. The prevalence of dyslipidaemia was 93.5%. Clustering was common with at least 2 risk factors present (excluding diabetes) in all patients (49).

Kamotho (2003), in a study on 108 black Africans undergoing coronary angiography at Nairobi hospital found more male than female affected while increasing age was a risk factor with a mean age of 54.4 years. Hypertension was prevalent in 63.2% mean BMI was 26.9 overweight prevalent in 47.6% and class I obesity 16.2%, smoking 5.6% while 25.9% were ex-smokers (1 female). 77.8% had family history of obesity, 66.7% had hypertension and 15.7% had family history of heart attack or sudden cardiac death or stroke. Dyslipidaemia was 93.5%. Clustering was seen commonly with most having at least 2 risk factors (48), however this study was done on already affected individuals in high a social- economic group.

3.5 OTHER RISK FACTORS

1) Left ventricular hypertrophy (LVH)

Data from the Framingham heart study have identified LVH as a blood pressure independent risk for sudden cardiac death, acute myocardial infarction and other cardiovascular morbidity and mortality. LVH is common in hypertension diagnosed by ECG or Echo. With the later help more accurate (35).

2. Lipoprotein (a) (Lp (a)

A genetically determined plasminogen- likes apolipoprotein, probably related to both atherogenesis and thrombogenesis (35)

3. Homocysteine

There is direct relationship between raised homocysteine levels with development of premature atherosclerosis and with increased risk of thrombosis (35)

4. Coagulation Markers

Fibrinogen, factor V, factor VII, Von Will brand factor, and fibrinolytic markers are associated with CAD (35)

5. **Dietary factors**

A small case-control study in a Scottish population demonstrated that people with schizophrenia made poor dietary choices, characterized by high fat and low fiber intake. A larger study examined in detail the dietary intake of 102 people with schizophrenia. Their fruit and vegetable consumption averaged 16 portions per week (less than half the recommended intake), and very few patients made acceptable dietary choices across a range of foodstuffs (44).

6. **Social Economic factors**

Factors related to social and cultural conditions and development. In the west affluent society CAD levels are declining parallel to economic development. In Africa there are changing lifestyle with affluence and rising CAD levels (65,66,67).

7. **Psychosocial factors, mental stress and personality**

Mental stress has been associated with an increased risk of CAD events. Certain personality types have been associated with risk of CAD events. Early research exploring the relationship of behavior patterns with cardiovascular disease focused on the effect of the type A behavior pattern (TABP)—time, hostility, and achievement-striving-competitiveness, men with type A behavior were twice as likely as men without type A traits to develop CAD (68).

8. **Genetic markers**

Various genes have been associated with hypertension, diabetes, Coagulopathies, Lipidaemia and homecysteine (12,35).

9. **Infection, inflammation and atherosclerosis**

These are an association between CAD and serological markers of infection by chlamydia, Helicobacter Pylori, Cytomegalovirus and periodontal disease (12).

10. **Oral contraceptives.**

Hormonal oral contraceptives have been associated with increased risk of myocardial infarction (20).

4.0 STATEMENT OF RESEARCH

4.1 RESEARCH QUESTION

1. What is the prevalence of some cardiovascular risk factors among patients admitted at Mathari hospital?

4.2 AIM.

To increase the awareness cardiovascular risk factors and other physical illnesses, and improve their diagnosis, treatment and follow-up.

4J BROAD OBJECTIVE

To determine the prevalence of some cardiovascular risk factors among psychiatric inpatients at Mathari hospital.

4.4 SPECIFIC OBJECTIVES

1. Mathari hospital:
   Determine the prevalence of the following among the psychiatric inpatients at Mathari:
   (a) Cigarette smoking
   (b) Obesity/overweight
   (c) Hypertension
   (d) Inadequate exercise
   (e) Risky alcohol use
2. Describe the socio-demographics correlates associated with the above risk factors
3. Describe possible associations of the risk factors
4. Describe other possible physical co-morbidity from physical examination findings.
5. Make appropriate recommendations.

4.5 HYPOTHESES

NULL-;There is no difference in the prevalence of **CVD** risk factors among inpatients at Mathari hospital than that found in similar populations.

ALTERNATIVE:- There is a higher prevalence of **CVD** risk factors among inpatients at Mathari hospital than that found in similar populations.

5.0 METHODOLOGY

5.1 STUDY DESIGN

Cross-sectional descriptive study.

5.2 Study area:

Mathari hospital, which is a psychiatric referral and teaching hospital situated about 4 kilometers north of Nairobi city. It has a bed capacity of 698 with 2 main sections namely forensic section with 351 beds and civil section with 332 beds. The civil section has several categories general wards (246 beds), amenity wards (45 beds), infirmary ward for psychiatric patients with co-morbid medical conditions (26 beds) and a drug rehabilitation ward (35 beds)(70)

5.3 Study population

Psychiatric inpatients admitted at Mathari hospital and consenting to participate.

5.4 Sample selection

Systematic random sampling was adopted using the inpatient register at the OPD. All patients are first seen at the OPD and allocated a specific ward prior to admission. The number of admissions per ward from January to June 2007 was used to give a proportionate allocation to avoid bias (see table).

Admitting ward	Total No. Of patients	Proportion	Allocation
5M	**2180**	180/8349x160=41.5	**42** every 3rd
6M	**1816**	1816/8349x160=34.8	**35** every 3rd
8M	**1463**	1463/8349x160=28.0	**28** every 3rd
9M	**1135**	1135/8349x160=21.7	**27** every 3ra
IF	**788**	788/8349x160=15.1	**15** every patient
2F	**967**	967/8349x160=18.5	**19** every patient
Total	**8349**	*Minimum sample*: **160**	

Source: Records Department, Mathari hospital, JULY2007.

Out of the first four patients admitted one was picked randomly, thereafter every third patient was selected in the male wards. If the selected patient failed to meet the selection criteria, the next consecutive was picked to fill the ward allocation till the sample was achieved for all the male wards. The same was replicated for the female wards except every patient was eligible.

5.5 INCLUSION CRITERIA:

(i) Psychiatric patients admitted at Mathari hospital.
(ii) Age above 18 years.
(iii) Consenting to participate in the research.

5.6 EXCLUSION CRITERIA:

(i) Lack of or refusal to consent
(ii) Patients who are too sick to participate

5.7 Sample size

The samples size was determined using the formula

$$n = \frac{z^2 pq}{d^2}$$

z is the standard deviation set at 1.96 which corresponds to 95% confidence interval

p is 60% the average prevalence of the most prevalent risk factor (Smoking) derived from western studies on psychiatric populations(56, 57).

$q = 1 - p$

d = degree of accuracy 7.5%

$$n = \frac{(1.96)^2 \quad (1-0.6)(0.6)}{0.075^2} = \frac{3.84 \times 0.24}{0.005625}$$

= 160

Minimum sample was 160 patients. A total of 161 patients were sampled.

5.8 STUDY INSTRUMENTS

1. Researcher-designed socio-demographic, Health and lifestyle questionnaire which includes questions on exercise/activity level to asses exercise adequacy as per CDC recommendation, active/passive tobacco smoking in the last one year taken as risky smoking.
2. AUDIT-C: (Alcohol Use Disorder Identification Test). A 3-question brief alcohol screen, which has been proven to be as highly accurate in primary settings as the 10-question AUDIT and has been validated in western studies (71,72). See appendix I (Questionnaire). Risky alcohol use taken as score >/= 4 for men and >/= 3 for females.
3. Digital BP machine to measure blood pressure in millimeters of mercury (mmHg) equivalents.
4. Weighing scale to measure weight in kilograms.
5. A non-stretch tape measure to take hip and waist circumference in centimeters.
6. A digital thermometer to measure temperature in degrees centigrade.

5.9 Procedures

After introduction and consent explanation, consent was obtained the socio-demographic; health and lifestyle questionnaire was filled by the researcher. Definitions and interpretation as per appendices III and IV.

Height: measured to the nearest 0.5 cm without shoes using non-stretch tape. Each participant standing on heels without shoes, buttocks and shoulders resting lightly against the wall looking straight ahead.

Weight: measured after removal of shoes and when wearing light clothing only, using a weighing scale, recorded to the nearest 0.1 kg.

BMI: calculated as weight (kg) height (m2) those with a BMI of less than 18.5kg/m2 classified as underweight, those with BMI of 25.0-29.9 kg/m2 classified as overweight while those with a BMI > 30.0 kg/m2 classified as obese (34).

Waist circumference: measured using a non-stretch measuring tape with measurements made halfway between the lower border of the ribs and the iliac crest in a horizontal plane. Central obesity defined as: Men with a waist circumference >= 94.0 cm and women with a waist circumference >= 80.0 cm (6).

Hip circumference: taken at the level of the greater trochanters.

WHR: obtained by dividing the mean waist circumference by the hip circumference. Men and women overweight with abnormal WHR >= 0.90 and >= 0.8 respectively (28)

Blood pressure: Measured in a sitting position after patient has relaxed for at least lOminutes. BP taken with a commercial digital BP machine (*citizen)* on left arm at level of the heart. BP >= 130 systole and diastolic >= 85 classified as **prehypertension. Hypotension** =< 79systole and =<59 diastole (45)

Hypertensive: taken as patient on treatment for it, and systolic reading >= 140/mmHg or diastolic reading >= 90 mmHg (45).

6.0 ETHICAL CONSIDERATIONS

Authority to carry out the study was sought and obtained from:

1. Ethics Committee Mathari hospital.
2. Ethics Committee Kenyatta National Hospital

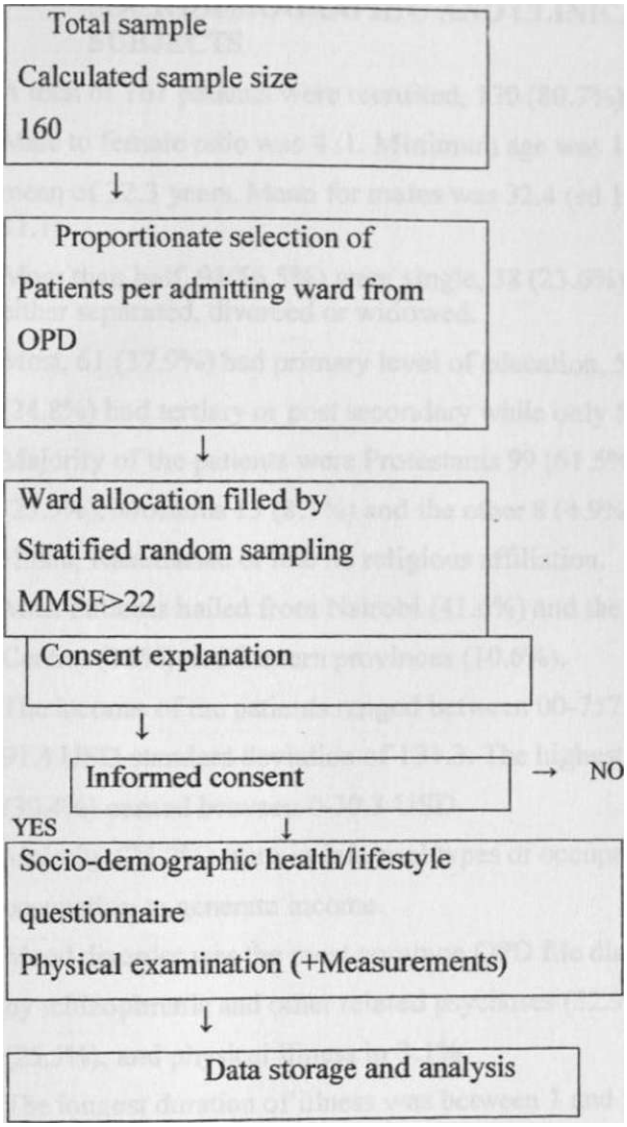
- The nature of the study was explained to the study subjects in a language the participant can understand (Kiswahili/English). It was made clear that participation is voluntary, it was explained that any abnormality/diagnosis ^were assured of confidentiality of information which was to be used only for research purposes and that they would only be identified by a serial number which would not be directly traceable to them in results/publications. However in cases where illness was diagnosed, confidentiality was that of doctor- patient in which case the condition was managed in collaboration with other medical staff. Cell phone contact of principal investigator and supervisor was given to address any queries that arose. Only patients well enough to give consent were included in the study and also use of family surrogates to consent on behalf of patient. The independent monitors mentioned above were involved to ensure ethical standards were met as per the Helsinki Declaration and Guideline 9 of the International Ethical Guidelines for Biomedical Research Involving Human Subjects (73,74). *SEE CONSENT EXPLANATION AND FORM IN APPENDIX II.*

6.10 DATA MANAGEMENT

Data collected on questionnaire was transferred to computer database and analyzed using SPSS version 12 software. Continuous data presented as means and standard deviation categorical data into percentages. Correlations between quantitative variables tested using Pearson's chi-square. Prevalence rates were calculated and presented as percentages.

The above was presented in form of tables and charts statistical significance taken as a P value less or equal to 0.05 at 95% confidence interval.

6.2 FLOW CHART



7.0 RESULTS

SOCIODEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF SUBJECTS

A total of 161 patients were recruited, 130 (80.7%) male and 31 19.3% females. Male to female ratio was 4:1. Minimum age was 18years and a maximum of 76years, mean of 32.3 years. Mean for males was 32.4 (sd 10.4), females mean was 30.0 (sd **11.1).**

More than half, 91(56.5%) were single, 38 (23.6%) married while 32 (19.9%) were either separated, divorced or widowed.

Most, 61 (37.9%) had primary level of education, 55 (34.2%) had secondary, 40 (24.8%) had tertiary or post secondary while only 5 (3.1 %) had no formal education.

Majority of the patients were Protestants 99 (61.5%), followed by Catholics 41 (25.5%), Moslems 13 (8.1%) and the other 8 (4.9%) were either traditionalists, Hindu, Rastafarian or had no religious affiliation.

Most Patients hailed from Nairobi (41.6%) and the surrounding districts in the Central (38%) and Eastern provinces (10.6%).

The income of the patients ranged between 00-757.6 US Dollars, a mean of 91.4 USD standard deviation of 131.3. The highest proportion of patients (30.4%) earned between 0-30.3 USD.

Majority (75.2%) were in informal types of occupations while 13.6% had no occupation to generate income.

Mood disorder was the most common OPD file diagnosis in 38.5% followed by schizophrenia and other related psychoses (32.9%), substance use disorders (25.5%), and physical illness in 3.1%.

The longest duration of illness was between 1 and 5years in 33.5%.

About half (49.7%) had between 2 and 5 admissions.

The most common complaints given by patients were various body pains (15.7%), drowsiness (12.9%), skin rash (11.4%), drooling (11.4%), and wounds (11.4%).

The following tables 1 to 19 summarize the findings.

Table 1: Socio demographic characteristics of the study subjects
Unless otherwise specified N= 161

VARIABLES		Frequency (F)	%
Age	18-27	66	41.0
	28-37	56	34.8
	38-47	24	14.0
	>48	15	9.3
Gender	Male	130	80.7
	Female	31	19.3
Marital status	Single	91	56.5
	Married	38	23.6
	Separated	32	19.9
Lev el of education	Nil	5	3.1
	Primary	61	37.9
	Secondary	55	34.2
	Tertiary	40	24.8
Residence	Nairobi	67	41.6
	Central	61	38.0
	Eastern	17	10.6
	Rift valley	10	6.2
	Others	6	3.6
Income bracket (USD)	0-30	49	30.4
	31-75	42	26.1
	76-150	33	20.5
	>150	37	23.0
Religion	Catholic	41	25.5
	Protestants	99	61.5
	Moslems	13	8.1
	Others	8	4.9
Occupations	Non	22	13.6
	Informal	121	75.2
	Formal employment	18	11.2
File diagnoses	Mood disorder	62	38.5
	Schizophrenias & related	53	32.9
	psychoses	41	25.5
	Substance related disorders	5	3.1
	Physical illness		
Duration of illness	Less than 1 year	34	21.7
	1-5	54	33.5
	6-10	22	13.7
	11-20	37	23.0
	>20	14	8.7
No. of admissions	1" admission	35	21.7
	2-5	80	49.7
	6-10	19	11.8
	11-20	14	8.7
	>20	13	8.1

USD=United States of America Dollar.

1 USD= 66 Kenya shillings

Table 2: Current/ new complaints (symptoms) as reported by patients. N =70

	COMPLAINT	F	%		COMPLAINT	F	%
k	Body pains	11	15.7	19.	Blurred vision	2	2.9
2.	Drowsiness	9	**12.9**	20.	Bleeding	2	2.9
3.	Rash	8	**11.4**	21.	Ear blockage	2	2.9
4.	Drooling	8	**11.4**	22.	Thirst/hunger	2	2.9
5.	Wounds	8	**11.4**	23.	Discharging ear	2	2.9
6.	Fatigue	7	10.0	24.	Body stiffness	1	1.4
7.	Tremors	6	8.6	25.	Localized body weakness	1	1.4
8.	Running nose/congestion	5	7.1	26.	Reduced/low libido	1	1.4
9.	Body swelling	4	5.7	27.	Intrusive thoughts	1	1.4
10.	Hard stools	4	5.7	28.	Palpitations	I	1.4
11.	Abdominal pains/discomfort	4	5,7	29.	Shivering	1	1.4
12	Dental pains	3	4.3	30.	Weight gain	1	1.4
13.	Body hotness	3	4.3	31.	Wheeze	1	1.4
14.	Cough	3	4.3	32.	Urinary frequency	1	1.4
15.	Diarrhea	3	4.3	33.	Throat pain	1	1.4
16.	Dizziness	3	4.3	34.	Vomiting	1	1.4
17	Headache	2	2.9	35	Dry mouth	1	1.4
18	Heavy tongue	3					

TABLE 3; Investigation done since current admission N

Investigation	Frequency
BSMPS	4
Urinalysis	2
Haemogram	1
Hemoglobin	1
ESR	1
ELISA	1
E E G	1
Random blood sugar	1
Total	12

admission

Only one patient had been screened for diabetes

No patient had been done lipid profiles.

BSMPS: blood slide for malaria parasites

ESR: erythrocyte sedimentation rate

Table 4: Physical signs (no diagnosis made)j^150

	Sign	F	%
1.	Tachycardia	87	**58.0**
2.	Fever	18	**12.0**
3.	Wasting	28	17.4
4.	Pallour	3	2.0
5.	Drowsiness	7	4.7
6.	Oedema	2	1.3
7.	Finger clubbing	**1**	0.7
8.	Systolic murmur	1	0.7
9.	Tremors	9	6.0
10	hypothermia	**1**	0.7

Tachcardia: pulse rate >/=100 beats /minute. Fever: temperature>/=37.3C, hypothermia: temperature below 35C or unrecordably low.
Wasting: BMI <18.5Kg/m2.

	diagnoses	F	%
1.	Wounds	59	39J
2.	Hypertension	28	18.7
3.	Hypotension	22	14.7
4	dermatoses	27	18.0
5	Dental caries	5	3.3
6.	LRTI	4	2.7
7	URTI	3	2.0
8	Arthritis	3	2.0
9.	Fractures	3	2.0
10.	UTI	2	1.3
11.	Cellulitis	2	1.3
12.	Blunt eye injury	2	1.3
13.	Conjunctivitis	2	1.3
14.	anaemia	2	1.3
15	Parkinsonism	1	0.7
16.	Epilepsy	1	0.7
17	Malaria	1	0.7
18	Jigger infestation	1	0.7
19.	Tumor growths (thyroid, skin etc)	3	2.0

LRTI: lower respiratory tract infection. URTI: upper respiratory tract infection.

UTI: urinary tract infection. Hypotension: BP <80mmHg systole and <50mmHg diastole.

Hypertension: Bp >/=140mmHg systole and >/=90mmHg diastole. Anaemia : haemoglobin level </=10g/litre.

Table 6: Current medications/treatments. N=161

Treatment	F	%
1. Typical antipsychotics	217*	134
2. Anticonvulsants/mood stabilizers	117	72.7
3. Anticholinergics	91	56.5
4. Sedatives	25	15.5
5. Antidepressants	13	8.1
6. Antimicrobials/antivirals	12	7.5
7. Nutritionals	12	7.5
8. Atypical antipsychotics	7	4.3
9. Vaccines	4	2.5
10. Surgical procedures + ECT	2	1.2
11. Anti-malarias	2	1.2
12. Analgesics	2	1.2
13. Antacids	1	0.6

NB. *Some patients were on more than one typical antipsychotic medication.

No patients were on any antihypertensive medication.
No patients were on any antidiabetic medication.
ECT: electroconvulsive therapy.

Table 7. Prevalence of Cardiovascular Risk Factors (CVRFs)

CVRF		Frequency	%
Exercise	Adequate	57	35.4
	Inadequate	104	**64.6**
Alcohol misuse	Yes (risky)	71	**44.1**
	No (no risk)	90	55.9
Smoking (tobacco exposure)	Yes	107	**66.5**
	No	54	33.5
Blood pressure	Hypotension	22	13.7
	Normal BP	88	54.7
	Prehypertension	23	14.3
	Hypertension	28	17.4
Overweight/obesity By BMI	Underweight	28	17.4
	Normal weight	103	64.0
	Overweight	19	**11.8**
	Obesity	11	**6.8**
Overweight/obesity By WC	Normal	129	80.1
	Abnormal	32	19.9
Overweight/obesity By WHR	Normal	103	64.0
	Abnormal	58	**35.0**
Hormonal contraceptive use N=31	Yes	6	**19.4**
	None	23	74.2
	Others	2	6.4

Overall prevalence of overweight and obesity by BMI was 30 (18.6%).

Table 8: Sociodemographic determinants of Blood Pressure

Variable		Blood Pressure n (%)				Significance tests
		Hypotension	Normal BP	Pre-hyper tension	Hypertension	
Age	18-27	9(5.6)	43 (26.7)	8 (5.0)	6(3.7)	$X^2 = 0.233$
	28-37	6(3.7)	31 (19.3)	10(6.2)	9(5.6)	P = 0.003
	38-47	6(3.7)	9(5.6)	4(2.5)	5(3.1)	SS
	>48	1 (0.6)	5(3.1)	1 (0.6)	8(5.0)	
Gender	Male	17(10.6)	66(41.0)	22(13.7)	25(15.5)	$X^2 = 0$ 153
	Female	5(3.1)	22(13.7)	1 (0.6)	3(1.9)	P = 0.052
						NSS
Marital status	Single	12 (7.5)	54 (33.5)	14 (8.7)	11 (6.8)	X^ 0.004
	Married	4(2.5)	20(12.4)	4 (2.5)	10(6.2)	P - 0.290
	Separated	6 (3.7)	14(8.7)	5 (3.1)	7(4.3)	NSS
Income USD	0-30	5(3.1)	27(16.8)	6(3.7)	11 (6.8)	X*= 0.050
	31-75	6(3.7)	24(15.0)	5(3.1)	7(4.3)	P = 0.525
	76-150	3(1.9)	22(13.7)	6(3.7)	2(1.2)	NSS
	> 150	8(5.0)	15 (9.3)	6(3.7	8(5.0)	
Religion	Catholic	6(3.7)	23(14.3)	6 (3.7)	6(3.7)	X*= 0.060
	Protestants	12(7.5)	56 (34.8)	13(8.1)	18(11.2)	P = 0.446
	Moslems	3 (1.9)	7 (4.3)	1 (0.6)	2(1.2)	NSS
	Others	1 (0.6)	2(1.2)	3 (19)	2(1.2)	
Education	Nil	1 (0.6)	4 (2.5)	0 (0.0)	0 (0.0)	X ^ 0.016
	Primary	8 (5.0)	32(19.9)	8(5.0)	13(8.1)	P = 0.839
	Secondary	6 (3.7)	32(19.9)	7(4.3)	10(6.2)	NSS
	Tertiary	7(4.3)	20(12.4)	8(5.0)	5(3.1)	
File diagnoses	Mood D	7 (4.3)	34 (21.1)	7(4.3)	14(8.7)	X^ 0.085
	Schizophrenias	10 (6.2)	28(17.2)	8 (5.0)	7(4.3)	P = 0.282
	Substance D	5(3.1)	24(15.0)	7(4.3)	5(3.1)	NSS
	Physical	0 (0.0)	2(1.2)	1 (0.6)	2(1.2)	
Duration of illness	Less than 1 yr	5(3.1)	20(12.4)	4 (2.5)	5(3.1)	X*= 0.085
	1 - 5yrs	7 (4.3)	32(19.9)	8(5.0)	7 (4.3)	P = 0.507
	6 - lOyrs	3(19)	8(5.0)	5(3.1)	6(3.7)	NSS
	11-20yrs	5(3.1)	22(13.7)	6 (3.7)	4(2.5)	
	Above 20yrs	2(1.2)	2(1.2)	0 (0.0)	6(3.7)	
No. Of admissions	First	4 (2.5)	20 (12.4)	5(3.1)	6(3.7)	X^2^ 0.053
	2-5	9 (5.6)	48 (29.8)	13(8.1)	10(6.2)	P = 0.507
	6- 10	4 (2.5)	6(3.7)	5(3.1)	4(2.5)	NSS
	11-20	4 (2.5)	7(4.3)	0 (0.0)	3(1.9)	
	>20	1 (0.6)	7(4.3)	0(0.0)	5(3.1)	
Current treatment	Typical AP	18(11.2)	71 (44.1)	15(9.3)	15(9.3)	X^ 0.082
	Atypical AP	1 (0.6)	0(0.0)	2(1.2)	1 (0.6)	P = 0.299
	Sedatives	1 (0.6)	3(1.9)	1 (0.6)	3(1.9)	NSS
	Mood stabilizers	0 (0.0)	9(5.6)	4 (2.5)	6 (3.7)	
	Antidepressants	1 (0.6)	2(1.2)	0 (0.0)	3(1.9)	
	Others	1 (0.6)	3(1.9)	1 (0.6)	0 (0.0)	
Residence	Nairobi	10 (6.2)	34 (21.1)	9 (5.6)	14(8.7)	
	Central	7 (4.3)	35(21.7)	9(5.6)	12(7.5)	X*= -0.116
	Eastern	1 (06)	12(7.5)	2(1.2)	2(1.2)	P = 0.142
	Rift valley	1 (0.6)	5(3.1)	3(19)	0 (0.0)	NSS
	Others	4(2.5)	2(1.2)	0 (0.0)	0 (0.0)	

There was statistically significant association between blood pressure and age **(P < 0.05).** Prehypertension and hypertension was more common in the middle **(28-37)** age groups in **6.2%** and **5.6%** respectively.

Table 8: Sociodemographic determinants of Blood Pressure

Variable		Exercise n (%)		Significance tests
		Adequate	Inadequate	
Age	18-27 28-37 38-47 >48	34(21.1) 27(16.8) 13(8 1) 6(3.7)	32(19 9) 29(18.0) 11 (6.8) 9(5.6)	X^2 - -0.017 P - 0.832 NSS
Gender	Male Female	50(31.1) 7(4.3)	80 (49.7) 24(15.0)	X^2 - 0.131 P = 0.098 NSS
Marital status	Single Married Separated/widowed/ Divorced	30(18.6) 13(8.1) 14 (8.7)	61 (37 9) 25(15.5) 18(11.2)	X^2 = 0.085 P = 0.313 NSS
Income USD	0-30 31 -75 76-150 Above 150	15(9 3) 13(8.1) 15(9.3) 14(8.7)	34 (21.1) 29(18.0) 18(11.2) 23(14.3)	X^2 = -0.085 P = 0.283 NSS
Religion	Catholic Protestant Moslems Others	17(10.6) 36(22.4) 3(1.7) 1 (0.6)	24(15.0) 63 (39.1) 10(6.2) 7(4.3)	X^2 = 0.138 P - 0.080 NSS
Education	Nil Primary Secondary Post-secondary	1 (0.6) 20(12.4) 22(13.7) 14 (8.7)	4 (2.5) 41 (25.5) 33 (20.5) 26(16.1)	X^2 = -0.046 P = 0.565 NSS
File diagnoses	Mood disorder Schizophrenia/psychoses Substance Physical illness	24(15 0) 16(9.9) 15 (9.3) 2(1.2)	38 (23.6) 37 (23.0) 26(16.1) 3(1.9)	X^2 = 0.16 P = 0.0836 NSS
Duration of Illness	Less than 1 year 1-5 6-10 11-20 Above 20 years	11(6.8) 19(11.8) 12(7.5) 13(8.1) 2(1.2)	23(14.3) 35 (21.7) 10(6.2) 24(15.0 12(7.5)	X^2 = 0.039 P = 0.625 NSS
No of admissions	First 2 -5 6-10 11-20 More than 20	12(7.5) 26(16.1) 9(5.6) 8 (5.0) 2(1.2)	23 (14.3) 54 (33.5) 10 (6.2) 6(3.7) 11(6.8)	X^2 =-0.011 P = 0.893 NSS
Current treatment	Typical AP Atypical AP Sedatives Mood stabilizers Antidepressants Others	44 (27.3) 0(0) 2(1.2) 7(4.3) 3(1.9) 1 (0.6)	75 (46.6) 4 (2.5) 6(3.7) 12(7.5) 3 (2.5) 4 (2.5)	X^2 = 0.061 P = 0.444 NSS
Residence	Nairobi Central Eastern Rift valley Others	20(12.4) 25(15.5) 6(3.7) 3(1.9) 3(1.9)	47 (29.2) 38 (23.6) 11 (6.8) 5(3.1) 3(1.9)	X^2 = - 0.075 P = 0.347 NSS

There was no significant association between exercise and any other socio demographic variables ($P > 0.05$)(no statistically significant findings).

Table 8: Sociodemographic determinants of Blood Pressure

Variable		Alcohol n (%)		Significance tests
		Non-risky	Risky	
Age	18-27 28-37 38-47 >48	35(21 5) 31 (19 3) 12(7.5) 12(7.5)	31 (19.3) 25(15.5) 12(7.5) 03 ((1.9)	- X^2 0.100 P = 0.0206 SS
Gender	Male Female	64 (49 2) 26 (83.9)	66(50.8) 5(16.1)	X^2 - 0.275 P = 0.000 SS
Marital status	Single Married Widowed/separated/	54 (33.5) 20(12.4) 16(9.9)	37(23.0) 18(11.2) 16(9.9)	X^2-0.079 P-0.318 NSS
Income USD	0- 30 31 -75 76-150 Above 150	37 (23.0) 26(16.1) 11 (6.8) 16(9.9)	12(7.5) 16 (9.9) 22(13.7) 21 (13.0)	X^2 = 0.256 P= 0.001 SS
Religion	Catholic Protestants Moslems Others	15(9.3) 61 (37.9) 10(6.2) 4 (2.5)	26(16.1) 38 (23.6) 3(1.7) 4(2.5)	X^2 = 0.141 P = 0.079 NSS
Education	Nil Primary Secondary Post-secondary	3(1.7) 35 (21.7) 33 (20.5) 19(11.8)	2(12) 26(16.1) 22(13.7) 21 (13.0)	X^2 = 0.069 P = 0.384 NSS
File diagnoses	MoodD Schizophrenias Substance D Physical illnesses	42 (26.1) 35 (21.7) 9(5.6) 4(2.5)	20(12.4) 18(11.2) 32(19.9) 1 (0.6)	X^2 = -0.271 P = 0.001 SS
Duration of illness	Less than 1 year 1 -5 6-10 11-20 Above 20 years	17(10.6) 23(14.3) 14(8.7) 23(14.3) 13(8.1)	17(10.6) 31 (19.3) 8 (5.0) 14(8.7) 1 (0.6)	X^2 = 0.234 P = 0.003 SS
No of admissions	First 2-5 6-10 11-20 Above 20	20(12.4) 38 (23.6) 14(8.7) 7(4.3) 11 (6.8)	15 (9.3) 42(26.1) 5(3.1) 7(4.3) 2(1.2)	X^2 = 0.137 P = 0.084 NSS
Current treatment	Typical Atypical Sedatives Mood stabilizers/ Antidepressants Others	71 (44.1) 3(1.9) 1 (0.6) 9(5.6) 3(19) 2(1.2)	47 (29.2) 1 (0.6) 7(4.3) 10 (6.2) 3(1.9) 3(1.9)	X^2 =-0.108 P-0.175 NSS
Residence	Nairobi Central Eastern Rift valley Others	35(21.5) 39(24.2) 8 (5.0) 4(2.5) 4 2.5)	32(19 9) 24(15.0) 9(5.6) 4 (2.5) 2(1.2)	X^2 = 0.014 P = 0.860 NSS

Alcohol was significantly associated with age, gender, and income, file diagnoses and duration of psychiatric illness (P< 0.05). Alcohol use was negatively correlated to income (P< 0.05) and file diagnoses (P< 0.05).

Risky alcohol use was more common in the youngest age group (18-27) in 19.3%, single males (50.8%), earning more than 150 USD (13.0%), with a diagnosis of substance use disorder (19.9%) of a duration of between 1-5 years (19.3%).

Table 8: Sociodemographic determinants of Blood Pressure

Variable		Smoking n (%)		Significance tests
		No risk	Risk	
Age	18-27 28-37 38-47 >48	25(15.5) 17(10.6) 6(3.7) 6(3.7)	41 (25.5) 39 (242) 18(11.2) 9(5.5)	X^s = 0.041 P = 0.608 NSS
Gender	Male Female	34 (26.2) 20 (64.5)	96(73.8) 11 (35.5)	X^2 = 0.320 P = 0.000 SS
Marital status	Single Married Widowed/separated/ Divorced	34 (21.1) 13(8.1) 7(4.3)	57(35.4) 25(15.5) 25(15.5)	X^2 = 0.120 P = 0.131 NSS
Income USD	0-30 31-75 76 - 150 Above 150	18(11.8) 16(9.9) 7 (4.3) 13(8.1)	31 (19.3) 26(16.1) 26(16.1) 24(15.0)	X^2 = 0.051 P = 0.517 NSS
Religion	Catholic Protestants Moslems Others	8(5.0) 41 (25.5) 3(1.9) 2(1.2)	33 (20.5) 58(36.0) 10 (6.2) 6(3.7)	X^2 =0.041 P = 0.609 NSS
Education	Nil Primary Secondary Post-secondary	1 (0.6) 16(9.9) 22(13.7) 15(9.3)	4(2.5) 45 (28.0) 33 (20.5) 25(15.5	X^2 = -0.115 P = 0.146 NSS
File diagnoses	Mood disorder Schizophrenias Substance D Physical illness	32(19.9) 19(11.8) 3(1.9) 0 (0.0)	30(18.6) 34(21.1) 38 (23.6) 5(3.1)	X^2= 0.382 b SS
Duration of illness	Less than 1 year I-5 6-10 II-20 Above 20 years	9(5.6) 16(9.9) 11 (6.8) 14 (8.7) 4(2.5)	25(15.5) 38 (23.6) 11 (6.8) 23(14.3) 10(62)	X^2 = 0.066 P = 0.404 NSS
No of admissions	First 2-5 6-10 11-20 Above 20	10 (6J2) 28(17.4) 8(5.0) 5(3.1) 3(1.9)	25(15.5) 52 (32.3) 11 (6.8) 9(5.6) 10(6.2)	X^2= 0.001 P = 0.988 NSS
Current treatment	Typical Atypical Sedatives Mood stabilizers/Acm Antidepressants Others	47 (292) 3(1.9) 1 (0.6) 2(1.2) 0 (0.0) 1 (0.6)	71(44.1) 1 (0.6) 7(4.3) 17(10.6) 6(3.7) 4(2.5)	X^2= 0.173 P = 0.029 SS
Residence	Nairobi Central Eastern Rift valley Others	21 (13.0) 22(13.7) 5(3.1) 4 (2.5) 2(12)	46(28.6) 41 (25.5) 12(7.5) 4(2.5) 4(2.5)	X^2=-0.060 P = 0.448 NSS

There was statistically significant association between smoking and gender, file diagnoses and current treatments being given ($P < 0.05$).
Smoking risk was common in male (73.8%) single (35.4%) with a diagnosis of substance use disorder (23.6%) and current treatment on typical antipsychotics (44.1%)

Table 12: Sociodemographic determinantsof waist circumference

Variable		Waist circumference n %		Significance tests
		Normal n<%)	Abnormal n(%)	
Age	18-27 28-37 38-18 >48	59(36.6) 45 (28.0) 16(9.9) 9(5.6)	7(4.3) 11 (6.8) 8 (5.0) 6(3.7)	X^2 = 0.249 P = 0.001 SS
Gender	Male Female	117 (90.0) 12 (38.7)	13(10.0) 19(61.3)	X^2 = 0.284 P - 0.000 SS
Marital status	Single Married W ldou ed separated	76 (47.2) 28(17.2) 25(15.5)	15 (9.3) 10(6.2) 7(4.3	X^2 = 0.073 P =0.357 NSS
Income USD	0-30 31-75 76 - 150 >150	37(23.3) 35 (21.7) 28 (17.2) 29(18.0)	12(7.5) 7 (4.3) 5(3.1) 8 (5.0)	X^2 = 0.035 P = 0.664 NSS
Religion	Calhoiic Protestants Moslems Others	34 (21.1) 77 (47.8) 13(8.1) 5(3.1)	7 (4.3) 22(13.7) 0 (0.0) 3(1.9)	X^2 = 0 052 P = 0.514 NSS
Education	Nil Primary Secondary Post-secondary	5(3.1) 55 (34.2) 40 (24.8) 29(18.0)	0 (0.0) 6 (3.7) 15 (9.3) 11 (6.8)	X^2 = 0.202 P = 0.010 SS
File diagnoses	MoodD Schizophrenias Substance D Physical illness	44 (27.3) 42 (26.1) 38 (23.6) 5(3.1)	18(11.2) 11 (6.8) 3(1.9) 0(0.0)	X^2 = 0.229 P = 0.003 SS
Duration of illness	Less than 1 year I-5 6-10 years II-20 years Above 20 years	31 (19.3) 45 (28.0) 19(11.8) 25(15.5) 9(5.6)	3(1.9) 9(5.6) 3(1-9) 12(7.5) 5(3.1)	X^2 = 0.225 P = 0.004 SS
No. Of admissions	First 2-5 6-10 11-20 Above 20	33 (20.5) 61 37.9) 16(9.9) 11 (6.8) 8(5.0)	2(1.2) 19(11.8) 3(1.9) 3(1.9) 5(3.1)	X^2 = 0.161 P = 0.041 SS
Current treatment	Typical AP Atypical AP Sedatives Mood stabilizers Antidepressants Others	93 (57.8) 1 (0.6) 8(5.0) 15(9.3) 6(3.7) 5(3.1)	25(15.5) 3(1.9) 0 (0.0) 4 (2.5) 0 (0.0) 0 (0.0)	X^2= -0.115 P = 0.146 NSS
Residence	Nairobi Central Eastern Rift valley Others	52 (32.3) 51(31.7) 12(7.5) 8(5.0) 6(3.7)	15(9.3) 12(7.5) 5(3.1) 0 (0.0) 0 (0 0)	X^2 =-0.127 P = 0.109 NSS

Waist circumference was significantly associated with age, gender, education, file diagnoses, duration of illness and the number of admissions to hospital ($p < 0.05$) Abnormal WC was common in the 28-37 age group (6.8%), female (61.3%), with secondary education (9.3%); those with diagnosis of mood disorder (11.2%), illness duration of between 11-20 years (7.5%), and between 2-5 number of admissions **(11.8%).**

Table 13: Sociodemographic determinants of Waist-Hip-Ratio

Variables		Waist-Hip-Ratio		Significance tests
		Normal n (%)	Abnormal n (%)	
Age	18-27	47 (29.2)	19(11.8)	$X^2 = 0.260$
	28-37	40 (24.8)	16(9.9)	P = 0.001
	38-47	12 (7.5)	12(7.5)	SS
	>48	4 (2.5)	11 (6.8)	
Gender	Male	101 (62.7)	29(22.3)	$X^2 = 0.585$
	Female	02(12)	29 (93.5)	P-0.000
				SS
Marital status	Single	61 (37.9)	30(18.6)	$X^2 = 0.053$
	Married	22(13.7)	16 (9.9)	P = 0.504
	Separated/divorced	20(12.4)	12(7.5)	NSS
Income (USD)	0-30	25 (15.5)	24(15.0)	X^2=-0.078
	31 -75	31 (19.3)	11 (6.8)	P = 0.324
	76-150	25 (15.5)	8(5.0)	NSS
	>150	22(13.7)	15 (9.3)	
Religion	Catholic	25 (15.5)	14(8.7)	X^2=-0.033
	Protestants	60 (37.3)	39 (24.2)	P = 0.679
	Moslems	11 (6.8)	2(1.2)	NSS
	Others	5(3.1)	3(1.9)	
Education	Nil	4(2.5)	1 (0.6)	X^2=-0.094
	primary	42(26.1)	19(11.8)	P = 0.234
	secondary	33 (20.5)	22(13.7)	NSS
	Tertiary	24(15.0)	16 (9.9)	
File diagnoses	Mood disorder	35 (21.7)	27(16.8)	X^2= 0.127
	Schizophrenias	32 (19.5)	21 (13.0)	P = 0.038
	Substance D	33 (20.5)	8 (5.0)	SS
	Physical	3(1.9)	2(1-2)	
Duration of illness	Less than 1 yr	23(14.3)	11 (6.8)	$X^2 = 0.127$
	l-5yTS	38 (23.6)	16(9.9)	P = 0.109
	6-10yrs	14 (8.7)	8(5.0)	NSS
	U-20yrs	21 (13.0)	16(9.9)	
	Above 20yrs	7 (4.3)	7(4.3)	
No. Of admissions	First	25(15.5)	10 (6.2)	$X^2 = 0.109$
	2-5	51 (31.7)	29(18.0)	P = 0.169
	6-10	12 (7.5)	7 (4.3)	NSS
	11-20	9(5.6)	5(3.1)	
	>20	6(3.7)	7(4.3)	
Current treatment	Typical AP	73 (45.3)	45 (28.0)	X^2 = -0.110
	Atypical AP	1 (0.6)	3(1.9)	P = 0.166
	Sedatives	7 (4.3)	1 (0.6)	NSS
	Mood stabilizers	12 (7.5)	7(4.3)	
	Antidepressants	5 (3.1)	1 (0.6)	
	Others	4 (2.5)	1 (0.6)	
Residence	Nairobi	47 (29.2)	20(12.4)	
	Central	37 (23.0)	26(16.1)	
	Eastern	10(6.2)	7(4.3)	$X^2 = 0.014$
	Rift valley	6(3.1)	2(1.2)	P = 0.858
	Others	3 (0.6)	3 (0.0)	NSS

There was a statistically significant association between age, gender and file diagnoses (P<0.05)

Abnormal WHR was more common in the younger age group 18-27 (11.8%); more common in female (93.3%) than in male (22.3%), with diagnosis of mood disorder **(16.8%).**

Table 14: Sociodemographic determinants of BMI

VARIABLE		Underweight n <%)	Normal weight n <%)	Overweight n (%)	Obesity n (•/.)	Significance test
Education	Nil Primary Tertiary/post Secondary	3(1.9) 12(7.5) 9(5.6)	2(1.2) 43 (26.7) 32(19.9)	0 (0.0) 4(2.5) 7(4.3)	0 (0.0) 2(1.2) 7 (4.3)	X^2 - 0.202 P = 0.010 SS
Current treatments	Typical AP Atypical AP Sedatives Mood stabilizers Antidepressants Others	22(13.7) 0 (0.0) 3(19) 1 (0.6) 2(1.2) 0(0.0)	73 (45.3) 2(1.2) 5(3.1) 13(8.1) 4 (2.5) 5(3.1)	13(8.1) 2(1.2) 0(0.0) 4 (2.5) 0 (0.0) 0 (0.0)	0 (0 0) 0 (0.0) 0 (0.0) 1 (0.6) 2(1.2) 0 (0.0)	X^2 =-0.037 P - 0.644 NSS
Duration of illness	Less than I year I-5 6-10 II-20 Above 20	6(3.7) 11 (6.8) 3(1.9) 6(3.7) 2(1.2)	24(15.0) 33 (20.5) 15(9.3) 23(14.3) 8 (5.0)	3(19) 7(4.3) 3(19) 3(1.9) 3(1.9)	1 (0.6) 3(1.9) 1 (0.6) 5(3.1) 1 (0.6)	X^2 = 0.115 P = 0.148 NSS
No of admissions	First 2-5 6-10 10-20 Above 20	8 (5.0) 11 (6.8) 4(2.5) 4 (2.5) I (0.6)	24(15.0) 49 (30.4) 13(8.1) 8 (5.0) 9(5.6)	2(1.2) 14 (8.7) 2(1.2) 0 (0.6) 1 (0.6)	1 (0.6) 6(3.7) 0 (0.0) 2(1.2) 2(1.2)	X^2 = 0 101 P = 0.366 NSS
Age	18-27 28-37 38-47 >48	12(7.5) 9(5.6) 6(3.7) 1 (0.6)	46 (28.6) 37 (23.3) 12(7.5) 8(5.0)	6(3.7) 6(3.7) 4(2.5) 3(19)	2(1.2) 4 (2.5) 2(12) 3(L9)	X^2 = 0.181 P = 0.022 SS
Religion	Catholic Protestants Moslems Others	6(3.7) 16(9.9) 4(2.5) 2(1.2)	29(18.0) 64 (39.8) 8 (5.0) 2(1.2)	4 (2.5) 12(7.5) 1 (0.6) 2(1.2)	2(1.2) 7(4.3) 0 (0.0) 2(1.2)	X^2 =0.052 P =0.514 NSS
Gender	Male Female	23(17.7) 5(16.1)	91 (70.0) 12 (38.7)	12 (9.2) 7 (22.6)	4(3.1) 7 (22.6)	X^2 = 0.284 P = 0.000 SS
Residence	Nairobi Central Eastern R/valley Others	10(6.2) 10(6.2) 4 (2.5) 2(1.2) 4(1.2)	42 (26.1) 41 (25.5) 10(6.2) 6(3.7) 4 (0.6)	11 (6.8) 6(3.7) 2(1.2) 0(0.0) 0(0.0)	4(2.5) 6(3.7) 1 (0.6) 0(0.0) 0(0.0)	X^2 =-0.136 P= 0.85 NSS
Income USD	0-30 31 -75 76- 150 >150	14(8.7) 6(3.7) 6(3.7) 2(1.2)	23(14.3) 31(19.3) 23(14.3) 26(16.1)	7(4.3) 3(19) 2(1.2) 7(4.3)	5(3.1) 2(1.2) 2(1.2) 2(1.2)	X^2 =0.075 P =0.343 NSS
Marital status	Single Married Separated	17(10.6) 3(1.9) 8(5.0)	59 (36.6) 25(15.5) 19(11.8)	9(5.6) 6(3.7) 4(2.5)	6(3.7) 4(2.5) 1 (0.6)	X^2 =-0.013 P =0.871 NSS
File diagnoses	Mood D Schizophrenias Substance D Physical	8(5.0) 14(8.7) 5(3.1) 1 (0.6)	38 (23.6) 30(18.6) 32(19.9) 3(1.9)	8(5.0) 7(4.3) 3(19) 1 (0.6)	8 (5.0) 2(1.2) 1 (0.6) 0 (0.0)	X^2 =-0.144 P-0.68 NSS

Body mass index was associated with age, gender and education, which was statistically significant (P<0.05).

Overweight/obesity was more prevalent in females (22.6%). Underweight was almost equally prevalent in both males and female in 17.7% and 16.1% respectively.

Underweight/overweight was more common in the younger age groups 18-27 (7.5%) and 28-37 (3.7%). underweight was almost equally prevalent as overweight and obesity in females. Females were more overweight or obese than males. Males were more underweight than overweight/obese.

Table 15; Blood pressure correlates of other CVRFs

Variable		Hypertension(%)	Normal tension	Prehypertension	Hypertension	Significance te
Exercise	Adequate Inadequate	10(6.2) 12 (7.5)	29(18.0) 59 (36.6)	8(5.0) 15 (9.3)	10(6.2) 18(11.2)	x^2= 0.031 P = 0.699 NSS
Alcohol misuse/risk	Yes/risky No/non risky	7(4.3) 15(9.3)	40 (24.8) 48 (29.8)	14(8.7) 9(5.6)	10(6.2) 18(11.2)	x^2 =-0.025 P = 0.750 NSS
Smoking	No risky Risky	10(6.2) 12(7.5)	28(17.2) 60 (37.3)	6(3.7) 17(10.6)	10(6.2) 18(11.2)	x^2= 0.044 P = 0.575 NSS
Waist circumference	Normal Abnormal	20(12.4) 2(1.2)	71 (44.1) 17(10.6)	20(12.4) 3(1.9)	18(11.2) 10(6.2)	$\mathbf{x^2}$= 0.163 P = 0.038 SS
Waist-hip-ratio	Normal Abnormal	14 (8.7) 8 (5.0)	57 (35.4) 31 (19.3)	18(11.2) 5(3.1)	14 (8.7) 14 (8.7)	x^2 = 0.063 P =0.430 NSS
BMI	Underweight Normal weight Overweight Obesity	8 (5.0) 13 (8.1) 1 (0.6) 0 (0.0)	14(8.7) 60 (37.3) 8(5.0) 6(3.7)	2(1.2) 17(10.6) 3(1.9) 1 (0.6)	4 (2.5) 13(8.1) 7(4.3) 4 (2.5)	x^2 = 0.247 P = 0.002 SS
Hormonal contraceptive N = 31	Yes No	0 (0.0) 6(19.4)	6(19.4) 15 C	0 (0.0) 1 (3.2)	0 (0.0) 3 (9.7)	x^2 = 0.020 P = 0.914 NSS

There was a positive association between blood pressure and both the waist circumference and body mass index which were statistically significant ($P < 0.05$)
Prehypertension and hypertension was common in patients with normal WC (12.2%) and (11.2%) respectively.
Hypertension was equally present in patients with obesity and underweight (2.5%).
Overweight was more prevalent than obesity in 4.3% hypertensives.
Prehypertension and hypertension were more common in patients with normal BMI (10.6% and 8.1% respectively)

Table 16: Smoking versus other CVRFs

Variable		No risk n (%)	Risky n (%)	Significance tests
Exercise	Adequate Inadequate	13(8.1) 41 (25.5	44 (27.3) 63 (39.1)	x^2 = -0.168 P = 0.033 SS
Alcohol misuse	Yes No	8(5.0) 46 (28.6)	63 (39.1) 44 (27.3)	x^2=-0.425 P = 0.000 SS
Waist circumference	Normal Abnormal	35 (21.7) 19(11.8)	94 (58.4) 13 (8.1)	x^2=-0.273 P = 0.000 SS
Waist-hip-ratio	Normal Abnormal	26(16.1) 28(17.2)	77 (47.8) 30(18.6)	x^2 =-0.234 P= 0.003 SS
BMI	Underweight Normal weight Overweight Obesity	8 (5.0) 28(17.2) 12 (7.5) 6 (3.7)	20(12.4) 75 (46.6) 7 (4.3) 5(3.1)	x^2=-0.205 P = 0.009 SS

Smoking was negatively correlated to exercise, alcohol, waist circumference, waist-hip-ratio and BMI. And they were all statistically significant ($P < 0.05$).
Risky smoking was more common in patients with inadequate exercise (39.1%), with alcohol misuse) 39.1%), normal WC (58.4%)
Normal WHR (47.8%) normal BMI (46.6%).

Table 17: ALCOHOL USE /AUDIT-C SCORES VERSUS OTHER CVRFs

Variable		No/non-risky n(%)	Risky/yes n(%)	Significance tests
Exercise	Adequate Inadequate	28(17.2) 62 (38.5)	29(18.0) 42 (26.1)	x^2= -0.101 P = 0.202 NSS
Waist circumference	Normal Abnormal	69 (42.9) 21 (13.0)	60 (37.3) 11 (6.8)	x^2=-0.173 P = 0.028 SS
Waist-hip-ratio	Normal Abnormal	54 (33.5) 36 (22.4)	49 (30.4) 22(13.7)	x^2= 0.093 P = 0.239 NSS
B.M.I	Underweight Normal weight Overweight Obesity	19(11.8) 53 (32.9) 10(6.2) 8 (5.0)	9 (5.6) 50 (31.1) 9(5.6) 3(1.9)	x^2=-0.004 P = 0.955 NSS

Alcohol (AUDIT- scores) negatively associated with waist circumference, which was statistically significant ($P < 0.05$).
Alcohol misuse was common in patients with normal WC, (373%).

TABLE 18: Exercise versus other (:VRFs

Variable		Adequate n (%)	Inadequate n (%)	Significance tests
Waist circumference	Normal Abnormal	51 (31.7) 6(3.7)	78 (48.4) 26(16.1)	x^2= 0.173 P = 0.028 SS
Waist-hip-ratio	Normal abnormal	43 (26.7) 14(8.7)	60 (37.3) 44 (27.3)	x^2= 0.177 P = 0.025 SS
B.M.I	Underweight Normal weight Overweight Obesity	11 (6.8) 38 (23.6) 5(3.1) 3(1.9)	17(10.6) 65 (40.4) 14 (8.7) 8 (5.0)	x^2= 0.080 P = 0.313 NSS

Exercise was positively associated with waist circumference and waist hip ratio and the association was statistically significant ($P < 0.05$).
Inadequate exercise was prevalent in patients with normal WC (48.4%) and normal WHR (37.3%).

TABLE 19: Hormonal contraceptive use versus some CVRFs n=31

Variable		Yes n (%)	No n (%)	Significance tests
Blood pressure	Hypo tension Norm tension Prehypertension Hypertension	0 (0.0) 6(19.4) 0 (0.0) 0 (0.0)	6(19.4) 15(48.4) 1 (3.2) 3 (9.7)	x^2 = 0.020 P = 0.914 NSS
Exercise	Adequate Inadequate	4(12.9) 2(6.5)	8 (28.8) 17(54.8)	x^2= 0.281 P = 0.125 NSS
Alcohol AUDIT-C scores	Non-risky Risky	4(12.9) 2(6.5)	22 (71.0) 3(9.7)	x^2 = 0.229 P = 0.215 NSS
Smoking	No risk Risky	2(6.5) 4(12.9)	18(58.0) 7 (22.6)	x^2=M).319 P = 0.080 NSS
Waist circumference	Normal Abnormal	2(6.5) 4 (12.9)	10 (32.3) 15 (48.4)	x^2 =-0.054 P = 0.773 NSS
Waist-hip-ratio	Normal Abnormal	1 (3.2) 5(16.1)	2 (6.5) 23 (74.2)	x^2= 0.116 P = 0.535 NSS
B.M.I	Underweight Normal weight Overweight Obesity	1 (3.2) 3 (9.7) 1 (3.2) 1 (3.2)	4(12.9) 9 (29.0) 6(19.4) 6(19.4)	x^2 = 0.088 P = 0.636 NSS

There was no significant association between hormonal contraceptive use and the measurements for the assessment of overweight/obesity viz waist circumference, waist hip ratio and body mass index (BMI).

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8.0 DISCUSSION

PREVALENCE OF CARDIOVASCULAR RISK FACTORS

This study reveals the presence of all the evaluated cardiovascular risk factors in varying degrees. However, there were no patients on treatment for dyslipidaemia and none had been screened for hypercholesterolemia. There were no patients on treatment for diabetes either. Although one had been investigated for the same, this is in sharp contrast with a previous study in the same population by Ndegwa (2004) who found 2% already known diabetics amongst 11.0% diabetics and 20.7% glucose intolerant in a sample of 145 inpatients (27). This finding may imply that psychiatric patients at Mathari are less likely to be screened for diabetes and perhaps other cardiovascular risk factors.

Psychiatric patients in other studies were found less likely to undergo cholesterol screening (42,43). This study found a high risk of tobacco exposure in the psychiatric patients (66.5%) that constitutes a cardiovascular risk (inclusive both active and passive smoking). Prevalence of smoking in psychiatric population is known to be higher than in general population. In the USA, schizophrenia patients have a prevalence of 56-88% compared to 25% in the general population. In Africa, most studies available are on the general population giving a prevalence of 18% and 19% active and passive smoking respectively, with women being lower than males (56,57,58,59).

This study examined overweight and obesity using 3 different criteria which showed variable results, that is, body mass index (BMI), waist hip ratio (WHR) and waist circumference, (WC). Nineteen (11.8%) of inpatients were overweight while 11 (6.8%) were frankly obese. Overall the prevalence of overweight/obesity was 18.6% by BMI. This was replicated by waist circumference, which gave 19.9% while the waist hip ratio, which measures central obesity, was giving almost twice as high readings, 35.0%. Allison and Casey (2004) reviewed 151 schizophrenia patients, reporting a prevalence of 51% in males and 59% females with obesity compared to 33% of people with other psychiatric disorders (32). The findings by WHR are in agreement with those in western studies examining obesity in other psychiatric illness. Schizophrenia per se is a severe mental illness, and is associated with higher rates of obesity as compared to other psychiatric illnesses and the general population.

A considerable number of patients, 17.4% had a below normal BMI which denotes under nutrition or wasting. This figure is almost similar to the group with overweight/obesity (18.6%) leaving the question as to which of the two is the major problem in the developing countries. It appears that western diseases are emerging due to changes in western diets and lifestyle therefore doubling the disease burden of patients in our setting.

Blood pressure was classified into hypotension, normotension, prehypertension and hypertension in order to capture adverse effects of medications (eg antipsychotics) and also pick masked hypertension so as to encourage lifestyle modification for any patient with high normal blood pressure (prehypertension). The prevalence of prehypertension was 14.3% while another 17.4% had frank hypertension.

This study found a similar prevalence of hypertension to that found in western studies, which range between 15-18%. Although other studies give higher prevalence, some studies in psychiatric patients give prevalence above 60%, while others give 4% and still others give the same prevalence as in the general population (42, 46, 47, 48).

Psychiatric inpatients at Mathari hospital were found to engage in some form physical activities, which were mainly occupational in nature. Walking and digging and other occupationally oriented activities were the most frequent form of exercise practiced by 21.7% and 13% respectively these were undertaken during walking to work or to church or during the actual occupational activity. The most frequent duration of activity was 60 minutes (9.3%) followed by 30minutes (7.5%). However the majority of exercise was judged as inadequate in 64.4% of patients, a finding which constitute significant cardiovascular risk. Centers for Disease Control (CDC) recommend at least moderately intense physical activity such as brisk walking done on a regular routine for a total of at least 30 minutes on most days (61). Mentally ill patients tend to have a sedentary lifestyle; Brown and McCreadie found people with schizophrenia tend to take only small amounts of exercise (44,62).

This study examined risk of alcohol as a cardiovascular risk using the AUDIT instrument with a standard score and cut-off for male (>=4) and female (>=3). Other studies have used other subjective measures, which have higher interviewer variations and errors (71,72). The effect of alcohol is known to be dose dependent with small amounts said to be beneficial while excessive amounts being a risk for hypertension and hypercholesterolemia (35, 36, 39). Risky alcohol use was found to be 44.1%.

Most studies have identified alcohol as the most commonly abused substance. Its comorbidity in psychiatric patients is higher than in general population about 4.5 times (75).

CORRELATIONS OF CARDIOVASCULAR RISK FACTORS.

Age and gender

Both older age and male gender are recognized cardiovascular risk factors though not modifiable. This study found a significant association between age

- and waist circumference, blood pressure, alcohol use, waist hip ratio and BMI ($P<0.05$). There was no association between age and smoking risk ($P>0.05$). Studies in USA black population and South Africa have demonstrated the same (14, 17, 18). There was significant association between gender and alcohol use, waist hip ratio, BMI, waist circumference, smoking ($P<0.05$), but not with blood pressure ($P>0.05$). Other studies show little sex differences (14) this study had more male than females with a ratio of 4 to 1, hence the disparity. Females have a higher CVD risk especially because of use of hormonal contraceptives pill (20). This study found 19.4% women using the hormonal contraceptives though this was not significantly associated with the other CVRFs ($P>0.05$).

EXERCISE

There was no significant relationship between exercise and any of the socio demographic variables, however it was positively and significantly associated with waist hip ratio and waist circumference ($p<0.05$). WHR and WC are measures of central fat distribution. A positive association implies that the more patients engaged in the exercises the more the weight gained and vice versa.

Since most of the reported exercise was walking and occupational in nature, perhaps other confounding factors play a role eg treatment with antipsychotics which increase appetite and hence weight gain. Exaggeration by respondents on the amount of exercise undertaken may be another factor.

OVERWEIGHT/OBESITY

This was assessed using three standardized criteria: BMI, WHR, and waist circumference (the last two measure central obesity) was significantly associated with education, file diagnoses, duration of illness and the number of admissions ($P<0.05$), while BMI and WHR were significantly associated with education and file diagnoses respectively ($P<0.05$).

All the significant associations are related to the main diagnoses at admission. According to the diagnostic criteria, the diagnoses of the main psychoses require that socio occupational functions be significantly affected (76).

The longer the duration of the main diagnoses means that the patients receive long

LIMITATIONS

1 Measurements of blood sugars and blood lipid profile could not be undertaken despite their importance, because of limitation of resources.

2 The researcher used the psychiatric diagnoses appearing in the patients' file, may be inaccurate given that some admitting clinicians had no psychiatric training.

3 The research was done in December and January during the electioneering and post election period of 2007 which may have affected the staffing of the hospital and thus lower quality of care for example investigations done.

4 There was no control group; therefore the results apply only to Mathari hospital inpatient and to some extent the outpatients in the same hospital.

CONCLUSIONS

Some cardiovascular risk factors were found to be prevalent:

(a) Prehypertension, 14.5%; hypertension, 17.4%

(b) Overweight & obesity 18.6%: overweight 11.8%, obesity 6.8%

(c) Inadequate exercise; 64.4%

(d) tobacco smoking; 66.5%

(e) Risky alcohol use; 44.1%

Physical illnesses are prevalent among psychiatric inpatients at Mathari hospital with medication side effects apparently contributing a significant component of physical co morbidity.

Inpatients at Mathari hospital are rarely screened and managed for cardiovascular risk factors (eg Obesity, Diabetes, Hypertension, and Dyslipidaemia) and few are screened for physical illnesses .

Some cardiovascular risk factors identified had significant associations with the patient's sociodemographics and other CVRFs.

term treatment with ant psychotics, which are known to cause increase in appetite and hence weight gain (32,33). Weight gain as aside effect was cited as contributing to medication non-compliance in recent study in the same study population (77).

BLOOD PRESSURE

There was a positive correlation between blood pressure and both the waist circumference and BMI ($P<0.05$). The two are measures of overweight/obesity and this agrees with other studies which show a relationship between weight gain and cardiovascular risk. Obesity increases risk for hypertension, development of insulin resistance and greater risk of CAD (28,29,30).

ALCOHOL (AUDIT-C SCORES)

Alcohol was significantly associated with income, file diagnoses and duration of psychiatric illness ($P<0.05$). Despite the sample population being Predominantly of low socioeconomic status those who earned more had more alcohol misuse. Those earning between 76 USD and 150 USD were 13.7% and those earning more than 150 USD were 13%. The predominant diagnosis for those with alcohol misuse was substance use disorder (19.9%). Co morbidity of alcohol with psychiatric illnesses most of which require long-term management has been mentioned (75) Alcohol was also negatively associated with waist circumference ($P<0.05$) this may imply that perhaps excessive use of alcohol caused poor eating habits (neglect) and malnutrition in affected patients or as a result of lack of food (poverty).

SMOKING **(tobacco)**

There was significant association between smoking and file diagnoses and the current treatments given ($P<0.05$). Excessive nicotine use has long been associated with schizophrenia and other severe mental illness, in actual fact, smoking is said to be a marker of more severe illness (42). This is consistent with other studies, as nicotine has been shown to induce microsomal enzymes that increase metabolism of antipsychotics. The more nicotine used, the higher the dose required to treat the psychoses (44). Perhaps this finding may explain why a large proportion of the physical signs/impressions were medication side effects as found by other investigator (77). Mathari hospital may be admitting severe mentally ill patients who smoke more even in the wards and therefore require even higher doses of the antipsychotics.

Smoking was negatively associated to exercise, alcohol, waist circumference, waist hip ratio and BMI, and this was statistically significant ($P<0.05$). There seem to be an inverse relationship between smoking, alcohol and measures of overweight and obesity. People who smoke tend to eat less food due to appetite suppressant effect of nicotine. Freudian psychosexual theory can also explain why some people tend to

smoke more and eat less because they may have had fixation in the oral stage of development, so that on quitting the habit they tend to eat more and thus gain weight. It is not clear why there was an inverse relationship between smoking and alcohol while the converse was expected as many smokers also drink alcohol.

Physical health of psychiatric inpatients at Mathari hospital

Going by file diagnoses, there was a low prevalence of 3.1% physical illnesses at the time of admission this prevalence is far below the findings of the general physical examination done by the researcher which found many patients (43.5%) with numerous new complaints more than a week after admission the most frequent complaints were various body pains (15.7%) followed by drowsiness (12.9%). Complaints of rashes, drooling, and wounds were present in 8 patients (11.4%) each. Most of these are known side effects of medications given to treat the psychoses or complications of the medications (falls).

In the study population, 93.2% had diagnostic signs made from the physical examination done on average one week after admission. Tachycardia was the most frequent finding present in (58%), wounds in (39.3%), blood pressure elevation in 18.7% skin conditions present in (18.0%), fever (12.0%), hypotension was seen in 14.7%, wasting was observed in (17.4%) and tremors (6%). Again these diagnostic signs were related to medication side effects, which could actually mask features of more serious diseases. Going by BMI, underweight (17.4%) and overweight/obesity (18.6%) were almost equal, these are measures of nutritional status, which may imply that the psychiatric patients have an added burden of having both extremes of abnormal weight. The reseacher could not arrive at a diagnosis in 150 patients hence some patients had physical signs and no diagnoses made. This was because of lack of laboratory investigations of the affected patients and also since some medication side effects can mimic actual physical disease.

In sharp contrast the investigations done were quite few in view of the fact that they are meant to unmask the various complaints and positive physical findings so as to arrive at a diagnosis. No lipid profile had been done; only one blood sugar had been done while four patients had been done blood slide for malaria parasites. Two patients had urinalysis done. One patient each had haemogram, hemoglobin, HIV ELISA and erythrocyte sedimentation rate done.

From these findings it is fair to conclude that the psychiatric patient in the ward at Mathari hospital is unlikely to be screened for cardiovascular risk factors and also for other physical illnesses.

RECOMMEDATIONS

1 In view of the significant presence of CVRFs among Mathari hospital inpatients, there is urgent need to pay attention to routine screening of blood pressure, diabetes, and weight and yearly lipid profiles among both the inpatients and out patients. Promotion of psycho education and rehabilitation of risky alcohol and smoking.

2 In view of the significant physical morbidity, there is need for establishment of an integrated mental/ physical health programme with the following objectives:

Induction of doctors handling psychiatric patients

- Emphasize DSM IV Axial diagnosis and management of psychiatric patients
- Routine weighing of patients for every admission or use of waist circumference to pick those at risk of obesity for weight management programmes.
- Routine blood sugar screening at admission and at least yearly lipid profiles, routine blood pressure monitoring in inpatients and outpatients
- Increase use of low potency ant psychotics for patients prone to medication side effects.
- Liaison physician and support medical officers to run a diabetic/hypertensive/weight clinic for psychiatric patients at Mathari and similar settings.

3 There is need for a study on the causes of death in psychiatric patients in our setting.

4 There is a need for a more detailed prevalence study on cardiovascular risk factors among psychiatric patients in our setting.

5 There is also a need for a study on effective intervention programmes to target the physical health of psychiatric patients at Mathari and similar settings.

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APPENDIX I

QUESTIONNAIRE : Serial Number

(A) Socio demographic questionnaire

(1) Age (1b) Sex

(2) Religion (3) Residence:

(4) Level of education: (5) Marital status

6)Occupation.....(6b) Income KSh

(B) Health and lifestyle questionnaire

(7) File diagnoses at admission (axes I, II, III,)

(a).....(b)

©.....(d) other

(8)Investigations done since current admission (results in above

(9). Duration of psychiatric illness since diagnosis:

(10) Number of admissions since diagnosis

(11). Current medications:(from records).

(a) (b) **(c)**

(12).Current (new) complaints:

(b) (b) **(c)**

(13) **PHYSICAL ACTIVITY (EXERCISE)**

(i) Do you do any **exercises**/vigorous **physical activities** on a regular basis in the past lyear?

(ii) What does it consist of?
(eg walking, jogging, swimming, aerobics, other games etc) NB.include heavy physical work eg. Heavy manual labour (digging, carrying loads, walking to work/church

(iii)For how many minutes per session/activity?

(iv) How many times a **week** do you do the above exercise/activity?

Contusion: (a) adequate exercise.....(b) inadequate exercise

(D). (14) **SUBSTANCE USE.**

AUDIT-C ALCOHOL screening questionnaire.

In the last year

1. How often do you have a drink containing alcohol?
   (i) Never (0)
   (ii) Two - three times (3)
   (iii) Monthly or less (1)
   (iv) Four or more (4)
2. How many drinks containing alcohol do you have on a typical day when you are drinking?

   (i) 1 or 2 (0)

   (ii) 3 or 4 (1)

   (iii)5 or 6 (2)
   (iv)7 to 10(3)
   (iv) 10 or more times (4)

3. How often do you have six or more drinks on one occasion?

- Never (0)
- Monthly (2)
- Less than monthly (1)
- Weekly (3)

-Daily or almost daily (4)

TOTAL SCORE: HARMFUL USE:(Male> 4: Female > 3): YES...NO...

(15)CIGARETTE/TOBACCO SMOKING

1. Have you ever smoked tobacco? Yes
   No.....(move to Q 5.) 2.When did you last smoke/sniff tobacco?
3. How long have you been smoking?
4. How much tobacco/ snuff do you smoke/sniff per day? No of cigarettes/srtw^"per day
5. Do you live/stay with a regular smoker in the same house? No
   Yes
6. How many cigarettes does he/she smoke per day?
7. How long have you been living with this person?

(F).(16) Hormonal contraceptive use. (Female)

Do you use Hormonal contraceptives? YES...NO... TYPE

(G)GENERAL PHYSICAL EXAMINATION

(a). **Vitals:** Pulse -BP.....-PR.....Temperature.....RR....

(b). Nutritional Status (Measurements)

Weight....Height.....Waist circumference.....Hip circumference

Calculated: WAIST- HIP-RATIO:.....BMI:

General physical and skin examination:

- Pallor
- Cyanosis.....Jaundice
- Skin changes describe (Dermatoses)
- Finger clubbing
- Adenopathy (specify)
- Dehydration (dry tongue, skin turgor)
- Other (eg injuries/tumors etc)

(H) SYSTEMIC EXAMINATION (WHERE INDICATED/SUSPICION)

Head, Eyes, Ear, Nose, Throat, examination

CARDIOVASCULAR SYSTEM:

Pulse character.....Rate.....Rhythm.....Volume

Jugular Venous Pulse: Normal.....raised
Carotid bruit
Apex
Heart sounds

Murmur
Other

RESPIRATORY SYSTEM:

ABDOMIiNAL EXAiMINATION

NERVOUS SYSTEM:

Impressions/Diagnoses:(physical)

(0

(H)

(Hi)

Appendix II: Informed consent explanation

To be read and explained to the patient in a language the patient understands, (eg English, Kiswahili).

My name is **Dr Moses Mwenda,** am a postgraduate student in the department of psychiatry, university of Nairobi. I am doing a study titled **"Prevalence of some cardiovascular risk factors amongst inpatients admitted at Mathari hospital"** as part of my degree. My supervisors are Dr Othieno and Dr Kuria, both psychiatrists and lecturers of University of Nairobi. The study aims at establishing the prevalence of some cardiovascular risk factors and document other physical illnesses among admitted Mathari hospital patients. It entails your answering questions regarding your personal data, health and social/lifestyle. I shall also conduct a physical examination from head to toe including taking your blood pressure, temperature, weight, height, waist and hip circumference. Please note that no samples will be taken from your body. NO invasive procedures will be done to you. Your agreement is entirely voluntary; you may withdraw from the study at any time. Refusal to participate will not in any way affect the way you are managed in this hospital or its clinics. If you have any queries, seek clarification on any point not clearly understood from me on cell phone **0722463588** or my supervisor, **Dr Kuria** on cell phone **0722755681.** During the study, and results/publications all information obtained will be treated confidentially no names will be used, identification will be by randomly assigned serial number not traceable to you. The benefit you will get is that any disease diagnosed/suspected shall be treated/investigated or advise given or referral made appropriately. In the latter case confidentiality and responsibility will be that of doctor to his patient.

Consent form

I, _____ do hereby volunteer to participate in this study; the nature and purpose of which have been full explained to me by **Dr Mwenda, I** understand that all information gathered will be used for the purpose of this research as explained.

Signed _____ date _____ Surrogate (sign) _____

Address _____

(Relationship)..... date

Witness **(Dr. Mwenda**)(sign)..... date

APPENDIX III

Risk factor: Definitions

Age - **Male - >/=45 years**
Female - >/=55 years
Sex - male gender

RISKY ALCOHOL USE

AUDIT-C SCORE
Male >/= 4 Female >/=3
Source: Katharin AB et al *Alcohol Res* **vol.31.No**.7ppl-10)

Definition of standard drink
12g of alcohol, equivalent to 360ml (12 oz) beer
150rnl (5 oz) wine
45ml (1.5 oz) of 80% proof distilled spirit/local equivalents. **Source**:(Mukamal, J.K.NEJM. 2003)

Waist circumference (WC)
Central obesity is defined by waist circumference of>/= 94.0cm in males and >/- 80.0cm in females.

Waist Hip Ratio

Abnormal if> 0.94 males and > 0.80 females

EXERCISE

CDC recommendation least: Brisk walk for thirty minutes on 4 or more days per week.

APPENDIX IV: REFERENCE TABLES

WHO criteria for diagnosis of Hypertension

Systolic BP (mmHg)	Diastolic BP	
<120	<80	Optimal BP
<130	<85	Normal BP
130-139	85-90	High Normal
140-159	90-99	Stage 1 Hypertension
160-179	100-109	Stage II Hypertension
>/= 180	>/=110	Stage III Hypertension

CLASSIFICATIONS OF BASAL METABOLIC INDICES		
Underweight		<18.5
Normal		18.5-24.9
Overweight		25.0 - 29.9
Obesity	Grade 1	30.0 -34.9
	Grade 2	35.0-39.9
	Grade 3	>40

Source: Cormac, I., Martin, D,, Ferriter, M. Improving the physical health of long-stay psychiatric in patients. *Advance. Psych. Trealm.* 2004: 10:107-115.