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Prevalence and Factors Associated With Type 2 Diabetes and Hypertension among Adult Refugees in Kamukunji Sub-County, Kenya, 2016

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ABSTRACT

Background: Diabetes and hypertension are non-communicable diseases (NCDs) that account for a growing burden of disease in people age > 40. Refugees lead a sedentary lifestyle putting them at risk. We sought to determine the prevalence and risk factors of the NCDs.

Methods: We conducted a cross-sectional survey using multistage sampling method. Semi-structured questionnaire was administered and measured blood pressure, height and weight. Capillary and venous blood was collected and tested for random blood sugar and glycosylated hemoglobin (HBA1c) respectively. Data analysis was done using SAS and estimates weighted to account for sampling variability.

Results: We recruited and interviewed 345 participants. Median age was 47years (IQR 48-50). Prevalence of diabetes was 28.7% (95% CI 21.9- 35.6) and of hypertension was 16.6 %(95% CI 10.7-19.3). In bivariate analysis for diabetes, obese (OR=1.6), abnormal blood pressure (OR=2.4), widowed (OR=2.4) explained the likelihood of having diabetes. The likelihood of having hypertension was explained by age, marital status, gender and being obese. While those aged ≥60 years were more likely (aOR= 6.7) to have hypertension than those aged 40-49 years. The obese were more likely (aOR= 1.8) to have hypertension compared to those with normal body weight. Windows were more likely (aOR=9.5) to have hypertension than the single.

Conclusions: Prevalence of diabetes and hypertension is high among refugees. Risk factors associated with hypertension were obesity, age and marital status.

Recommendations: Change of lifestyle to reduce body mass index among urban refugees

***Key words**: Diabetes, Hypertension, Refugees*

INTRODUCTION

Globally, diabetes mellitus and hypertension (HTN) have become major medical and public health concern. The two conditions are known risk factors for heart failure, cerebrovascular disease and coronary artery diseases. Diabetes mellitus (DM) is among leading non-communicable diseases and it is the main cause of mortality worldwide. It is estimated that, approximately 1.3 million deaths are attributed to the illness by the year 2013 alone (Lee, Song,

Noh, Choi, & Jo, 2012). Globally, by the year 2013, around 382 million people lived with diabetes mellitus. It is projected to rise to 592 million by 2035 (Amoussou-Guenou et al., 2015). Diabetes has been known as a disease for the elderly but today it affects the young and the adolescents but, with a high prevalence on the older population aged 40 years and above with a prevalence of 90% (Ayah et al., 2013)

Hypertension is well recognized as a major cause of morbidity and often affects people with type 2 diabetes although the relationship between the two diseases is unknown. Both conditions are associated with high sodium diet, obesity, Physical inactivity and high fat diet. Hypertension contributes to the burden of stroke, heart disease, kidney failure and disability also resulting to premature mortality. The disease rarely shows any symptoms in the early stages and many people go undiagnosed.

In sub-Saharan Africa (SSA), the prevalence of type 2 Diabetes is on the increase, probably due to change in lifestyle following rural to urban migration.

In Kenya, the number of refugee and asylum seekers is on the increase; as at January 2015, there were 650,610 asylum seekers with an expected increase of another 12,000 by December 2015. As at April 2012 the total number of urban refugees living in Nairobi was 54,383 (8.7%) with an average weekly new arrivals ranging from 300-500 people(Pavanello, Elhawary, & Pantuliano, 2010a) (Mohamed et al., 2014). Diabetes is on the increase with approximately 8 million cases reported in the year 2014 in Kenya. This represented an increase of almost a million cases compared with the number of cases reported in 2013 (Madeline Jackson ,2012).

In Kenya, diabetes prevalence in urban setting is estimated at 4-11% and hypertension is 23% (Sola et al, 2013). This growing burden of disease could be due to urban migration and life style changes. Over 50% of hospital admission and 55% deaths are due to NCDs where diabetes and hypertension are leading(El-busaidy et al., 2014).

This growing burden of disease could be due to urban migration and life style changes. Areas with the highest prevalence included Nairobi, Central, Eastern and Rift valley region (The Rockefeller Foundation, 2015). Type 2 diabetes accounts for 85-90% of the diabetic disease burden in Kenya and in response to this, the Ministry of Health has developed a strategic plan (2014-2018) to halt and reverse rising non-communicable diseases (NCDs) (MOH Kenya, 2012)

Diabetes and Hypertension are on the increase in Kenya especially among the low social economic class living in urban areas including refugees (Pavanello, Elhawary, & Pantuliano, 2010b)**.**This is associated with lifestyle and eating habits which are the main risk factors for hypertension. Failure to get healthy foods, lack access to healthcare services, exercises and limited health information increase risk to diabetes and hypertension. Among these, physical inactivity, obesity, unhealthy diet, and cigarette smoking are established risk factors for the development of the diseases and have been shown to be more prevalent among low socioeconomic groups(Booth, Roberts, & Laye, 2012).

Problem statement

Diabetes and hypertension are the leading causes of death among the non-communicable diseases (NCDs) worldwide. Approximately 80% of deaths associated with non-communicable diseases come from developing countries. Diabetes and hypertension (HTN) are both risk factors for Cardiovascular Diseases (CVDs) and are of major medical and public health concern. Type 2 diabetes affects 124 million people worldwide (WHO,2015).

In Kenya, 6% of deaths are attributed to diabetes according to 2012 report (The Rockefeller Foundation, 2015). Management of diabetes is expensive to the affected persons, their families,

and authorities. Diabetes has direct, indirect, and intangible cost. Direct cost of diabetes include costs incurred by family members in buying drugs, hospitalization among others while indirect costs include costs due to diabetic patient inability to be productive as they used to be when they were not sick. This affects both the family and the country at large. Intangible cost includes pain, anxiety and other factors that lead to inconvenience and even decrease the quality of life. Hospitals expenditure in management and treatment of diabetes is 16%, this shows that actions should be taken to prevent people from getting these conditions and to prevent complications to those who are already diagnosed.

Physical inactivity is also among the factors which affects the urban dwellers who most of the times sit in offices and due to the nature of work; they have little or no time at all for exercises. A report published in 2012 stated that about 6% of deaths recorded in Kenya were as a result of lifestyle diseases like type 2 diabetes and hypertension (The Rockefeller Foundation, 2015). Refugees living in urban settings like Nairobi often face challenges that are unique to them; these include insecurity, lack of shelter, violence, and physiological problems due to separation from their families. These make them vulnerable to adopting lifestyles that predisposes them to diabetes and hypertension. Because of insecurity, they remain indoors most of the time and they end up eating over- processed food since they cannot access a variety of foodstuff. They get these from hawkers who deliver the over-processed foods to their doorstep. The urban refugees also have a tendency to remain indoors without much physical activities. Further to this, due to insecurity, they may not access health services. Failure to seek medical care can result in uncontrolled medical conditions. All these factors do not only put urban refugees at risk of developing diabetes and hypertension, but also make management of the conditions challenging thus increasing the likelihood of complications and death (Pavanello et al., 2010b)

Objectives

Broad objective

To determine prevalence and factors associated with type 2 diabetes and hypertension among refugees aged 40 years and above in Kamukunji Sub County, Nairobi, Kenya.

Specific objectives

i. To determine the prevalence of type 2 diabetes and hypertension among refugees aged 40 years and above living in Kamukunji sub county, Nairobi, Kenya
ii. To determine the factors associated with type 2 diabetes and hypertension among refugees Aged 40 years and above living in Kamukunji sub county, Nairobi, Kenya

LITERATURE REVIEW

Diabetes mellitus is a body metabolic disorder. It is caused by insulin hormone production defect, utilization by the body or both. It is characterized by hyperglycemia and results into long-term damage, dysfunction, and failure of various organs, mainly, the eyes, nerves kidneys, blood vessels and the heart (Najafi et al, 2014). Diabetes mellitus is of three types, namely; Type 1 diabetes, type 2 diabetes and gestational diabetes. People with impaired fasting glucose level of (5.6–6.9 mmol/L)) and those with impaired glucose tolerance of (7.8 mmol/L) but not over (11.1 mmol/L)), and with an HbA1c levels ranging between 5.7–6.4% are considered as pre-diabetic and are at considerable risk for developing diabetes mellitus as well as cardiovascular diseases(Badran, Laher, Badran, & Laher, 2012).

Gestational diabetes

Pregnancy results into high levels of insulin in blood and insulin resistance thus predisposing some women into developing diabetes. Gestational diabetes mellitus (GDM) occurs when a

woman's pancreatic function is not sufficient to overcome the effect of pregnancy. GDM is glucose intolerance that was not present before one got pregnant. GDM develops only during pregnancy and disappears after pregnancy and it increases the risk of the mother developing diabetes later in her lifetime. GDM can be managed with diet observation, being physically active or even in some cases medication (Thomas de Lima et al, 2013). GDM affects between 2% and 5% of pregnant women and it is directly proportional to the prevalence of type 2 diabetes (Thomas de Lima et al ,2013**;** Dombrowski, Schatz, and ACOG Committee on Practice Bulletins-Obstetrics 2008).

Type 1 diabetes

Type 1diabetes (T1D) is a heterogeneous disorder characterized by destruction of pancreatic beta cells, resulting into absolute insulin deficiency. The majority of cases are attributable to an autoimmune-mediated destruction of beta cells (type 1a) while a small minority of cases results from an idiopathic destruction or failure of beta cells (type 1b). T1D accounts for 5–10% of the total cases of diabetes worldwide. Type 1 diabetes is most common among children and the adolescents, although it is being diagnosed in youth(Association & others, 2010).

Type 2 diabetes

Type 2 diabetes accounts for 90-95% of those people with diabetes. Adult-onset diabetes, it affects individuals who have insulin resistance and usually have relative (rather than absolute) insulin deficiency throughout their life time. People suffering from type 2 diabetes do not need insulin treatment to survive. There are could be many different causes of this form of diabetes ranging from insulin defect to insulin resistance(Association & others, 2010). In type 2 diabetes, the body either produces inadequate amounts of insulin to meet the demands of the body or insulin resistance has developed. Insulin resistance refers to when cells of the body such as the muscle, liver and fat cells fail to respond to insulin, even when levels are high. In fat cells, triglycerides are instead broken down to produce free fatty acids for energy; muscle cells are deprived of an energy source and liver cells fail to build up glycogen stores. This also leads to an overall rise in the level of glucose in the blood. Glycogen stores become markedly reduced and there is less glucose available for release when it may be needed.

People with type 2 diabetes are obese more often than not and this causes resistance of the insulin producing cells resulting into increased blood glucose levels (Eckel et al., 2011). The influence of obesity on type 2 diabetes risk is not only determined by the degree of obesity but also by where fat accumulates. Increased upper body fat including visceral adiposity, as reflected in increased abdominal girth or waist-to-hip ratio, is associated with the metabolic syndrome, type 2 diabetes, and cardiovascular disease (Eckel et al., 2011).

Risk factors associated with type 2diabetes mellitus and hypertension

Obesity

Obesity is an abnormal accumulation of body fat, usually 20% or more over an individual's ideal body weight. Studies have shown that body mass index (BMI), a general measure of obesity, is a strong sign of type 2 diabetes and hypertension(Eckel et al., 2011)

Obesity is a risk factor for type 2 diabetes and many studies has proved obesity to be a powerful predictor of the development of the disease. Obesity has increased rapidly in many populations in recent years because of an interaction between genetic and environmental factors. These include: metabolic characteristics (physical inactivity, micronutrient composition of the diet(Steyn et al., 2004). The increase in obesity has been accompanied by increase in prevalence of type 2 diabetes. Since obesity is a common predictor of type 2 diabetes, increase of the disease

in many populations has been associated with obesity**.** To be at low risk of acquiring diabetes one has to maintain a BMI < 21 this is from a Nurses' Health Study. The study suggested that the distribution of body fat is important factor of determining the risk of diabetes. These measures apply to the abdominal or visceral fats(Harvard health publications, 2009)

Smoking tobacco

Smoking is one of the major risk factors associated with diabetes and hypertension. Smoking makes blood to thicken, thus making it difficult for the blood to carry oxygen. In return, there is increase of blood pressure and heart rate. Smoking lowers High Density Lipoprotein (HDL) ("good" cholesterol) and raise Low Density Lipoprotein (LDL) ("bad" cholesterol). Smoking also increases triglyceride level. Triglycerides are a type of fat found in the blood, which alters the normal functioning of the heart. The fat therefore disturbs the rhythms, and damage blood vessel walls, making them stiff and less elastic. As a result, the blood vessels narrow adding to the damage caused by unhealthy cholesterol level. This Contributes to build up of plague in the arteries and inflammation resulting into hypertension (WHO, 2015).

Physical inactivity

Physical activity is necessary for the heart and circulatory system. Inactive person increases the risk of acquiring blood pressure, heart disease, blood vessel disease, and stroke. Lack of physical exercise contributes to one becoming overweight. Vigorous physical activity is one of the solutions for hypertension. Lack of physical activities alone contributes to the development of type 2 diabetes, but obesity poses greater risk compared to inactivity. Physical activity helps to control weight, uses up glucose as energy and makes cells more sensitive to insulin (American heart association, 2012). Studies have indicated the importance of lack of physical activity in the development of type 2diabetes and hypertension(American heart association, 2016).

Genetic factors

Type 2 diabetes and hypertension have a strong genetic basis (Dean and McEntyre, 2004). Approximately, 40 % of offspring born of one parent with type 2 diabetes develops diabetes. The risk increases if the mother is affected (Lyssenko and Laakso, 2013). The risk is higher (70 %) if both parents have diabetes. The risk of developing diabetes in future is 2 times higher if there is family history of diabetes. Primary hypertension is also associated with individual genes and genetic factors. However, multiple genes contribute to the development of the disease in any given individual. Gene mutations can cause hypertension even in the absence of other risk factors for example, Liddle's syndrome. In addition to genes that are associated with hypertension, there are genes that protect against the development of hypertension an example is Gitelman's syndrome (Coggon and Martyn, 2005).

Eating habits/types of food

Eating of over processed food has adversely contributed to the rise of diabetes and hypertension. On the other hand, eating of natural food will control the development of both diabetes and hypertension. Example of foods that poses great risk of acquiring the diseases includes**:** salty (sodium chloride) food, animal fats such as on meat, deep-fried food unless vegetable oil is used, and all trans-fat foods(Campbell, Khan, Cone, and Raisch, 2011).There is need to eat complex carbohydrates like sweet potatoes and brown rice. There is need to avoid simple sugars which results into sudden increase of blood glucose. Eating sugary foods contributes to more risks of acquiring diabetes. There is need to adopt traditional foods which are more natural and are not over-processed. These foods include; arrowroots, and cassava instead of bread ,vegetables like Amarantha(terere),Spider plant(Saga), Bacella alba (Nderema) among others (Franz et al.,

2002).To prevent diabetes and hypertension, a lot of fruits and vegetables should mask our daily food composition. Studies have shown that drinking of coffee prevents diabetes. Avoiding alcohol intake is also a way of controlling diabetes and hypertension. Drinking too much alcohol can also raise blood pressure to unhealthy level. Alcohol can cause hypoglycemia shortly after drinking and for up to 24 hours after. Avoiding alcohol intake is one of the ways to help kidney damage because of these two conditions(Sartorelli D S, 2010; Zhang Y et al, 2010).

Diagnosis of type 2 diabetes

Glycosylated hemoglobin (HBA1c) test

Glycosylated hemoglobin is a blood test used to give an accurate picture of overall diabetes control; the test indicates the average blood sugar level for the past 2-3 months. It measures the percentage of blood glucose attached to hemoglobin, (the oxygen-carrying protein in red blood cells). The higher the blood glucose levels, the more sugar attaches to hemoglobin. A glycosylated hemoglobin level of 6.5 percent or higher on two separate tests is an indication that a patient suffers from diabetes. A normal HBA1c level ranges from (5.7 to 6.4) percent. Abnormal HBA1c results are ≥ 6.5 percent. ("Hemoglobin A1C Test," 2014; Edelman, Olsen, Dudley, Oddone, & Harris, 2004).

Random blood sugar test

It is a blood sugar test performed at any time; this is regardless of the time that one had taken meals. For accurate results, the test should be performed two and half hours after taking a meal. The unit of measurement is millimoles per liter or milligram per deciliter. A random blood sugar level of 200 mg/dL (11.1 mmol/L) or higher suggests diabetes, especially when coupled with any of the signs and symptoms of diabetes, such as frequent urination and extreme thirst (American heart association, 2012)

Hypertension

Hypertension is defined as an abnormally high arterial blood pressure that is usually indicated by an adult systolic blood pressure of 140 mm Hg or greater or a diastolic blood pressure of 90 mm Hg or greater. It is usually of unknown cause but may be attributed to a preexisting condition. Such conditions include; endocrine disorder that typically results in a thickening and inelasticity of arterial walls and hypertrophy of the left heart ventricle which is a risk factor for various pathological conditions or events such as heart attack, heart failure, stroke, end-stage renal disease, or retinal hemorrhage("Diabetes and Hypertension,"2011).

Essential hypertension

It is a type of hypertension whose cause is not known (Blacher, Kakou, Lacombe, & Safar, 2010). It affects 95% of the hypertensive patients usually as a result of interaction of genetic and environmental factors. The prevalence of essential hypertension increases with age. Individuals with relatively high blood pressure while young are at risk of developing hypertension. Essential hypertension can increase the risk of renal, cerebral and other cardiac illnesses (Carretero and Oparil, 2000).

Secondary hypertension

Secondary hypertension is a type of hypertension whose causes can be corrected. A secondary cause may be suggested by laboratory abnormalities like (hypokalemia which is suggestive of aldosteronism and abnormalities (Jr, 2007). Secondary hypertension also occurs in individuals with resistant hypertension. The prevalence of secondary hypertension and etiology vary with age groups. Almost 5 to 10 % of adults with hypertension have a secondary cause (Akpunonu, Mulrow and Hoffman, 1996). The secondary causes include; Renovascular diseases, renal

parenchymal disease, Cushing's syndrome, coarctation of the aorta primary hyperaldosteronism among others. Occasionally included in this category is alcohol and oral contraceptive-induced hypertension. In young women, renal artery stenosis caused by fibromuscular dysplasia is one of the most common secondary causes. Up to 85% of hypertensive, children have an identifiable cause, often, renal parenchymal disease. Children with confirmed hypertension should have an evaluation of renal ultrasonography (Viera and Neutze, 2010).

Relationship between diabetes and hypertension

Hypertension continues to rise among people with diabetes; this can be associated to the nature of the illness. It is known that these illnesses are of slow onset and therefore there is always delayed health care seeking behavior concerning them. This results into increased number of people with the diseases but are undiagnosed. In a cohort study conducted among 12,550, the ability to develop type 2 diabetes was found to be 2.5 times more likely to people suffering from hypertension as compared with those with normal blood pressure. CVDs are associated with diabetes and hypertension and the risk of developing CVD is 75% in People suffering from diabetes and hypertension. This results into increased morbidity and mortality of this high-risk population (Colosia, Khan and Palencia, 2013).

METHODOLODY

Study Design and Setting

A cross-sectional survey was conducted among adult refugees residing in Eastleigh Section II, Kamukunji Sub-county, Nairobi County, Kenya.

Study Population

The target population comprised registered refugees aged ≥40 years living in the study area.

Sample Size Determination

Sample size was calculated using Cochran's formula for cluster sampling, assuming a diabetes prevalence of 10.7%, 95% confidence level, 5% precision, and a design effect of 2. The minimum required sample was 294 individuals. After adjusting for an anticipated response rate of 85%, the final sample size was 345 individuals. Using an estimated proportion of adults aged ≥40 years (24%) and an average household size of five persons, 288 households were required.

Sampling Procedure

A multistage cluster sampling approach was used. Eastleigh Section II was divided into 24 blocks considered as clusters; 12 were randomly selected. Six plots per selected block were sampled using probability proportional to size, yielding 72 plots. A sampling frame of all households within the 72 plots was generated, and 288 households were selected using simple random sampling. All eligible adults in selected households were invited to participate. Replacement households within the same plot were used where no eligible participants were found or consent was not provided.

Eligibility Criteria

Inclusion: Refugees aged ≥40 years, holding a UNHCR registration card, and providing informed consent.

Exclusion: Critically ill individuals and those with major hearing or cognitive impairments precluding informed consent.

Data Collection

Data were collected through:

- Face-to-face interviews using a semi-structured questionnaire translated into English and Somali.

- Anthropometric measurements (weight, height), used to calculate BMI.
- Blood pressure measurement using validated automated digital sphygmomanometers.
- Capillary blood sampling for random blood glucose testing.
- Venous blood sampling for HbA1c testing among participants with random blood glucose ≥11.1 mmol/L or known diabetes.

Interviewers, nurses, and laboratory technologists were trained prior to fieldwork. Instruments were piloted and revised before use. Blood pressure was measured twice, 30–60 minutes apart, with repeat measurements within 24 hours for borderline results. Participants with elevated blood pressure were referred for care.

Laboratory Procedures

Random blood glucose was measured using calibrated glucometers following standard aseptic procedures. Venous blood samples (4 mL in EDTA tubes) were analyzed for HbA1c using the SD Biosensor method. HbA1c results were classified according to international criteria: ≥6.5% (diabetes), 5.7–6.4% (pre-diabetes), and <5.7% (normal). Quality control followed Westgard rules, including daily running of control samples, proper waste disposal, and calibration of glucometers. Venous samples were transported in cool boxes at 2–8°C and analyzed within 12 hours.

Ethical Considerations

Ethical approval was obtained from Moi University IREC (No. 1617). Administrative permissions were granted by the Ministry of Health and Kamukunji Sub-county authorities. Written informed consent was obtained from all participants prior to interviews and biological measurements. Confidentiality and the right to withdraw were upheld throughout.

Data Management and Analysis

Data were double-entered and validated in Epi Info™ 7.1.4. Questionnaire and laboratory datasets were merged using unique identifiers. Analyses accounted for clustering and were weighted to adjust for non-response and unequal selection probabilities. Descriptive statistics were used to estimate prevalence of diabetes, hypertension, and associated risk factors. Logistic regression models were fitted to assess associations between risk factors and the two conditions.

RESULTS

In the study, 345 refugees were interviewed; the median age was 47 years (IQR41-55). Female were 212 (61%), most participants 213(59.1%) were in the age group 40-49 years. Majority of our study participants were married 213 (63.3%). The majority were Somali in origin 240 (69.3%). Among them, 134 (42.2%) had Madrassa level of education and 124(37.6%) were housewives. The mean age of those who had diabetes was 50 years (SD 9.57) and the mean age of those who did not have diabetes was 48 years (SD 9.52) (table1).

Table 1: Socio-demographic characteristics of refugees, Kamukunji, Kenya, 2016

Variable	Total (N=345)	Percent	HTN* (n=55)	percent	Total	%	Positive	Percent
Gender				Positive	N=345		DM* n=104	Positive
Male	133	38	14	30.4	133	36.9	36	36.9
Female	212	62	41	67.6	212	63.1	68	63.1
Age category								
40-49 years	213	62.2	21	34.4	213	60.7	58	57.1
50-59 years	74	21.1	13	25.1	74	22.6	26	23.6

60 years and above	58	16.7	21	40.5	58	16.7	20	19.3
Marital status								
Single	57	14.4	3	5.5	57	13.1	15	9.8
Married	213	61.5	30	53.1	213	62.2	61	59.7
Divorced	32	10.5	6	13.1	32	10.9	8	10
Widowed	43	13.6	16	28.3	43	13.8	20	20.5
Ethinicity								
Somali	240	66.9	45	79.5	240	69.4	74	73.4
Ethiopia	75	21.4	8	15.8	75	21.9	23	21.6
Other	30	11.7	2	4.7	30	8.7	7	5
Occupation								
House wife	124	38.1	20	37.9	124	35.7	33	29.1
Hawker	31	8.6	7	11.6	31	9.8	12	9.5
Selling food stuff	36	12.3	5	11.8	36	11.7	9	10.2
Not working	83	25.4	16	32	83	28	30	31.1
Others	52	15.6	5	6.7	52	14.8	17	20.1
Education								
Primary level	67	19.4	9	17.3	67	19.6	25	24.3
secondary & Tertiary level	78	28.5	12	22.5	78	26.2	29	36.2
Gudsi	39	12.1	7	12	39	13.1	9	8.2
Madarasa	134	40	24	48.2	134	41	33	31.3

*HTN-Hypertension

*DM-Diabetes

Prevalence of diabetes and hypertension

The prevalence of diabetes and hypertension among the refugees was 28.7% (95% CI 21.9- 35.6) and 16.6%, (95% CI 10.7-19.3) respectively. Among the diabetics, those who had uncontrolled diabetes had a prevalence of 4.5(95% 2.6-7.2). Among those who had hypertension, those who had controlled blood pressure had a prevalence of 55.1 %(95% CI37.8-72.4), prevalence of those who had mild hypertension was 19.4% (95% CI10.2-28.6), moderate hypertension had a prevalence of 14.5 % (95% CI4.9- 24.1) and prevalence of those who had severe hypertension was 10.9% (95%CI 1.3-20.5). The prevalence of those who had both diabetes and hypertension was 5.5% (95% CI2.9-7.9) as shown in table 2.

Table 2: Prevalence of diabetes and hypertension among refugees, Kamukunji, Kenya, 2016

Disease	Frequency N=345	% Prevalence(95%CI)
Diabetes	104	28.7(21.9-35.6)
Controlled diabetes	4	4.5(2.6-7.2)
Hypertension	55	16.6 (10.7-19.3)
Controlled hypertension*	34	55.1 (37.8-72.4)
Mild *	8	19.4 (10.2-28.6)
Moderate*	8	14.5 (4.9- 24.1)
Severe*	5	10.9 (1.3-20.5)

Both daibetes and hypertension	19	5.5 (2.9-7.9)

*Controlled hypertension - SBP≥120 mm/HgDSP≤80mm/Hg
*Mild hypertension -SBP120-139mm/Hg-DBP 80-89MM/Hg
*Moderate hypertension -SBP140-150mm/Hg and DBP 90-99mm/Hg
*Severe hypertension -SBP≥160mm/Hg or DBP ≥100mm/Hg
SBP(Systolic Blood Pressure); DBP(Diastolic Blood Pressure)

Risk factors for diabetes and hypertension; bivariate and multivariate analysis

Risk factors for diabetes

Marital status (being window) was found to be a risk factor for diabetes. The window were2.4 (95%CI 1.9 - 6.3) likely to have diabetes compared to the single. However, all the other demographic characteristics were not significantly associated with diabetes; female (P=0.2), age group 50-59 years and ≥60years (P=0.5 and (P=0.7) respectively, marital status; married (p=0.3), divorced (P=0.7), according to occupation; Hawker (P=0.7), selling food stuff in kiosk (P=0.8) and the unemployed (P=0.6). According to the level of education; those with primary level (P=0.5), secondary and tertiary (P=0.5) and madrasa (P=0.9) as shown in table 3.

Table 3: Bivariate analysis for demographic risk factors associated with diabetes among refugees in Kamukunji, Kenya, 2016

Variable	Total (N)	Percent	Positive	%Positive95%CI	OR95%CI	Pvalue
Gender						
Male	133	37.4	36	26.5 (17.8 - 35.2)	Ref	-
Female	212	62.6	68	29.7 (19.6 - 39.9)	1.4(0.8 - 2.5)	0.2
Age category						
40-49 years	213	59.1	58	27.4 (16.8 - 38.1)	Ref	-
50-59 years	74	22	26	27.9 (18.8 - 37.0)	1.2(0.6 - 2.4)	0.5
≥60years	58	18.9	20	35.3 (7.3 - 63.2)	1.2(0.6 - 2.3)	0.7
Marital status						
Single	57	16.9	15	21.8 (10.5 - 33.0)	Ref	-
Married	213	60.8	61	27.9 (16.7 - 39.1)	1.5(0.7- 3.1)	0.3
Divorced	32	10.4	8	30.4 (9.8 - 50.9)	1.3(0.4 - 4.00)	0.7
Widowed	43	11.9	20	40.6 (24.6 - 56.6)	2.4(1.9 - 6.3)	0.05
Ethinicity						
Somali	240	70.7	74	29.9 (20.6 - 39.1)	Ref	-
Ethiopia	75	21.5	23	31.3 (20.0 - 42.7)	1.3(0.7- 2.5)	0.5
Other	30	7.8	7	14.2 (1.9 - 26.4)	0.67(0.23 - 1.9)	0.5
Occupation						
House wife	124	36.3	33	24.8 (11.0 - 38.6)	Ref	-
Hawker	31	7.8	12	35.8 (2.8 - 68.8)	1.2(0.3 - 3.2)	0.7
Selling food stuff	36	9.8	9	24.0 (10.8 - 37.3)	1.1(0.4 - 3.1)	0.8
Not working	83	29.2	30	33.7 (16.0 - 51.3)	1.2(0. - 2.4)	0.6
Others	52	16.9	17	37.1 (18.0 - 56.3)	1.4(0.7 - 3.3)	0.4
Education						
Primary level	67	19.3	25	39.4 (21.4 - 57.5)	1.5(0.5 - 4.8)	0.5
secondary & Tertiary	78	25.1	29	34.4 (22.0 - 46.7)	1.9(0.6 - 5.8)	0.2

level						
Gudsi	39	12.6	9	16.5 (4.2 - 28.8)	Ref	-
Madarasa	134	43	33	22.0 (9.3 - 34.7)	1.0(0.3 - 2.9)	0.9

According to behavioral practices; bivariate analysis revealed no association between behavioral practices and likelihood of having diabetes: physical inactivity (p=0.9), eating of processed food (p=0.2), use of saturated fat(p=0.1) this is shown in table 4.

Table 4:Bivariate analysis for behavioral risk factors associated with diabetes among refugees in Kamukunji, Kenya, 2016

Variable	Total (N)	Percent	Positive	%Positive95%CI	OR95%CI	Pvalue
Physical exercise						
Physical activity	230	65.6	67	27.4 (17.2 - 37.5)	Ref	0.9
No Physical activity	115	34.4	37	31.7 (20.7 - 42.8)	1.0(0.6 - 1.8)	
Breakfast						
natural food	119	36.8	34	24.2 (13.8 - 34.7)	Ref	-
processed food	226	63.2	70	31.3 (21.4 - 41.3)	1.4(0.8- 2.4)	0.2
Boiling	117	35.2	45	34.7 (25.1 - 44.4)	1.5(0.9 - 2.7)	0.1
saturated fat	228	64.8	59	25.8 (16.7 - 35.0)	Ref	

In bivariate analysis for the comorbid risk factors associated with diabetes, those who had abnormal blood pressure were 2.4 (95% CI1.2 - 5.1) times more likely to have diabetes than those who had normal blood pressure, while those who were obese were 1.6(95% CI1.9 - 2.9) times more likely to have diabetes than those who had normal body weight as shown in table 5

Table 5: Bivariate analysis for comorbid factors associated with diabetes among refugees in Kamukunji, Kenya, 2016

Variable	Total (N)	Percent	Positive	%Positive95%CI	OR95%CI	Pvalue
Bloodpresure						
Normal blood pressure	302	90.1	82	27.2 (19.2 - 35.1)	Ref	-
Abnormal blood pressure	43	9.8	22	40.0 (26.0 - 54.0)	2.4(1.2 - 5.1	0.01
Obesity						
Obese	102	29.7	34	35.5 (16.0 - 55.1)	1.6(1.9 - 2.9)	0.05
Not Obese	243	70.3	70	26.3 (18.4 - 34.1)		

Risk factors for hypertension

Bivariate analysis for hypertension for demographic risk factors indicated that factors associated with hypertension were, gender, age and marital status. Females were 2.1(95% CI 1.3 – 3.4) likely to have hypertension compared with the male. While those aged 50-59 years were 2.6(95% CI 1.4 – 4.8) likely to have hypertension compared to the age-group 40-49 years. Also those aged ≥60 years were more at risk of having hypertension 7.4(95%CI2.6-21.1) compared with those in the age-group 40-49 years. According to marital status; the married were 4.9(95% CI 1.9- 12.0) at risk of having diabetes than the single and widowed were 17.8(95% CI 7.6.1– 51.8) times more likely to have hypertension compared to the single. According to ethnicity, being Somali was not a risk factor for hypertension (p =0.2). There was no association between type of occupation and having diabetes; the unemployed (p=0.6), hawker (p=0.5) and housewives

(p=0.9). Having formal education was protective; Primary level of education OR (0.9), secondary and tertiary level OR (0.7) as shown in table 6.

Table 6: Bivariate analysis for demographic risk factors for hypertension among refugees in Kamukunji, Kenya, 2016

Variable	Total	Percent	Pos	% Positive(CI)	OR(95%CI)	p_value
Gender						
Male	133	38	14	9.4(4.5 - 14.3)	Ref	-
Female	212	62	41	21.5 (16.2 - 26.9)	2.1(1.3 - 3.4)	0.02
Age category						
40-49 years	213	62.2	21	9.8 (2.9 - 16.7)	Ref	-
50-59 years	74	21.1	13	21.1 (14.0 - 28.2)	2.6(1.4 - 4.8)	0.03
≥60 years	58	16.7	21	42.9 (20.4 - 65.3)	7.4(2.6- 21.1)	0.01
Marital status						
Single	57	14.4	3	6.7 (0.0 - 15.5)	Ref	-
Married	213	61.5	30	15.3 (8.4 - 22.1)	4.9(1.9- 12.0)	0.01
Divorced	32	10.5	6	22.1 (0.0 - 49.8)	4.2(0.9 - 18.3)	0.05
Widowed	43	13.6	16	36.9 (24.9 - 48.9)	17.8(6.1 - 51.8)	<.01
Ethinicity						
Somali	240	66.9	45	21.0 (12.7 - 29.4)	1.8(0.7 - 4.2)	0.2
Ethiopia	75	21.4	8	13.0 (3.5 - 22.5)	Ref	-
Other	30	11.7	2	7.1 (0.0 - 19.0)	0.5(0.1 - 2.0)	0.3
Occupation						
House wife	124	38	20	17.5 (7.1 - 27.8)	1.0(0.5 - 2.1)	0.9
Hawker	31	8.6	7	24.1 (5.2 - 43.0)	1.5(0.4- 5.7)	0.5
Selling food stuff	36	12.3	5	17.4 (2.9 - 31.9)	Ref	-
Not working	83	25.4	16	22.5 (5.8 - 39.2)	1.4(0.4 - 5.0)	0.6
Others	52	15.6	5	7.9 (0.3 - 15.4)	0.4(0.2 - 1.4)	0.1
Education						
Primary level	67	19.4	9	16.8 (1.8 - 31.8)	0.9(0.3 - 2.7)	0.8
secondary & Tertiary level	78	28.5	12	14.9 (3.4 - 26.5)	0.7(0.2 - 3.2)	0.7
Dugsi	39	12.1	7	18.5 (3.0 - 34.0)	Ref	-
Madarasa	134	40	24	22.6 (11.8 - 33.4)	1.3(0.5 - 3.7)	0.6

The behavioral risk factors for hypertension indicated that there was no association between lack of physical activity and hypertension (p=0.6), and use of saturated fats and hypertension (p=0.69). However, eating of natural food was found to be protective 2 (OR=0.4) as shown in table 7.

Table 7: Bivariate analysis for behavioral risk factors associated with hypertension among refugee, Kamukunji, Kenya, 2016

Variable	Total	Percent	Pos	% Positive(CI)	OR(95%CI)	p_value
Physical exercise						
Physical activity	230	65.9	35	16.1 (8.6 - 23.7)	Ref	-
No Physical activity	115	34.1	20	20.6 (5.7 - 35.5)	1.3(0.5 - 3.6)	0.6

Natural food	119	36.4	24	25.1 (11.0 - 39.1)	0.4(0.5 3.2)	0.2
Processed food	226	63.6	31	13.4 (7.8 - 19.0)	Ref	-
Boiling	117	34	20	16.5 (7.7 - 25.3)	Ref	-
Use saturated fats	228	65.3	35	18.3 (11.0 - 25.6)	1.1(0.7- 1.9)	0.6

For the comorbid risk factors for hypertension, those who were obese were 1.6(95% CI1.0 - 2.7) more likely to have hypertension compared to those who had normal body weight and there was no association between diabetes and hypertension (p=0.4) (table 8).

Table 8: Bivariate analysis for comorbid risk factors for hypertension among refugees in Kamukunji, Kenya, 2016

Variable	Total	Percent	Pos	% Positive(CI)	OR(95%CI)	p_value
Obesity						
Obese	102	28.9	23	24.7 (14.4 - 35.1)	1.6(1.0 - 2.7)	0.04
Normal body weight	243	28.9	32	14.8 (8.7 - 20.9)	Ref	-
Diabetes						
Positive	104	31.8	19	23.2 (11.9 - 34.6)	1.2(0.8 - 1.9)	0.4
Negative	241	68.2	36	15.1 (9.2 - 21.0)	Ref	-

Multivariate analysis for hypertension

After adjusting for all variables that had a p- value less than 0.1 in the multivariate model for hypertension the variables which remained independently associated with hypertension were gender, age, marital status and obesity. Females were 1.9(95%CI1.1- 3.4) times likely to have hypertension compared with the males. Those aged≥ 60 years were 6.7 (95%CI 2.2-21.0) times at risk of having hypertension compared to those aged 40-49 years. Those who were widowed were 9.5(95%CI3.8 - 23.7) times likely to have hypertension than the single. Those who were obese were 1.8 (95%CI 1.1 - 2.7) times likely to have hypertension (table9).

Table 9: Multivariate analysis of risk factors for hypertension among refugees in Kamukunji, Kenya, 2016

Variable	No N=345.	Positive	aOR(95%CI)	P-value
Male	133	14	Ref	
Female	212	41	1.9(1.1- 3.4)	0.01
40-49 years	213	21	Ref	
50-59 years	74	13	2.7(1.3 - 5.6	
≥60 years	58	21	6.7(2.2- 21.0)	0.03
Single	57	3	Ref	
Married	213	30	4.1(1.8 - 9.6)	
Divorced	32	6	2.3(0.3- 16.4)	
Widowed	43	16	9.5(3.8 - 23.7)	<.01
Obese	102	28.9	1.8(1.1 - 2.7)	0.01
Not Obese	243	71.1	Ref	

DISCUSSION

Prevalence of diabetes

We found that over a quarter of our study population had type 2 diabetes, which is higher than that of the urban population in Kenya 4-11% (Hall, Thomsen, Henriksen, & Lohse, 2011). and higher than the rural population (Ayah et al., 2013b). This could be due to refugees status; refugees are undergo stress which ranges from environmental changes, social and cultural changes which accompany migration and this can result into diabetes and Stress has been studied to be a trigger of diabetes. In people with type 2 diabetes, mental stress often raises blood glucose levels. Physical stress, such as illness or injury, causes higher blood glucose levels in people with either type 1 or type 2 diabetes(Alex, ria, & 1-800-Diabetes, 2016). Mental stress can trigger diabetes or even make glucose control difficult since there are high chances of forgetting medications or even not watching what one eats due to stress. Also stress has been found to affect hormones which in return can trigger direct rise of blood glucose. This could also be explained by what this study found; that eating of processed food had a prevalence of a third in this study population; there is little knowledge on what processed food contains despite the ingredients being portrayed on the packaging containers. Some of the foodstuff contains a lot of sugar and salt which pose risk to diabetes. This is consistent with a study conducted among urban population in Kenya which indicated that eating of processed food was a risk factor for diabetes (Campbell et al., 2011).

Prevalence of hypertension:

This study also demonstrated that approximately a fifth of adults aged 40 years and above were hypertensive. This prevalence is low than for the urban population in Kenya which is 23.7% (Joshi et al., 2014).The low prevalence could be associated with what this study found that smoking tobacco and drinking alcohol which are among the known modifiable risk factors for hypertension had a low prevalence of 3.6% and 1.6% respectively, so the fact that only a few respondents smoke tobacco and consumed alcohol could explain this low prevalence of the disease among this population. This contrasts with a study conducted among urban population in Kenya which found that smoking tobacco and drinking alcohol were among the risk factors which contributed to increased prevalence of 32% of the hypertension in urban population (Joshi et al., 2014). However the prevalence of hypertension was found to be high among the respondents compared with the Jordan refugees who had a lower prevalence of 9.7% (Doocy et al., 2015). This could be linked to use of saturated fat since prevalence of saturated fat use was two fifth and saturated fat intake has been linked to an increased risk of hypertension and this effect is thought to be mediated primarily by increased concentrations of Low Density Lipoprotein (LDL) cholesterol.

Factors associated with diabetes - bivariate analysis:

This study found that being widow and having abnormal blood pressure were factors associated with diabetes. This could be due to stress since majority of the widowed people suffer psychological stress and mental stress, this comes about as a result of loss of spouse or even separating with the spouses due to issues of migration where men are left behind probably waiting for the situations to get better/ improve and they end up remaining back; therefore majority of the women who were windowed left their home of origin anticipating that their spouses would join them later, this to some extent did not happen and they ended up remaining as windows. This could be the beginning of stress since they need to cater for their basic needs in the country where they have resettled in; lack of money and support predisposes these women to

stress and stress has been studied to be a trigger of type 2 diabetes. Majority of our study participants were house wives by occupation status, this shows that their source of income was limited and this could allow stress to set in hence predisposing them to be at risk of acquiring diabetes. Studies have shown that stress affects people with diabetes by elevating the glucose level, this happens when stress hormones make blood sugar levels rise, sometimes to harmful heights. Second, people under stress often don't take good care of themselves. They may forget to eat or exercise, skip medications, become dehydrated, or feel reluctant to check blood sugar regularly or keep routine medical appointments(Henry & Sarah, 2014). This study is consistent with a study finding on glycemic control which indicated that stress is a potential cause of chronic hyperglycemia in diabetes (Surwit, Schneider, & Feinglos, 1992). This study also found that people with diabetes were more likely to also have high blood pressure. This could be due to use of saturated fat which can act as a trigger when used for a long period due to the increased LDL cholesterol. Diabetes increases risk of developing high blood pressure and other cardiovascular problems, because diabetes adversely affects the arteries, predisposing them to atherosclerosis (narrowing of the arteries). Also majority of study participants were female of who according to occupation were house wives; this suggested that the level of physical inactivity would be high among females who had house helps and relied upon them to do household chores while they themselves were supervisors. This was reported information. Diabetes causes atherosclerosis which can cause high blood pressure, which if not treated, can lead to further blood vessel damage, and stroke, heart failure, heart attack or kidney failure. This study found that eating of natural food was protective (OR=0.4). The natural food in this study included; arrowroots, sweet potatoes and cassava, traditional,vegetables like Amarantha(terere),Spider plant(Saga), Bacella alba (Nderema) among others (saga, managu and terere). This could be due to the fact that natural foods have a lot of fiber and consist of complex sugars; simple sugars results into sudden increase of blood glucose. Eating sugary foods contributes to more risks of acquiring diabetes. (Nderema) among others (Franz et al., 2002)

Risk factors associated with hypertension:

In bivariate analysis for hypertension, being female was a risk factor for hypertension. Females were more likely to have hypertension compared to the male. This could be due to physical inactivity since majority of study participants were female and their main occupation was housewives. This contrasts with a study conducted among urban population in Kenya which indicated that men were more at risk of having diabetes compared to women(Ayah et al., 2013b). However studies have shown that women are more at risk due to use of Combined Oral Contraceptives (COC) and effects of menopause and Hormone Replacement Therapy (HRT). However, Age, marital status and high BMI≥ 30Kg/m^2 (being obese) were the risk factors which were independently associated with hypertension

Among study participants, increasing age was a risk factor for hypertension 50-59 and above 60 years. They had 2.6 times and seven times increased risk for hypertension compared to those aged 40-49 years. This could be due to increased weight as a result of physical inactivity. It is known that as one approaches old age; physical activity also reduces, this can result to increased body weight, also age influences metabolic rate (Burning of calories is low in older people than young people) this can result into obesity, there is also reduced water intake due to bladder incontinence and drinking adequate water (≥ eight glasses of water per day) have been associated with better health and loss of body weight (Mandyl, 2015). This was consistent with a study conducted among refugees in United States(US) where old age was a risk factor for hypertension (Ursua et al., 2013).

Obesity explained the risk of having hypertension in this study. About half of the refugees used saturated fats during cooking and this could explain the likelihood of being obese and also old age could have contributed to being obese. Also eating of processed food can result into obesity since most of the processed foods are prepared using fats and it is difficult to know the mode of preparation or even type of oil used during processing of these foods. Two thirds of the study participants were female this shows that greater burden of obesity was linked to being female; and culturally acceptable and desired body shapes among Africans makes women have excess body weight, this make them to have less desire to lose weight; therefore, this lack of awareness results into obesity which is a major risk factor for hypertension. The finding of this study corresponds to a study conducted among the immigrants in US which found that individuals who were obese (BMI≥30Kg/m^2) were more at risk of having hypertension than those who had a BMI of =18.530Kg/m^2 (Ursua et al., 2013). Obesity is found to affect a number of hormonal levels in our body, the worst affected is the Renin-Angiotensin-Aldosterone system (RAA). This system is responsible for controlling the blood volume of the body and along with the sympathetic nervous system which controls the level of sodium and water retention in the body. Being widowed was a risk factor for hypertension. The reason for this could be stress. This is consistent to a study conducted among Cambodian refugees who found that due to environmental changes which accompany migration, most women suffered stress due to loss of their spouses or even separation and had developed high blood pressure(Peterman, Wilde, Silka, Bermudez, & Rogers, 2012). Similar to a study which indicated that widowed had 2.3 odds of having hypertension OR=2.3 compared to the married.

CONCLUSION AND RECOMMENDATIONS

This study shows that prevalence of these NCDs is high in this refugee population. The factors associated with diabetes were high blood pressure and marital status. While factors associated. with hypertension were obesity, age and marital status. Eating natural food was protective to diabetes. There is need to adopt traditional foods which are more natural and are not over-processed.

Obesity was one of the outstanding modifiable risk factor. In order to prevent obesity, programs designed to reduce weight should be put in place. Public health education on lifestyle modification where refugees should be educated on primary strategies should be adopted; these will involve, dietary changes, ways on how to reduce weight and increasing of physical activity. I recommend further research where dietary data, including salt intake, and socio-economic and lipid profile data should be incorporated for more in-depth findings.

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