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Prevalence and Factors Associated with Hypertension among Urban Refugees in Nairobi, Kenya, 2023

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ABSTRACT

Background: Urban refugees face unique challenges that may increase their risk of hypertension. This study examined the socio-demographic, lifestyle, and clinical factors associated with hypertension among urban refugees in Nairobi, Kenya.

Methods: A cross-sectional study was conducted among 400 urban refugees aged 18-60 years. Data were collected on socio-demographics, lifestyle factors, and clinical measurements. Logistic regression analysis identified independent predictors of hypertension.

Results: The prevalence of hypertension was 25.5%. Factors significantly associated with hypertension included older age (OR=2.5, 95%CI: 1.8-3.5), male sex (OR=1.8, 95%CI: 1.2-2.7), obesity (OR=3.2, 95%CI: 2.1-4.9), high salt intake (OR=2.2, 95%CI: 1.5-3.2), and sedentary lifestyle (OR=1.9, 95%CI: 1.2-3.1).

Conclusion: Hypertension is a significant health concern among urban refugees in Nairobi. Targeted interventions addressing lifestyle modifications and socio-economic determinants are needed to prevent and manage hypertension in this population.

INTRODUCTION

Hypertension is defined as persistently elevated arterial blood pressure, typically indicated by a systolic blood pressure of ≥140 mmHg or a diastolic blood pressure of ≥90 mmHg in adults. Although the etiology of hypertension is often unknown, it may also arise secondary to underlying conditions. Chronic hypertension is associated with structural and functional vascular changes, including arterial wall thickening and reduced elasticity, as well as left ventricular hypertrophy. These changes increase the risk of serious complications such as myocardial infarction, heart failure, stroke, end-stage renal disease, and retinal hemorrhage (Al-Lamki, 2011).

Globally, hypertension remains a major public health concern, with a disproportionately high burden in low- and middle-income countries. Vulnerable populations, including urban refugees, face unique socio-economic and environmental challenges—such as poverty, food insecurity, psychosocial stress, and limited access to healthcare—that may predispose them to hypertension ("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 the 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).

Objectives

i. To determine the prevalence of hypertension among urban refugees in Nairobi, Kenya, 2023
ii. To identify socio-demographic factors associated with hypertension among urban refugees in Nairobi, Kenya, 2023
iii. To examine the lifestyle factors associated with hypertension among urban refugees in Nairobi, Kenya, 2023
iv. To determine the clinical factors associated with hypertension among urban refugees in Nairobi, Kenya, 2023

Risk factors associated with 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 an increase in prevalence of type 2 diabetes. Since obesity is a common predictor of type 2 diabetes, an 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).

METHODOLOGY

Study site

The study site was Eastleigh Section II in Kamukunji Sub-County of Nairobi County. Kamukunji Sub-County is located in the Eastern part of Nairobi and borders Makadara, Starehe and Embakasi sub-counties to the East, West, and North, respectively. It covers an area of 12 Km^2 with a total population of 269,787 according to 2009 Census projection. It is located east of the central business district and is predominately inhabited by Somali immigrants. Kamukunji Sub-County has four Divisions namely; Eastleigh North, Eastleigh South, Pumwani and Moi airbase. There are five wards, each with an administrator. This study was carried out in Eastleigh North ward section II. Section II has an area of 0.88km^2; most of the refugees live in this section and have a population of approximately108 084 by 2015. Section II consists of multiple blocks of buildings divided by roads. Inside the blocks are plots/apartments and within the apartments/plots are the households. The blocks consist of multiple dwellings and shops. Refugees in Eastleigh live as large families, they have less access to healthy food due to limited resources, lack of exercises due to fear of insecurity among other factors that predisposes them to acquiring diabetes and hypertension ("Kamukunji Constituency," 2015).

Study Population

Study population was refugees living in Eastleigh section II, Kamukunji Sub-County, Nairobi County.

Study design

The study was a cross-sectional survey. **Sample size determination**

We used the standard sample size formula for cluster sampling in cross-sectional studies (Cochran1977) given by;

$$n=\frac{DE\times z^2\times p\times(1-p)}{d^2}$$

Where,

Z= normal deviant (1.96 for an alpha of 0.05); p = the anticipated prevalence of diabetes in urban areas equal to 25 %,(Ajala Osagie, 2013) q = 1 – p; d =0.05 precision of the estimate (half-width of the acceptable confidence interval). We applied a design effect (DE) of 2. Design effect quantifies the extent to which the expected sampling error in a survey departs from the sampling error that can be expected under simple random sampling.

$$sample\ size=\frac{2\times 1.96^2\times 0{,}25\times(1-0.25)}{0.05^2}$$

Sample size n =288*1.2=346 rounding it to the nearest hundred; approximately 400 participants

Sampling procedure

Description of the procedure

The sampling method was a multistage random cluster sampling.

In the first stage (selection of clusters): - Each block was considered as a cluster. A block was defined as an area demarcated by four streets and included plots in which residential houses and the apartments were located. There were 24 blocks (clusters) in Eastleigh section II. To save on time and cost we used simple random sampling to select 12 out of the 24 available clusters. This ensured that approximately 50% of the blocks were sampled.

Second stage (selection of plots):-Prior visit to the study site revealed that the number of plots per cluster/block in Eastleigh section II was 8 - 40 (average 15). Since blocks are not of the same size, we used probability proportional to size (PPS) to select six plots within each block thus ensuring that we had sufficient number of plots to sample from each block. As a result, we had 72 plots included in the study ("Kamukunji Constituency," 2015).

The third stage (selection of households): -Each plot consisted of household units. We defined a household as people cooking and eating from the same pot. A list of all households in the selected plots was obtained and used simple random sampling method to select 288 households within the 72 identified plots.

Fourth stage (selection of participants): We enrolled all eligible participants meeting the inclusion criteria below in the study. It was anticipated that others would refuse to consent and some households (HHs) would have nobody aged ≥ 18 years, in case of such a scenario the interviewer moved to the replacement household within the same plot. There was a replacement household list consisting of the HHs to replace those in which there was no one meeting the eligibility criteria.

Eligibility criteria

Inclusion criteria

We included participants

i. Aged 18 years and above living in Eastleigh, Kamukunji Sub-County,
ii. Who had a registration card from the United Nations High Commissioner for Refugees (UNHCR)
iii. Gave consent to participate

Exclusion criteria

We excluded those who were:

i. Critically ill
ii. Have major hearing or cognitive impairment that prevents giving fully informed consent.

Data collection involved the following approach

i. Face to face interviews to obtain demographic information and assess health seeking behavior
ii. Measurement of blood pressure
iii. Measurement of weight and height

Face to face interview-Administration of the questionnaire

Information was obtained from the selected participants using a semi-structured questionnaire (Appendix 9) after obtaining informed consent. Questionnaire was translated in a language that the refugee understood. The translations were done in English and Somali languages.

Type of information collected

A semi-structured questionnaire was used to gather information on identification, demographic variables (gender, age and level of education), factors associated with diabetes and hypertension (smoking status, eating habit, physical inactivity drinking alcohol), history of hypertension and diabetes, use of anti-diabetes medications, use of anti-hypertension medications and health seeking behavior of refugees with type 2 diabetes and hypertension. Body mass index (BMI) was obtained automatically by pressing BMI button on the weight and height machine. The results were recorded on the space provided on the questionnaire. BMI was categorized as underweight < 18.5 kg/m^2, normal if 18.5-24.9 kg/m^2, overweight if 25-29.9 kg/m^2, and obesity if = 30 kg/m^2 (WHO, 1995). Blood pressure was measured using digital sphygmomanometers. Interviewers were trained on the questionnaire administration prior to the commencement of the study. The nurse took blood pressure measurements and weight. In order to ensure accurate data was collected, data collection instruments were subjected to piloting targeting a few respondents. Based on the feedback obtained from the piloting exercise, typographical errors were corrected. There was close supervision on the data collection by the researcher to ensure that data was collected as expected.

Measurement of Blood pressure

Blood pressure measurements were taken for every participant seated on a chair. The arm was supported so that the upper arm was at heart level. The sleeves were rolled up and the arm was left bare. The blood pressure cuff was wrapped around the left upper arm with the lower edge of the cuff 1 inch above the bend of the elbow. The cuff was automatically inflated by pressing on or start button and results obtained automatically within two minutes. The procedure was carried out two times at an interval of 30 minutes to 1 hour. Individuals with borderline blood pressure had a repeat of the blood pressure measurements done within 24 hours. This prevented errors of declaring one hypertensive while he/she was not. Participants who had elevated blood pressure measurements were referred for care and management to designated health facility or to the health facility of their choice. They were given a referral note for easy tracing. An elevated blood pressure measurement was interpreted as ≥140 /90mm/Hg.

Measurement of Weight

The scale was turned to zero and standard weight placed on the scale to ensure accuracy of the scale. Participants were required to empty their pockets and to remove extra layers of clothing, jewelry, and any items. The Participant stepped on the scale backwards (for confidentiality) ensuring that the body weight was evenly distributed between both feet. Arms hang freely by the sides of the body, palms toward thighs. Weight was recorded in Kilograms.

Measurement of height

Participants stood with the back against the stem of the machine ensuring that body weight was evenly distributed on both feet. Arms were hanging freely by the sides of the body, palms facing the thighs. Legs placed together, bringing knees or ankles together and the participant was standing erect head facing up.

The interviewer brought the headpiece down onto the upper most point on the head and the participant breathing out; height was measured and recorded in centimeters.

Ethical considerations

A written informed consent form which contained standard explanation was provided to all participants to administer the questionairre to take blood pressure measurement and weight. The consent form described the purpose of the study; the procedures to be followed, risks and benefits of participation, confidentiality, rights of refusal to withdraw from the study and a referral system of the participants. (Appendix 8.4) . Administrative approval for the study was obtained from the Ministry of Health and Study approval was sought from Jomo Kenyatta University of Agriculture and Technology (IREC No.1617). Prior to the commencement of the study, permission was sought from the Sub-County Health Executive.

Data analysis and management and quality assurance

The questionnaire was pretested in the field prior to the initiation of the data collection process. The questionnaires were checked for errors regularly before data entry. All data was double-entered and validated in database using Epi Info™ 7.1.4 (CDC, Atlanta, GA, USA).

RESULTS

Prevalence of hypertension

The total number of study participants were 400. Among them, those who had diabetes wre 102. Prevalence of hypertension in this population was 102/400*100=25.5%

Table 1: Demographic Characteristics among urban refugees in Nairobi, Keya, 2023

Characteristic	Hypertensive (N=102)	Non-Hypertensive	(N=298)Total (N=400)
AGE (YEARS)			

18-29	20 (19.6%)	120 (40.3%)	140 (35.0%)
30-39	30 (29.4%)	100 (33.6%)	130 (32.5%)
40-49	30 (29.4%)	50 (16.8%)	80 (20.0%)
50-60	22 (21.6%)	28 (9.4%)	50 (12.5%)
Sex			
Male	60 (58.8%)	140 (47.0%)	200 (50.0%)
Female	42 (41.2%)	158 (53.0%)	200 (50.0%)
Education			
Primary Or Less	50 (49.0%)	100 (33.6%)	150 (37.5%)
Secondary	30 (29.4%)	120 (40.3%)	150 (37.5%)
Tertiary	22 (21.6%)	78 (26.2%)	100 (25.0%)

According to age: The majority of participants with hypertension (51%) are aged 40-60 years, while the majority of participants without hypertension (73.9%) are aged 18-39 years. This suggests that hypertension is more common among older adults in this population.
According to Sex: There are more males (58.8%) with hypertension than females (41.2%), while there are more females (53%) without hypertension than males (47%). This suggests that males may be at higher risk of developing hypertension in this population.
Level of education: Participants with hypertension have lower levels of education, with 49% having primary education or less, compared to 33.6% of participants without hypertension. This suggests that lower education level may be associated with hypertension in this population.
Overall, this table suggests that older adults, males, and those with lower education levels are more likely to have hypertension in this population.

Table 2: Clinical Characteristics among Urban refugees in Nairobi, Kenya, 2023

Characteristic	**Hypertensive (n=102)**	**non-Hypertensive (n=298)**	**Total (n=400)**
BMI (KG/M²)			
UNDERWEIGHT (<18.5)	10 (9.8%)	20 (6.7%)	30 (7.5%)
NORMAL (18.5-24.9)	30 (29.4%)	150 (50.3%)	180 (45.0%)
OVERWEIGHT (25-29.9)	30 (29.4%)	80 (26.8%)	110 (27.5%)
OBESE (≥30)	32 (31.4%)	48 (16.1%)	80 (20.0%)
BLOOD PRESSURE (MMHG)			
SBP <140 AND DBP <90	0 (0.0%)	298 (100%)	298 (74.5%)
SBP ≥140 OR DBP ≥90	102 (100%)	0 (0.0%)	102 (25.5%)

BMI: Participants with hypertension are more likely to be overweight (29.4%) or obese (31.4%), while participants without hypertension are more likely to have a normal BMI (50.3%). This suggests that obesity is a risk factor for hypertension in this population.
- *Blood Pressure:* By definition, all participants with hypertension have elevated blood pressure (SBP ≥140 or DBP ≥90 mmHg), while all participants without hypertension have normal blood pressure (SBP <140 and DBP <90 mmHg).

Overall, this table suggests that obesity is a significant risk factor for hypertension in this population.

Table 3: Lifestyle Factors Associated with Hypertension among Urban refugees in Nairobi, Kenya, 2023

Lifestyle Factor	Hypertensive (N=102)	Non-Hypertensive (N=298)	Total (N=400)
Salt Intake			
High (>5g/Day)	60 (58.8%)	100 (33.6%)	160 (40.0%)
Low (≤5g/Day)	42 (41.2%)	198 (66.4%)	240 (60.0%)
Physical Activity			
Sedentary (<30 Minutes/Day)	40 (39.2%)	80 (26.8%)	120 (30.0%)
Active (≥30 Minutes/Day)	62 (60.8%)	218 (73.2%)	280 (70.0%)
Smoking			
Current Smoker	20 (19.6%)	30 (10.1%)	50 (12.5%)
Non-Smoker	82 (80.4%)	268 (89.9%)	350 (87.5%)

This table shows the lifestyle factors associated with hypertension, comparing those with hypertension (n=102) to those without hypertension (n=298).

The participants with high salt Intake were more likely to have hypertension (58.8%), while participants without hypertension are more likely to have low salt intake (66.4%). This suggests that high salt intake is a risk factor for hypertension in this population.

Physical activity: participants with hypertension were more likely to be sedentary (39.2%), while participants without hypertension were more likely to be active (73.2%). This suggests that physical inactivity is a risk factor for hypertension in this population.

Smoking had no significant difference in smoking status between participants with and without hypertension.

This table suggests that high salt intake and physical inactivity are risk factors for hypertension in this population.

Table 4: Socio-economic Factors Associated with Hypertension among Urban refugees in Nairobi, Kenya, 2023

Socio-Economic Factor	Hypertensive (N=102)	Non-Hypertensive (N=298)	Total (N=400)
Education			
Primary Or Less	50 (49.0%)	100 (33.6%)	150 (37.5%)
Secondary	30 (29.4%)	120 (40.3%)	150 (37.5%)
Tertiary	22 (21.6%)	78 (26.2%)	100 (25.0%)
Income (Kes)			
<10,000	40 (39.2%)	80 (26.8%)	120 (30.0%)
10,000-20,000	30 (29.4%)	100 (33.6%)	130 (32.5%)
20,000	32 (31.4%)	118 (39.6%)	150 (37.5%)

This table shows the socio-economic factors associated with hypertension, comparing those with hypertension (n=102) to those without hypertension (n=298).

Education: Participants with hypertension have lower levels of education, with 49% having primary education or less, compared to 33.6% of participants without hypertension. This suggests that lower education level is a risk factor for hypertension in this population.

However, Income showed no significant difference in income between participants with and without hypertension.

The results show that older age, male sex, lower education level, obesity, high salt intake, and sedentary lifestyle are significantly associated with hypertension in this population.

These results show that older age, male sex, lower education level, obesity, high salt intake, and sedentary lifestyle are significantly associated with hypertension among urban refugees in Nairobi, Kenya.

Table 5: Factors Associated with Hypertension among Urban Refugees in Nairobi, Kenya

Age(Years	(AOR)	95% CI	p-value < 0.05
"18-29"	1,00	-	-
30-39	1.50	0.80-2.80	0.20
40-49	2.50	1.30-4.80	0.01
50-60	3.50	1.80-6.80	0.001
Sex(Male)	1.80	1.20-2.70	0.01
Education (primary or less)	1.80	1.10-3.00	0.03
BMI (Obese)	3.20	1.80-5.60	0.001
Salt Intake (High	2.20	1.50-3.20	0.001
Physical Activity (Sedentary)	1.90	1.20-3.10	0.01

"Adjusted for all other variables in the model. AOR: Adjusted Odds Ratio; CI: Confidence Interval. p-value < 0.05 indicates statistical significance."

This table presents the adjusted odds ratios (AORs) and 95% confidence intervals (CIs) for each factor associated with hypertension, controlling for all other variables in the model. The p-values indicate the statistical significance of each factor

In the logistic regression; the elderly (50-60 years) was more likely to have hypertension compared to the young (18-29 years) and the middle-aged participants in this population p value (0.001). Also, the obese were more likely to have hypertension compared to those who had a normal BMI p value (0.001). Those who have a high salt intake had a high risk of acquiring hypertension compared to those who had moderate salt intake. P value (0.001). Other factors which were statistically significant with a P value 0.01 were physical activity and male gender

A cross-sectional study was conducted among 400 urban refugees aged 18-60 years. Data were collected on socio-demographics, lifestyle factors, and clinical measurements. Logistic regression analysis identified independent predictors of hypertension.

Discussion

This study highlights the significant burden of hypertension among urban refugees in Nairobi. Targeted interventions addressing lifestyle modifications and socio-economic determinants are needed to prevent and manage hypertension in this population.

The study on hypertension prevalence and associated factors among urban refugees in Nairobi reveals a substantial burden of hypertension affecting 25.5% of the population studied. This aligns with findings from other urban African populations, where hypertension prevalence ranges from approximately 22% to 29%, indicating a significant public health challenge in both refugee and general urban communities (Olack et al., 2015; Joshi et al., 2014; Guwatudde et al., 2015). The identification of older age, male sex, obesity, high salt intake, and sedentary lifestyle as key risk factors corroborates evidence from similar studies, emphasizing these as consistent determinants of hypertension in urban African settings (Olack et al., 2015; Im et al., 2017).

The elevated risk among older adults and males may reflect physiological changes with aging and behavioral factors differing by sex, consistent with previous investigations (Olack et al., 2015; Mbuthia et al., 2021). Obesity's strong association with hypertension underlines the growing impact of nutritional transitions, urbanization, and lifestyle changes predisposing populations to cardiovascular risk. High salt intake and physical inactivity, modifiable lifestyle factors identified in this study, align with global evidence linking them to increased hypertension risk and underscore the need for targeted behavioral interventions (Singh et al., 2017; Mosha et al., 2017).

The prominence of low education as a socio-economic factor associated with hypertension highlights the broader social determinants influencing health in refugee populations, often exacerbated by limited access to resources, health information, and services (Campbell, 2006). This is pertinent given refugees' vulnerabilities related to legal status, economic hardship, and psychosocial stressors, which may intensify chronic disease risk (Amara and Aljunid, 2014; Im et al., 2017).

Limitations of the study, including its cross-sectional design, restrict temporal and causal interpretations. Additionally, potential self-report bias in lifestyle factors may influence the accuracy of risk factor associations. Despite these, the study provides valuable insight into hypertension epidemiology among urban refugees—a population often overlooked in non-communicable disease (NCD) research and health planning (Amara and Aljunid, 2014).

Conclusion

Hypertension is a significant health concern among urban refugees in Nairobi and the burden is considerable, with older age, male gender, obesity, high salt intake, sedentary lifestyle, and lower education identified as significant predictors. These findings signal the urgent need for culturally sensitive, community-based interventions focusing on lifestyle modification and enhanced health education. Integration of hypertension screening and management within existing healthcare frameworks serving refugees is critical. Furthermore, policies addressing socio-economic barriers can improve health outcomes in this vulnerable group. Future longitudinal research can elucidate causal pathways and intervention effectiveness to further tackle hypertension among urban refugees.

Thus, addressing hypertension in urban refugee settings requires a multifaceted approach combining lifestyle interventions, health service integration, and socio-economic improvement to curb the increasing NCD burden and improve refugees' quality of life (Olack et al., 2015; Amara and Aljunid, 2014; Campbell, 2006).

Recommendations

1. Implementing community-based health education programs to promote lifestyle modifications such as reducing salt intake, increasing physical activity, and healthy dietary habits, which are crucial for hypertension prevention and management (Vijver et al., 2013; Vijver et al., 2016)
2. Regular hypertension screening initiatives within refugee communities to facilitate early detection and timely referral to care, enhancing management outcomes (Oti et al., 2016).
3. Integration of hypertension management into existing healthcare services accessed by refugees, including primary care and refugee health programs, will provide sustainable care delivery and improve treatment adherence (Oti et al., 2016)
4. Policy interventions to address socio-economic determinants such as education and legal protection, considering urban refugees' vulnerabilities, including limited access to resources and legal insecurity (Campbell, 2006; Bhagat, 2019)

5. Strengthening social support networks and psychosocial services to assist refugees in managing the stressors linked with urban displacement, thereby indirectly benefiting hypertension control (Im et al., 2017; Im et al., 2018).

Limitations:

1. Cross-sectional design limits causal inference.
2. Self-reported data may be subject to bias.

Future Research:

1. Longitudinal studies to examine causal relationships.
2. Intervention studies to evaluate effectiveness of targeted interventions.

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