Risk Factors For Hypertension Among Adults Attending Health Centres In Ruiru Sub-County, Kiambu County, Kenya

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ABSTRACT

Objective: To identify risk factors for Hypertension among adults attending Health Centers. **Design:** Retrospective case control study. **Setting:** Ruiru Sub-County, Kiambu County. **Subjects:** 150 cases with 2paired matches. **Results:** Hypertension is projected to outstrip communicable diseases by 2020; its associated with diverse multisystem damage with 28% mortality in Kenya, this was a retrospective case control study with an aim of determining risk factors of hypertension which will be used to design an intervention strategy, blood pressure, weight and height was measured ,study revealed several risjk factors; use of private car (P=0.011), Income £500-1000 (P=0.043), without formal education (P=0.013) college graduates, (P=0.001),correlation done and respondents earning >£500 consumed alcohol (p value, 0.001), secondary and above level of education consumed alcohol(p=0.0001) and also smoked (P=0.049), therefore early screening & detection, health education, treatment, prevention & control policies should be formulated, and further research should be done.

Keywords: Risk factors, Hypertension, Health Centers

1. INTRODUCTION

Global analysis of hypertension indicates that over 25% of the world's adult population had hypertension in 2000; this proportion is expected to increase to 29% by 2025.Lopez, (2001). According to the WHO (2010), cardiovascular disease accounted for 9.2% of total deaths in the African region with poor lifestyle choices e.g. smoking, overuse of alcohol, poor diet, lack of physical activity indicated as key contributors to the development and progression of preventable non communicable diseases like hypertension.

Hypertension is a "Silent "chronic condition characterized by elevated blood pressure or intermittent or sustained elevation in diastolic ≥90 mmHg or systolic blood pressure of ≥ 140 mmHg, WHO(2003) therefore classified as primary (90–95%) and secondary (5-10%) probably caused by conditions in kidneys, heart or endocrine system, Chobanian *et al.*(2003).

Globally, it constitutes the basis for cardiovascular disease (CVD) epidemic in sub-Saharan Africa with a range of 25%-35% in adults aged 25–64 years and in Kenya, National prevalence of hypertension was recorded at 13% with 28% mortality rate, MoH *et al* (2015).

According to the WHO data published in May 2014, Hypertension Deaths in Kenya reached 1,995 or 0.60% of total deaths with age adjusted death rate of 12.49 per 100,000 of population and this ranks Kenya position 120 in the world.

A survey conducted in Nairobi by AstraZeneca (2015) reveals that only 20% of people are unaware of their hypertensive status and that only about 20 % of them had sought medical treatment to control it with nearly half Kenyan adults having raised blood pressure.

2. BACKGROUND

2.1 GLOBAL PATTERN OF HYPERTENSION

In 2008, approximately 40% of adults aged 25 and above had been diagnosed with hypertension and the number of people with the condition rose from 600 million in 1980 to 1 billion when hypertension is defined as blood pressure above 140/90mmHg.

Hypertension is responsible for at least 45% of deaths contributing to more than 7.1 million deaths per year due to heart disease and 51% of deaths due to stroke, this prevalence dramatically increases in patients older than 60 years and worldwide, *Hypertens*, (1999).

Evidence from various studies have reported that prevalence of hypertension is 22% in Canada, of which 16% is controlled; it is 26.3% in Egypt, of which 8% is controlled; and it is 13.6% in China, of which 3% is controlled.

A progressive rise in BP with increasing age is observed, age-related hypertension appears to be predominantly systolic rather than diastolic where the systolic blood pressure rises into the eighth or ninth decade, whereas the diastolic blood pressure remains constant or declines after age 40 years.

Black individuals have a higher prevalence and incidence of hypertension than white persons with 50% increase in prevalence with most studies in the United Kingdom and the United States reporting a higher prevalence but also a lower awareness of hypertension in the black than in white people.

Mortality from hypertension in African-Caribbean–born people is 3.5 times the national rate; similar data have been published for African American citizens.

The prevalence of hypertension is highest in the African Region at 46% of adults aged 25 and above, while the lowest prevalence at 35% is found in the Americans. Kaplan (2014)

2.2 HYPERTENSION IN KENYA

According to WHO (2011) publication, Hypertension deaths in Kenya reached 2,845(0.90%) of total deaths with age adjusted death rate of 21.81/100,000 of population which ranks Kenya number 121 in the world.

It's estimated that 27.3% of Kenyan population aged between 30-70 years living in urban areas are hypertensive with a national prevalence of 13%, Christensen et al (2008)

A study done in Thika comprehensive care clinic, Njeru ,(2008) shows that prevalence of hypertension among HIV patients was 18% with old age, overweight and having had kidney disease were noted to be the risk factors significantly associated with hypertension among HIV infected patients.

3. METHODS

3.1 STUDY SUBJECTS

The study was conducted in Ruiru Sub-County Health Centers, the Sub-county has a unique population characteristics of 1:1 ratio of adult male to female with 75,184 households and a mix of between urban and Peri-urban with a population coverage of 201,986 (National census 2009) and population **density of** 825 people per km 2.

Annually; 120,980 patients are attended as per the register books with an average of 200-480 patients/day and annual outpatients visits of 567,184 at the consultation and Hypertensive outpatient clinics.

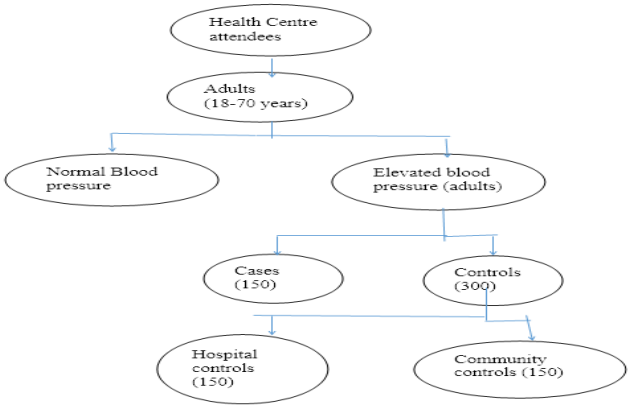
Age distribution of 0-18 years (32.5 %), 18-64 years (63.5 %), 64+ years (4%) and temperatures range from a minimum of 12.8°C to a maximum of 24.6°C with an average of 18.7°C and average rainfall of 989mm per annum.

3.2 STUDY DESIGN

A retrospective case control study was carried out in three Health Centers (Ruiru, Githunguri and Langata) in Ruiru Sub-County through recruitment of 150 cases with 150 health facility controls and 150 community controls matched per age, sex, ethnicity and residential area; therefore total of 450 study subjects.

The above study design was selected because the objective of the study was to assess the risk factors for hypertension and correlate the findings with a control group and the aforementioned health facilities were selected because hypertension and any form of elevated blood pressure cases are only managed at this level or above Adult population of 18-70 years and specifically patients attending out-patient department formed cases and paired matches were recruited from health facility and community as per characteristics.

Sampling was done through Dupott, (1988) and CDC EPI-info software, hence Cases=150 (136+10%) for non-respondents and drop outs =150 cases and 300 Controls.



Study algorithm

All adults (18-70 years) attending the three Health Centres were registered and given OPD numbers; baseline vital signs check done, below is a summary of study sampling procedure algorithm that will be used to recruit cases and control

Patients with notably high blood pressure were notified, and BP check repeated within an interval of 15minutes;50 cases were randomly selected from each health facility who met study criteria paired with two corresponding paired controls selected from the health facilities and community, controls BP measurements was done to exclude hypertensive cases, however controls found to have high blood pressures were issued with a referral note indicating the BP readings to the nearest Health Centre for follow-up

Cases and control were paired according to age +-5years, same sex and ethnic origin, 5 kilometers radius residential area and 5 days interval between interviews and they should have been hypertensive for not more than one year

Ethical clearance and approvals was done at all levels from the department of public health,Kenya National Commission for Science, Technology and Innovation (NACOSTI), Ruiru Sub-County research committee at the County Commissioner, County director of Education, County Health Research office and finally to Health Centres In-charges.

A semi-structured questionnaire was used to collect data, Research Assistants were trained on the study tools, and piloting of the research tool was done and thereafter subsequent collection of the main data after getting informed consent from the study participants

The variables of interest was based on adopted and modified STEP WHO criteria for NCDs research, thereafter data entry and storage was done through a database created with MS Access, double data entry was carried out by two data entry clerks and pre-testing on the same, Upon completion of data entry by the two clerks, their entries were compared to check for errors and corrections done in relation to original questionnaire and data was analyzed using STATA version 13; according to objectives.

4. RESULTS

Table 1: Demographic characteristics of the respondents

Variable	Characteristic	Frequency, n (%)
Age group	<=25 yrs	14(3.1)
	25-44 yrs	131(29.1)
	45yrs+	305(67.8)
Gender	Male	69(15)
	Female	381(85)
Level of education	No formal schooling	37(8.3)
	Less than primary school	97(21.8)
	Primary school completed	169(37.9)
	Secondary school completed	112(25.1)

	College/University completed	29(6.5)
Occupation	Student	7(1.6)
	White collar job	66(14.8)
	Self employed	244(54.6)
	Retired	82(18.3)
	Home maker	48(10.7)
Marital status	Never married	46(10.3)
	Married	298(66.7)
	Separated	44(9.8)
	Divorced	17(3.8)
	Widowed/widower	42(9.4)
income level	Less than 20000	364(82.7)
	20000-50000	65(14.8)
	51000-100000	9(2.1)
	More than 100000	2(0.5)

Table 1 above shows that 68% of respondents are 45 and above years with (85%) of the respondents being females. It is evident the sample is mostly composed of respondents whose highest level of education is Primary education (37.9%).

Over half of them (54%) are self-employed and two thirds (66.7%) of the respondents are married, with the remaining categories (Widowed/widower, Separated, and Never married) being represented fairly equally, save for the one divorced which forms only 3.8% of the sample.

With regards to income of the respondents, majority of them (82.7%) earn less than Ksh.20000 per month followed and those who earn more than Ksh. 50000 per month constitute 2.6% of the respondents.

4.1 RISK FACTORS FOR HYPERTENSION

Table 2: Classification of respondents by attributes of age and blood pressure

Case type	Variable	Obs	Mean	Std. Dev.	Min	Max
Cases	Age	150	51.74667	13.1966	18	80
	Systolic	150	160.78	17.69346	131	211
	Diastolic	150	94.36	15.79154	61	148
Community controls	Age	150	51.2	14.59705	21	89
	Systolic	150	124.52	10.65677	101	140
	Diastolic	148	77.43243	8.100695	55	96
Health facility controls	Age	150	51.23333	14.02893	19	84
	Systolic	150	125.36	10.50936	98	150
	Diastolic	150	77.84667	7.838758	55	115

Table 2 above is a summary of age and blood pressure characteristics of respondents in their respective categories, age in years and blood pressure in millimeters of mercury (mmHg).

Respondent had age range of 18 to 74 years with SBP range of 98 to 211 mmHg and DBP OF 55 to 148mmHg, Cases had mean age of 51.7 years, with mean blood pressure of 161/94 mmHg, Community controls had a mean age of 51.2 years and mean blood pressure of 125/77mmHg and health facility controls had a mean age of 51.2 years and mean blood pressure of 125/78mmHg.

Table 3: Non-modifiable risk factors for hypertension.

Variable	characteristic	Status only, n (%)		Total, n	P value
		Controls	Cases		
Gender	Male	48(68.6)	22(31.4)	70	0.771
	Female	252(66.3)	128(33.7)	380	
Age group	<=25 yrs	9(64.3)	5(35.7)	14	0.588
	25-44 yrs	92(70.2)	39(29.8)	131	
	45yrs+	199(65.2)	106(34.8)	305	
Some family members have been diagnosed with: a) Diabetes	No	132(66.7)	66(33.3)	198	0.42
	Yes	161(66.8)	80(33.2)	241	
	Don't know	3(42.9)	4(57.1)	7	
b) Hypertension	No	106(61.6)	66(38.4)	172	0.197
	Yes	187(69.5)	82(30.5)	269	
	Don't know	3(75)	1(25)	4	
c) Cholesterol	No	266(68)	125(32)	391	0.133
	Yes	13(59.1)	9(40.9)	22	
	Don't know	16(51.6)	15(48.4)	31	
d) Stroke	No	245(65.9)	127(34.1)	372	0.312
	Yes	41(65.1)	22(34.9)	63	
	Don't know	9(90)	1(10)	10	
e) Cancers	No	248(67.2)	121(32.8)	369	0.695
	Yes	39(61.9)	24(38.1)	63	
	Don't know	8(66.7)	4(33.3)	12	
f) Heart attack	No	273(66.4)	138(33.6)	411	1
	Yes	14(66.7)	7(33.3)	21	
	Don't know	8(66.7)	4(33.3)	12	
g) Kidney disease	No	276(67.6)	132(32.4)	408	0.197
	Yes	7(46.7)	8(53.3)	15	
	Don't know	11(61.1)	7(38.9)	18	

Table 3 above presents the comparison between non modifiable risk factors (age, gender and genes) and hypertension, gender comparison shows that 31.4% (n=70) of males and 33.7% (n=380) of females were hypertensive, across age-groups, the study showed that 35.7% (n=14) of respondents between 18 and 25 years, 29.8% (n=131) of those between 25 and 44 years, and 34.8% (n=305) of those above 45 years were hypertensive. The risk of hypertension was not significantly different across gender (P=0.713), and across different age-groups (0.588). Also, there is no significant association between hypertension and having family members who have been diagnosed with diabetes (P=0.42), hypertension (P=0.197), high cholesterol (P=0.133), stroke (P=0.312), cancers (P=0.695), heart attack (P=1.0), or kidney disease (P=0.197).

Table 4: Individual risk factors: nutritional activities

Variable	Characteristic	Status, n (%)		Total, n	P value
		controls	Cases		
Ever been a smoker	No	283(66)	146(34)	429	0.135
	Yes	16(84.2)	3(15.8)	19	
Currently smoke	No	9(90)	1(10)	10	0.667

Variable	Characteristic	Status, n (%)		Total, n	P value
		controls	Cases		
	Yes	5(100)	0(0)	5	
Ever taken alcohol	No	232(65.4)	123(34.6)	355	0.247
	Yes	66(71.7)	26(28.3)	92	
Currently taking alcohol	No	53(67.1)	26(32.9)	79	0.769
	Yes	12(75)	4(25)	16	
Take fruits in normal food intake	No	7(70)	3(30)	10	0.555
	Yes	291(66.4)	147(33.6)	438	
Take vegetables in normal food intake	No	1(50)	1(50)	2	0.801
	Yes	295(66.4)	149(33.6)	444	
	Don't know	2(100)	0(0)	2	
How often do you add salt at the table before eating food	Always	7(63.6)	4(36.4)	11	0.765
	Often	19(61.3)	12(38.7)	31	
	Sometimes	122(68.5)	56(31.5)	178	
	Rarely	109(67.7)	52(32.3)	161	
	Never	41(61.2)	26(38.8)	67	
How often eat processed food high in salt	Always	3(100)	0(0)	3	0.68
	Often	7(63.6)	4(36.4)	11	
	Sometimes	82(68.9)	37(31.1)	119	
	Rarely	144(67.6)	69(32.4)	213	
	Never	57(60.6)	37(39.4)	94	
	Don't know	5(62.5)	3(37.5)	8	
How much salt they think consume	Far too much	10(76.9)	3(23.1)	13	0.912
	Too much	53(67.1)	26(32.9)	79	
	Right amount	212(66.3)	108(33.8)	320	
	Too little	17(60.7)	11(39.3)	28	
	Far too little	5(71.4)	2(28.6)	7	
Type of oil/fat often used for meal preparation in household	Vegetable oil	264(65.2)	141(34.8)	405	0.313
	Butter	31(77.5)	9(22.5)	40	
	Margarine	1(100)	0(0)	1	
	None used	1(100)	0(0)	1	

Table 4 above presents how nutritional and behavioral factors influence the risk of hypertension. 15.8% (n=19) of those who have ever smoked had hypertension compared to those who had never smoked (34%, n=429) and 34.6% (n=355) have hypertension compared to 28.3% (n=92) of those who have ever taken alcohol. 33.6% (n=438) of those who take fruits and 33.6% (n=444) of those who take vegetables in their normal food intake are hypertensive.

38.8% (n=67) of those who never add salt at the table before eating and 38.7% (n=31) had hypertension whereas those who eat processed food high in salt, 39.4% (n=94) of those who reported having never eaten processed food high in salt and 31.1% (n=119) of those who reported eating processed food high in salt sometimes were hypertensive.

39.3% (n=28) of those who consumed too little salt and 23.1% (n=13) of those who consumed far too much salt and respondents who used cooking fat/ oil in food preparation, 34.8% (n=405) those who used vegetable

oil compared to 22.5% (n=40) amongst those who used butter had hypertension, Overall, nutritional factors did not show significant association with hypertension.

Table 5: Individual risk factors: physical activities

Variable	Characteristic	Status, n (%)		Total, n	P value
		controls	cases		
Work involve vigorous-intensity activity for at least 10 minutes that increases heart rate	No	113(65.7)	59(34.3)	172	0.792
	Yes	180(66.9)	89(33.1)	269	
How usually get to workplace: a) Walking	No	22(75.9)	7(24.1)	29	0.27
	Yes	276(65.9)	143(34.1)	419	
b)Cycling	No	290(67.1)	142(32.9)	432	0.317
	Yes	7(53.8)	6(46.2)	13	
c) Public transport	No	28(82.4)	6(17.6)	34	0.043
	Yes	269(65.3)	143(34.7)	412	
d) Private car	No	199(72.6)	75(27.4)	274	0.001
	Yes	98(57.3)	73(42.7)	171	
On average, how long do you walk per day?	<1 km	104(73.2)	38(26.8)	142	0.046
	1-5km	175(62.3)	106(37.7)	281	
	6-10km	16(76.2)	5(23.8)	21	
	11-20km	2(100)	0(0)	2	
	>20 km	0(0)	1(100)	1	
Do any moderate-intensity for at least 10 minutes?	No	291(66.9)	144(33.1)	435	0.489
	Yes	5(55.6)	4(44.4)	9	

Table 5 depicts the association of physical activities one engages in and the risk of being hypertensive. 33.1% (n=269) of those who engage in vigorous activities for at least 10 minutes and 44.4% (n=9) of those who do moderate intensity sport for 10 minutes had high blood pressure.

As regards means of getting to workplace, 24.1% (n=29) of those walk, 46.2% (n=13) of those who cycle, 34.7% (n=412) of those who use public transport, and 42.7% (n=171) of those who use private car were hypertensive. Under the category of average distance walked per day, 26.8% (n=142) of those who walk less than 1km, 37.7% (n=281) of those who walk for between 1km - 5km, and 23.8% (n=21) of those who walk for 11km to 20 km a day had hypertension.

Engaging in vigorous activities for at least 10 minutes (P=0.792), walking to workplace (P=0.27), cycling to workplace (P=0.317), and doing moderate intensity sport for at least 10 minutes (P=0.489) all showed no significant association with having hypertension.

There is a statistically significant evidence that using private car to workplace (P=0.001), using public transport to workplace (P=0.043), and distance walked per day (0.046) are associated with risk of hypertension, nature of this association is illustrated in logistic regression model.

Table 6: Socio-economic and intermediate factors

Variable	Characteristic status	Status n (%)		Total, n	P value
		Controls	cases		
Education	No formal education	19(51.4)	18(48.6)	37	0.001
	Less than primary school	63(64.9)	34(35.1)	97	
	Primary school completed	102(60.4)	67(39.6)	169	
	Secondary school completed	87(77.7)	25(22.3)	112	
	College/University completed	25(86.2)	4(13.8)	29	
	Post-graduate completed	0(0)	2(100)	2	
Occupation	Student	5(71.4)	2(28.6)	7	0.103
	White collar job	48(72.7)	18(27.3)	66	
	Self employed	167(68.4)	77(31.6)	244	
	Retired	44(53.7)	38(46.3)	82	
	Home maker	33(68.8)	15(31.3)	48	
Marital status	Never married	26(56.5)	20(43.5)	46	0.391
	Married	203(68.1)	95(31.9)	298	
	Separated	31(70.5)	13(29.5)	44	
	Divorced	9(52.9)	8(47.1)	17	
	Widowed/widower	28(66.7)	14(33.3)	42	
Income	Less than 20000	240(65.9)	124(34.1)	364	0.533
	20000-50000	48(73.8)	17(26.2)	65	
	51000-100000	6(66.7)	3(33.3)	9	
	More than 100000	1(50)	1(50)	2	
BMI	Not obese	284(67)	140(33)	424	0.568
	Obese	16(61.5)	10(38.5)	26	

Table 6 is an illustration of the association of hypertension and socio-economic factors. About half (48.6%, n=37) of those with no formal education and 13.8% (n=29) of those with college/university education therefore education (P=0.001) showed a strong statistical association with hypertension.

Hypertension was also noted in 46.3% (n=82) of the retired respondents, 28.6% (n=7) of students, 47.1% (n=17) of divorced and 29.5% (n=44) of those who were separated

Income levels also contribute to hypertension, 34.1% (n=364) of those whose income was less than £200and 26.2% (n=65) of those earning between £200 and £500 had hypertension 38.5% (n=26) of those who were obese and 33% (n=424) of those who were not obese were hypertensive.

To test for the significance of risk factors, conditional logistic regression model was used where the response variable was blood pressure (1=case, 0=control) and the predictor variables were: gender, age, BMI (1=obese, 0=normal weight) smoking history, physical activities, drinking history, means of transport to workplace, education, marital status, and monthly income (Kshs).

Table 7: Logistic Regression analysis of risk factors for hypertension

Conditional (fixed-effects) logistic regression		Number of observations =		403		
		LR chi2(22) =		59.12		
		Prob> chi2 =		0.0001		
Risk factor	Odds Ratio	Std. Error	Z	p>|z|	95 % Conf. interval	
Gender	1.700949	1.55995	0.58	0.562	0.2818705	10.26438
Ever been a smoker	0.2107978	0.169942	-1.93	0.053	0.0434152	1.023507
Ever taken alcohol	0.6240768	0.226571	-1.3	0.194	0.3063445	1.271353
Physical activity						
Vigorous activity	1.151131	0.316056	0.51	0.608	0.6720749	1.971659
Means of getting to workplace						
Walking	1.0487	0.830949	0.06	0.952	0.2219181	4.955756
Cycling	2.027815	1.51478	0.95	0.344	0.4690073	8.767521
Public transport	5.106456	4.211796	1.98	0.058	0.914029	25.71515
Private car	1.881763	0.466405	2.55	0.011	1.157684	3.058721
Age	1.031099	0.028646	1.1	0.27	0.9764559	1.0888
Education						
Less than primary school	0.6038533	0.317118	-0.96	0.337	0.2157332	1.69023
Primary school completed	0.5941653	0.335219	-0.92	0.356	0.1966402	1.795322
Secondary school completed	0.2220788	0.134455	-2.49	0.013	0.067789	0.727537
College/University completed	0.015947	0.019049	-3.46	0.001	0.0015342	0.165754
Post graduate completed	2.48E+11	6.12E+14	0.01	0.992	0	.
Marital status						
Married	0.3699368	0.18807	-1.96	0.05	0.1365809	1.001994
Separated	0.3491391	0.211315	-1.74	0.082	0.1066138	1.143361
Divorced	0.8107748	0.609985	-0.28	0.78	0.1855667	3.542423
Widowed/widower	0.3745652	0.235916	-1.56	0.119	0.1089953	1.287202
Income (Kshs.)						
20000-50000	0.6651248	0.249823	-1.09	0.278	0.3185582	1.388729
51000-100000	8.30781	8.676598	2.03	0.043	1.072753	64.33887
More than 100000	2.18E-06	0.004573	-0.01	0.995	0	.
BMI (1/0)	2.014469	1.085711	1.3	0.194	0.7004872	5.793232

Table 7 shows logistic regression analysis output for potential risk factors of hypertension. The likelihood ratio test statistic for this model has a P-value<0.0001indicating that the model is statistically significant in explaining the risk factors for hypertension.

Logistic regression output revealed that gender was not a significant risk factor for hypertension (P=0.562). Age of patient also showed no significant evidence of being a risk factor for high blood pressure (P=0.27).

Having a past history of smoking (P=0.053) or taking alcohol (P=0.194) was not a significant risk factor for high blood pressure. Also, the study results reveal that BMI was not a significant risk factor for hypertension.

Regarding means of transport to workplace, using private car (0.011) were statistically significant risk factors for high blood pressure, while walking (P=0.952), cycling (P=0.344), and public transport (0.058) showed no statistical significance as a risk factor.

Adjusting for gender, age, BMI, smoking history, physical activities, drinking history, education, income, and marital status, those who use private car to workplace were 88.2% more likely to get hypertension than those who do not.

Having controlled for gender, age, BMI, smoking history, physical activities, drinking history, means of transport to workplace, income, and marital status; Those who have completed secondary education are 77.8% less likely to get hypertension compared with those with no formal schooling (P=0.013) and those who have completed college/university education are 98.4% less likely to have hypertension compared with those without formal schooling (P=0.001)

No level of marital status (each compared with "never married") were not statistically significant risk factors for hypertension.

Considering monthly income, those who earn an average monthly income of £500 and £1000 were 8.3 times more likely to be hypertensive than those who earn less than £200 (P=0.043), having adjusted for gender, age, BMI, smoking history, physical activities, drinking history, means of transport to workplace, education, and marital status.

Table 8: Correlation of higher income to other risk factors

Logistic regression		Number of obs =	448			
		LR chi2(1) =	5.26			
		Prob > chi2 =	0.0218			
Log likelihood = -41.444862		Pseudo R2 =	0.0597			
Income	Odds Ratio	Std. Err.	Z	P>z	[95% Conf. Interval]	
Eat vegetables	0.0183476	0.026759	-2.74	0.006	0.0010523	0.3198963
Ever taken alcohol	14.53529	11.78574	3.3	0.001	2.966464	71.22107
_cons	1.000049	1.414214	0	1	0.0625605	15.98611

Table nine makes comparison of those with higher income and their feeding habits. The results show that clients earning over £500 and eat vegetables were 99% less likely to use vegetables compared to those earning a lesser amount (P=0.006). Clients with a reported income of more than £500 were 14.5 times more likely to have consumed alcohol (p value, 0.001)

Table 9: Correlation of those with educated to form four and above to other risk factors

Logistic regression		Number of obs =	447			
		LR chi2(1) =	19.42			
		Prob > chi2 =	0.0001			
Log likelihood = -268.94008		Pseudo R2 =	0.0349			
education	Odds Ratio	Std. Err.	Z	P>z	[95% Conf. Interval]	
Ever taken alcohol	2.9	0.698223	4.42	0.00001	1.809077	4.648779
Ever been a smoker	2.527566	1.191179	1.97	0.049	1.00358	6.365796
_cons	0.3601533	0.0433229	-8.49	0	0.2845091	0.4559093

The results reveal that clients who reported to have attained secondary level of education and higher were 2.9 times more likely to have consumed alcohol(p=0.0001) and 2.5 times more likely to have been a smoker(p-0.049).

Table 10: Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev	[95% Conf. interval]	
Controls	300	4.58	0.106379	1.84253	4.370655	4.789345
Cases	150	4.613333	0.14433	1.767669	4.328136	4.89853
Combined	450	4.591111	0.085608	1.816017	4.422869	4.759353
Diff		-0.033333	0.181797		-0.390615	0.3239483
diff	= mean(Controls)-mean(Cases)				t =	-0.1834
H_0: diff	**= 0**			degrees of freedom =		448
H_1: diff ≠ 0						
P-value = 0.8546						

A two Tailed test gives us a p value of 0.8546 (with degrees of freedom = 448). Since the P-/value is greater than 0.05, we fail to reject the null hypothesis and we conclude that the risk of hypertension don't vary among cases and controls attending Health Centres in Ruiru Sub-county of Kiambu County.

5. DISCUSSION

Hypertension is associated with elevated blood pressure of diastolic ≥90 mmHg or systolic blood pressure of ≥ 140 mmHg above the normal, WHO (2003).

In this study, it shows that 68 % of respondents were above 45 years; with a wide gender parity of 31.4% (n=70) males and 33.7% (n=380) females were hypertensive, however the risk of hypertension was not significantly different across gender (P=0.713), and across different age-groups (0.588) and in a similar study in Kenya, it's estimated that 27.3% of Kenyan population aged between 30-70 years living in urban areas are hypertensive Christensen et al (2008).

In this study, respondents had a systolic blood pressure range of 98mmHg to 211mmHg and diastolic blood pressure range of 55mmHg to 148mmHg with mean age of 51.7 years and mean blood pressure of 161/94 mmHg. In the Community controls, the mean age was 51.2 years with mean blood pressure of 125/77mmHg and in the health facility controls mean age was 51.2 years and mean blood pressure of 125/78mmHg.

There is no significant association between hypertension and having family members who have been diagnosed with diabetes (P=0.42), hypertension (P=0.197), high cholesterol (P=0.133), stroke (P=0.312), cancers (P=0.695), heart attack (P=1.0), or kidney disease (P=0.197).

Most studies have focused on prevalence, according to Kearney et al, 2004, statistics varies from country to country with the lowest having been reported in rural India (3.4% in men, 6.8% in women) and the highest in Poland (68.9% in men and 72.5% in women), however few studies which focused on risk factors isolated diet, smoking and alcohol as contributors of hypertension, MoH *et al* (2015).

It's evident that education levels (P=0.001) plays a key role in hypertension, 48.6%, n=37 of respondents with no formal education have been shown to be at high risk of getting hypertension as opposed to people with primary and other levels of education and 13.8% (n=29) of those with college/university education.

Most of the studies have associated occupation especially white collar jobs and hypertension due to the level of inactivity associated with the occupations, in Kiambu County, approximately 68% of respondents are self-employed and in white collar jobs.

High income index attributes to a high level of luxury to people, in this study, respondents who earns > 20,000 (26.2%) are at high risk of developing hypertension due to changed and inactive lifestyles like owning and driving private cars.

A survey conducted in Nairobi by AstraZeneca (2015) revealed that 20% of people are unaware of their hypertensive status with only 20 % seeking medical treatment; in this study, 81% of hypertensive patients were informed of their hypertensive state.

WHO (2010) believes that more than 60% of the global population is not sufficiently active, in this study 42.7% (n=171) of those who use private cars to workplace (P=0.001) are hypertensive, also using public transport to workplace (P=0.043), and distance walked per day (0.046) are associated with the risk of hypertension.

There's a significant association between hypertension and socio-economic factors. About half (48.6%, n=37) of those with no formal education and 13.8% (n=29) of those with college/university education have high blood pressure, therefore education (P=0.001) showed a strong statistical association with hypertension.

6. CONCLUSION

Use of private car (P=0.011) to work place was statistically significant risk factors for hypertension and if the above are adjusted for gender, age, BMI, smoking history, physical activities, drinking history, education, income, and marital status, those who use private car to workplace were 88.2% more likely to get hypertension than those who do not.

Income index is a risk factor where those who earn an average monthly income of between £.500 and £1000 were 8.3 times more likely to be hypertensive than those who earn less than £200 (P=0.043), having adjusted for gender, age, BMI, smoking, physical activities, drinking history, means of transport to workplace, education, and marital status.

Level of education plays a key role in development of hypertension, those without formal education (P=0.013) in relation to those who have completed secondary level of education are 77.8% more likely to develop hypertension while in comparison to college /university graduates, they are 98.4% more likely to develop hypertension (P=0.001).

7. RECOMMENDATIONS

Health education

Health education in regard to physical exercise especially to encourage less use of private car and motivate walking and cycling aimed at modifiable risk factors associated with hypertension.

Routine screening of hypertension

There should be routine risk factor screening and early detection of hypertension, this will enable timely initiation of treatment, ensure consistent follow-up and effective control of complications.

Further research

More studies should be done to find out risk factors for hypertension in other counties to help correlate the findings and develop a national wide policy and program.

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