

# High Blood Pressure, an Epidemic Inadequately Diagnosed and Poorly Controlled: A Community-based Survey in Kinondoni District

Pedro Pallangyo<sup>1</sup>, Paulina Nicholaus<sup>2</sup>, Peter Kisenge<sup>3</sup>, Mohamed Aloyce<sup>4</sup> and Maria Samlongo<sup>5</sup>

<sup>1</sup> Jakaya Kikwete Cardiac Institute

Received: 7 December 2015 Accepted: 3 January 2016 Published: 15 January 2016

---

## Abstract

**Background:** Population ageing, rapid urbanization and unhealthy lifestyles continue to transform global health. The prevalence of hypertension which currently affects over a billion people globally is rapidly increasing while the rates of its awareness, treatment and control remain low especially in developing nations. We aimed to determine the prevalence, awareness, control and associated factors for hypertension among residents of the largest district in Dar es Salaam. **Methods:** We conducted a cross-sectional, community-based survey in January 2016, 1831 persons were recruited. Physical activity was assessed using the physical activity vital sign scale (PAVS) and alcohol dependence was assessed by the CAGE questionnaire. Trained personnel measured and recorded blood pressure and anthropometric measures. Hypertension was defined according to the 7th Report of the Joint National Committee (JNC 7) or use of blood pressure lowering medications. Multivariate logistic regression analyses were performed to assess for factors associated with high blood pressure.

---

**Index terms**— high blood pressure, hypertension, excess body weight, physical inactivity, hypertension control, hypertension awareness, obesity.

## 1 I. Background

While infectious diseases continue to plague sub-Saharan Africa, the rapid increase in noncommunicable diseases (NCDs) is exacerbating an already distressing situation. Faced by impoverished health care systems and poor infrastructure, a rising trend of NCDs in Africa is making the battle against the ever present infectious diseases even more difficult. Cardiovascular disease is currently the number one killer in developing countries, claiming as many lives as HIV, TB and malaria combined. [1][2][3] With a 7% attribution to the global burden of disease, hypertension is indeed the single most substantial cause of disability and mortality worldwide. [4][5][6] Accountable for about 50% of deaths due to heart disease, kidney failure and stroke in 2013, hypertension remains a significant threat to global health and development. [7][8][9] Despite having a high asymptomatic potential, easy diagnostic modality, and a clear management strategy, the rates of hypertension awareness, treatment and control is very low especially in developing nations. 10 Tanzania like other third world countries is witnessing an upsurge of NCDs with hypertension among the leading etiologies. This community-based survey conducted in Kinondoni district, Dar es Salaam, aimed to determine the prevalence, awareness, control and associated factors for high blood pressure in the targeted urban population. The screening advert through the media were recruited and screened. Socio-demographic parameters were gathered through interviews utilizing a structured questionnaire. We grouped age into 4 categories; children: <18 years, young adults: 18-39 years, middle age 40-54 years and elderly: ≥55 years. 11 Physical activity was assessed using the Physical Activity Vital Sign (PAVS) scale 12

; with scores of 0 minutes/week denoting inactivity, 1 -<150 minutes/week signifying underactivity and ?150 minutes/week indicating physical activeness. Weight and Height were measured using the standard measuring scales and BMI for those aged 20 years and above was calculated by a ratio of weight (in kilograms) to height (in meters) squared. For those under 20 years, a CDC BMI calculator for children and teens 13 was utilized. We defined underweight as BMI<18.5 kg/m<sup>2</sup>, normal: BMI 18.5-24.9 kg/m<sup>2</sup>, overweight: BMI 25-29.9 kg/m<sup>2</sup> and obese: BMI ?30 kg/m<sup>2</sup>. 14 Individuals who smoked at least 1 cigarette in the past 6 months were regarded as current smokers, those who last smoked over 6 months or self-reported quitting smoking were considered past smokers and those who never smoked but currently live with a smoker were regarded as passive smokers. Alcohol drinking was defined as at least a once consumption every week. Alcohol dependence was assessed by the CAGE questionnaire ??5, where a total score of 2 or greater was used to define alcohol dependence. Blood pressure (BP) was measured by digital BP machines where a systolic blood pressure (SBP) <120 mmHg and a diastolic blood pressure (DBP) <80 mmHg was used to define normotension/optimal BP. Pre-hypertension was defined by SBP of 120-139 mmHg or DBP of 80-89 mmHg, while SBP ?140 mmHg or DBP ?90 mmHg indicated hypertension. 16 A hypertensive subset with SBP ?180 mmHg or DBP ?110 mmHg was regarded as hypertensive crisis. 17 Awareness of hypertension was defined as a self-report of any prior diagnosis of hypertension in a health facility and/or use of antihypertensives. Controlled hypertension/BP was defined as awareness of hypertension associated with a SBP <140mmHg and DBP <90mmHg. All interviewers and medical personnel involved in the screening were familiar with the study aims and methods.

## 2 II. Methods

### 3 b) Statistical analysis

All statistical analyses were performed by STATA v11.0 software. Summaries of continuous variables are presented as means ( $\pm$  SD) and categorical variables are presented as frequencies (percentages). Categorical and continuous variables were compared using the Pearson Chi square tests and Student's T-test respectively. Bivariate analyses were performed to assess for factors associated with high blood pressure. Significant variables ( $p<0.05$ ) were then entered in a multivariate logistic regression model to control for confounders. Odd ratios with 95% confidence intervals and p-values are reported. Statistical significance was set at  $p<0.05$  and all tests were two tailed. The mean BMI of participants was  $27.8 \pm 7.1$ . Overall, 97 (5.4%) were underweight, 544 (30.3%) had normal BMI, and 1155 (64.3%) were overweight or obese; Table 2. Age ?40 and female sex displayed a higher likelihood for being overweight and/or obese, (OR 4.0, 95% CI 3.2-5.0,  $p<0.001$  and OR 2.3, 95% CI 1.8-2.8,  $p<0.001$  respectively).

## 4 III. Results

### 5 a) Study Population

### 6 c) Blood Pressure Control and Hypertension Awareness

Of the 1796 persons who responded to the questions regarding history of chronic disease, 688 (38.3%) had a history of at least one chronic illness. Cardiovascular related diseases were reported by 612 (88.9%) of those with a positive history of chronic illness, 559 (91.3%) of whom had hypertension awareness.

The prevalence of hypertension in this study was 63.3% (1137/1796) and 49.2% (559/1137) of these were aware of their hypertensive status. The mean SBP and DBP of persons aware of their hypertensive status was  $166.0 \pm 29.8$

## 7 IV. Discussion

Nearly two-thirds of individuals in this recent urban community-based screening had high blood pressure. In contrast to previous studies, these findings are substantially high. In a systematic review of hypertension studies in Africa by Addo 18 et al, there was a wide variation in hypertension prevalence ranging from 9.3% 19 in Ethiopia to 48.1% 20 in Mozambique. Our findings nevertheless are in unison with another population-based Tanzanian study which found a prevalence of 70% 21, this study however involved persons aged above 70 years.

Correlates of high blood pressure included age ?40, male sex and BMI ?25 which were associated with up-to 5-fold increased chance of being hypertensive. These factors and others including physical inactivity are well established risk factors that have been consistently demonstrated in several studies. 22,23 The rates of hypertension were nearly similar to the rates of excess body weight in this study. This potentially implied that overweight/obesity was the strongest modifiable factor associated with hypertension. Physical inactivity was not a significant factor for hypertension in this present study, it should be noted however that the population we screened was predominantly inactive. Moreover, the observation that females were more likely to be inactive than males was reciprocated in the BMI measurement in the sense that females displayed higher likelihood for excess body weight compared to males. The overall rates of obesity in this present study were almost twice the rates found by Shayo 24 et al in the same setting in 2010. In unison to Shayo et al study, we also found higher rates of obesity among females. We were intrigued by the observation that although females were significantly obese than males, hypertension rates were higher in males compared to females. Androgen mediated abnormalities

in pressure natriuresis is currently the plausible theory explaining the differences in hypertension rates between sexes. 25 One in every two persons with high blood pressure in this study was unaware of their hypertensive status. Reported rates of hypertension awareness in Africa ranges from 12.3% among Nairobi slum dwellers to 81% in urban Tunisia. 26,27 Remarkably, one out of every five persons who were unaware of their hypertensive status had BP elevated to crisis levels. It is well known that such high BP is critical and warrant immediate evaluation as can result to multiple organ failure including blindness, kidney failure, heart failure and stroke. 17 One third of newly diagnosed hypertensives had echocardiographic changes consistent with hypertension (i.e. left ventricular hypertrophy). This finding reflects the high asymptomatic potential of hypertension and suggests that regular BP measurement is important. Hypertension control rates are uniformly low amongst studies and according to a systematic review by Kayima et al, Tanzanian populations whether urban or rural had the lowest control rates of <7%. 3 In contrast to these findings, our control rates were over twice as much and even so should be regarded as low.

This study has a number of strengths including; (i) we recruited over 1800 persons, a good number suitable for subgroup analyses, (ii) the use of standard tools which allow for comparability among studies, and (iii) we performed ECHO on a subset of individuals aware of their hypertension status and those newly diagnosed to assess for cardiovascular changes associated with hypertension. Our study had some few limitations including; (i) the recruitment process and measurements (weight, height and BP) could have potentially introduced selection bias and non-differential bias respectively, and (ii) our hypertension rates could be somewhat overestimated as we relied on a single occasion BP measurement to make the diagnosis. Future studies in this area should thoroughly assess dietary habits and salt intake and its association with excess body weight and hypertension.

## 8 V. Conclusions

In conclusion, our findings suggest that excess body weight is a single modifiable risk factor strongly associated with high blood pressure. Moreover, majority of persons with hypertension are undetected and thus unaware of their hypertension status. In view of this,



Figure 1:

<sup>1</sup>© 2016 Global Journals Inc. (US) High Blood Pressure, an Epidemic Inadequately Diagnosed and Poorly Controlled: A Community-based Survey in Kinondoni District, Dar Es Salaam Tanzania

1

displays the socio-demographic characteristics of 1831 recruited persons. The mean age was  $43.6 \pm 16.8$  years, and 63.5% were women. Primary education was the highest level attained in 58% of participants, married subgroup comprised the largest proportion (58%) with regard to marital status and 4.4% had health insurance.

b) Risk Factors for High Blood Pressure

Smoking status, alcohol intake and physical activity was assessed among persons aged 18 years and above ( $n = 1708$ ). Regarding smoking history; 1.1% (19/1708) were current smokers, 5.2% (89/1708) were past smokers and 4.2% (72/1708) were passive smokers. Current use of alcohol was reported by 11% (188/1708) of participants, 48.4% of whom were alcohol dependent. The mean PAVS score was 59.8 minutes/week. About 67% (1144/1708) of participants were inactive, 18.3% (313/1708) were underactive and 14.7% (251/1708) were active. While age and BMI differences displayed similar rates of physical inactivity, female sex was associated with a 70% increased chance of being inactive compared to males, (OR 1.7, 95% CI 1.3-2.3,  $p < 0.001$ ).

Figure 2: Table 1

hypertension and 46.7% (578/1237) were newly diagnosed with hypertension. 20.4% (118/578) of the new hypertensives had their BPs within the hypertensive crisis range. During multivariate logistic analysis; age  $\geq 40$ , male sex and BMI  $\geq 25$  were strongly associated with a newly diagnosed hypertensive status, (OR 5.7, 95% CI 4.2-7.8,  $p < 0.001$ ; OR 1.6, 95% CI 1.1-2.2,  $p < 0.01$ ; and OR 2.9, 95% CI 2.1-4.1,  $p < 0.001$  respectively).

#### d) Echocardiography Findings

We performed echocardiograms (ECHO) on 205 newly-diagnosed and 340 persons aware of their hypertensive status. Overall, 47% (256/545) of ECHOs revealed features of hypertensive heart disease (HHD), 9.4% (51/545) dilated cardiomyopathy (DCM), 2.0% (11/545) valvular heart disease (VHD) and 41.6% (227/545) had normal findings. Of the ECHOs performed on newly diagnosed hypertensives, 34.1% (70/205) revealed HHD, 5.4% (11/205) DCM, 1.5% (3/205) VHD and 59.0% (121/205) had normal findings.

D  
D  
D  
D  
)  
I  
(

Figure 3:

1

	Year 2016
	Volume XVI Issue III Version I
	D D D D ) I
	(
Characteristic	n (%)
Age: mean (SD), years	43.6 (16.8)
Age groups	
<18	123 (06.7%)
18-39	601 (32.8%)
40-54	615 (33.6%)
?55	492 (26.9%)
Sex	
Female	1163 (63.5%)
Male	668 (36.5%)
Education level	
None	130 (07.1%)
Primary	1062 (58.0%)
Secondary	515 (28.1%)
Post-Secondary	124 (06.8%)
Marital status	
Single	467 (25.5%)
Married	1061 (58.0%)
Divorced	106 (05.8%)
Widowed	197 (10.7%)
Income: mean (SD), USD	128 (165)
Income category	
<\$1/day	177 (14.7%)
\$1-2/day	210 (17.5%)
>\$2-5/day	601 (50.0%)
>\$5/day	213 (17.8%)

Figure 4: Table 1 :

2

Characteristic	BMI category			
	underweight	normal	overweight	Obese
Overall	97 (05.4%)	544 (30.3%)	499 (27.8%)	656 (36.5%)
Age group				
<18	44 (50.0%)*	39 (44.3%)	1 (01.1%)*	4 (04.6%)*
18-39 ?	34 (05.7%)	277 (46.0%)	152 (25.3%)	138 (23.0%)
40-54	10 (01.6%)*	120 (19.5%)*	191 (31.1%)*	294 (48.8%)*
?55	9 (01.8%)*	108 (22.0%)*	155 (31.5%)*	220 (44.7%)*
Sex				
Female	52 (04.5%)	279 (24.4%)	285 (24.9%)	528 (46.2%)*
Male	45 (06.9%)*	265 (40.6%)*	214 (32.9%)*	128 (19.6%)

Key: ?: reference group ; \*: p<0.05 ; \*\*: p<0.01 ; \*\*\*: p<0.001

Figure 5: Table 2 :

3

Characteristic	Blood Pressure Range		
	normotensive	pre-hypertensive	hypertensive
Overall	237 (19.2%)	422 (34.1%)	578 (46.7%)
Age group			
<18	12 (60.0%)	7 (35.0%)	1 (05.0%)*
18-39 ?	149 (29.1%)	209 (40.8%)	154 (30.1%)
40-54	53 (12.5%)	145 (34.1%)	227 (53.4%)*
?55	23 (08.2%)	61 (21.8%)	196 (70.0%)*
Sex			
Female	156 (20.1%)	280 (36.0%)	342 (43.9%)
Male	81 (17.6%)	142 (30.9%)	236 (51.5%)*
BMI Category			
Underweight	20 (45.5%)	16 (36.4%)	
Normal ?	126 (30.1%)	143 (34.2%)	
Overweight	48 (13.4%)	117 (32.6%)	
Obese	43 (10.3%)	146 (35.1%)	

Figure 6: Table 3 :





communities living especially in resource-limited settings need to be educated and continuously reminded on the importance of regular health check-up, exercising consistently and healthy eating as crucial strategies in implementing primary prevention. Furthermore, counseling on the importance of adherence to medication and life-style modification should be incorporated in all consultations.

## .1 Declarations Ethical Consideration

The study was approved by the Unit of Research of the Jakaya Kikwete Cardiac Institute (JKCI) and the permission to conduct the study was granted by the Office of the Kinondoni District Commissioner. All the participants or their legal proxy's verbally consented to participate in the screening. Participants who were in a clinically unstable state were rushed to the Mwananyamala district hospital for appropriate attention and intervention. Prescription amendments and new drug prescriptions were issued accordingly. Persons who required a further assessment and clinic enrolment were scheduled as appropriate to attend the or Mwananyamala district

## .2 Availability of Data and Materials

The final version of data set supporting the findings of this paper may be found in the Jakaya Kikwete Cardiac Institute website ([www.jkci.or.tz](http://www.jkci.or.tz)). The corresponding author will be more than willing to email the data set to the editorial committee whenever it's needed.

Competing interest: The authors declare that they have no conflict of interest to declare.

Funding: This work was funded by the Office of the Kinondoni District Commissioner. The contents does not necessarily represent the official views of the funder and the authors take full responsibility for this manuscript.

Authors Contributions: MJ, PK, and PP made contributions in conception and design of the study. PP and PN contributed in analysis and manuscript development. PK, MA, MS, TS and MJ revised the manuscript. All authors have read, contributed to and approved the final version for publication

## .3 VI. Acknowledgement

We thank the nursing, medical, technical and supporting staff of the Jakaya Kikwete Cardiac Institute and Mwananyamala district hospital for their tireless efforts that made this study a success. We extend our gratitude to all the study participants for their willingness, tolerance and cooperation offered during the study duration. We are grateful to the office of Kinondoni District Commissioner for funding this study.

[ American Heart Association. Hypertensive Crisis] , [http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/AboutHighBloodPressure/Hypertensive-Crisis\\_UCM\\_301782\\_Article.jsp#.VuD9yJK06Fw](http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/AboutHighBloodPressure/Hypertensive-Crisis_UCM_301782_Article.jsp#.VuD9yJK06Fw) American Heart Association. *Hypertensive Crisis*

[Lim et al. ()] 'A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions'. S S Lim , T Vos , A D Flaxman . *The Lancet* 1990-2010. 2010. 2012. 380 (9859) p. . (: a systematic analysis for the Global Burden of Disease Study)

[Hammami et al. ()] 'Awareness, treatment and control of hypertension among the elderly living in their home in Tunisia'. S Hammami , S Mehri , S Hajem , N Koubaa , M A Frih , S Kammoun . *BMC Cardiovasc Disord* 2011. 11 (65) p. .

[Gaziano ()] 'Cardiovascular disease in the developing world and its cost-effective management'. T A Gaziano . *Circulation* 2005. 112 (23) p. .

[Nejjari et al. ()] 'Epidemiological trial of hypertension in North Africa (ETHNA): an international multicentre study in Algeria, Morocco and Tunisia'. C Nejjari , M Arharbi , M T Chentir , R Boujnah , O Kemmaou , H Megdiche . *J Hypertens* 2013. 31 (1) p. .

[Reckelhoff ()] 'Gender differences in the regulation of blood pressure'. J F Reckelhoff . *Hypertension* 2001. 37 (5) p. .

[Lopez et al. ()] 'Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data'. A D Lopez , C D Mathers , M Ezzati , D T Jamison , Cjl Murray . *Lancet* 2006. 367 (9524) p. .

[Kearney et al. (2005)] 'Global burden of hypertension: analysis of worldwide data'. P M Kearney , M Whelton , K Reynolds , P Muntner , P K Whelton , J He . *Lancet* 2005 Jan 15-21. 365 (9455) p. .

[Strath et al. ()] 'Guide to the Assessment of Physical Activity: Clinical and Research Applications. A Scientific Statement from the'. S J Strath , L A Kaminsky , B E Ainsworth . *American Heart Association. Circulation* 2013. 128 p. .

[Kayima et al. (2013)] 'Hypertension awareness, treatment and control in Africa: a systematic review'. J Kayima , R K Wanyenze , A Katamba , E Leontsini , F Nuwaha . *BMC Cardiovascular Disorders* august 2013. 13 p. 54.

[Addo et al. ()] 'Hypertension in Sub-Saharan Africa'. J Addo , L Smeeth , Leon Da . *Hypertension* 2007. 50 (6) p. .

[Hendriks et al.] 'Hypertension in Sub-Saharan Africa: cross-sectional surveys in four rural and urban communities'. M E Hendriks , Fwnm Wit , Mtl Roos . *PLoS ONE* 2012 (3) p. e32638.

[Damasceno et al. ()] ‘Hypertension prevalence, awareness, treatment, and control in mozambique: urban/rural gap during epidemiological transition’. A Damasceno , A Azevedo , C Silva-Matos , A Prista , D Diogo , N Lunet . *Hypertension* 2009. 54 (1) p. .

[Beaglehole et al. ()] ‘Improving the prevention and management of chronic disease in low-income and middle income countries: A priority for primary health care’. R Beaglehole , J Epping-Jordan , V Patel , M Chopra , S Ebrahim , M Kidd . *Lancet* 2008. 372 p. .

[Physical Activity, and Obesity. BMI Percentile Calculator for Child and Teen English Version Centers for Disease Control and Prevention. BMI Percentile Calculator for Child and Teen English Version’. <http://pubs.niaaa.nih.gov/publications/inscage.htm> Centers for Disease Control and Prevention. Division of Nutrition, Physical Activity, and Obesity. About Adult BMI Centers for Disease Control and Prevention. Division of Nutrition (National Institute on Alcohol Abuse and Alcoholism. CAGE Questionnaire)

[Muluneh et al. ()] ‘Population based survey of chronic non-communicable diseases at gilgel gibe field research center, southwest Ethiopia’. A T Muluneh , A Haileamlak , F Tessema , F Alemseged , K Woldemichael , M Asefa . *Ethiop J Health Sci* 2012. 22 (S) p. .

[Shayo and Mugusi ()] ‘Prevalence of obesity and associated risk factors among adults in Kinondoni municipal district’. G A Shayo , F M Mugusi . *BMC Public Health* 2011. 11 p. 365.

[Van De Vijver et al. ()] ‘Prevalence, awareness, treatment and control of hypertension among slum dwellers in Nairobi’. S J Van De Vijver , S O Oti , C Agyemang , G B Gomez , C Kyobutungi . *J Hypertens* 2013. 31 p. .

[Chobanian et al. ()] ‘seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure’. A V Chobanian , G L Bakris , H R Black . *Hypertension* 2003. 42 p. .

[De Vijver et al. ()] ‘Status report on hypertension in Africa -Consultative review for the 6th Session of the African Union Conference of Ministers of Health on NCD’s. The Pan’. S V De Vijver , H Akinyi , S Oti . *African Medical Journal* 2013. 16 p. 38.

[Gaziano et al. ()] ‘The global cost of non-optimal blood pressure’. T A Gaziano , A Bitton , S Anand , M C Weinstein . *Journal of hypertension* 2009. 27 (7) p. 1472.

[Dewhurst et al. ()] ‘The high prevalence of hypertension in rural-dwelling Tanzanian older adults and the disparity between detection, treatment and control: a rule of sixths?’. M J Dewhurst , F Dewhurst , W K Gray , P Chaote , G P Orega , R W Walker . *J Hum Hypertens* 2012. 13 (10) p. 59.

[Brundtland ()] *The World Health Report 2002: reducing risks, promoting healthy life*. Geneva: World Health Organization, G H Brundtland . 2002.

[World Health Organization (WHO) ()] *World Health Organization (WHO)*, [www.who.int/cardiovascular\\_diseases/publications/global\\_brief\\_hypertension/en/](http://www.who.int/cardiovascular_diseases/publications/global_brief_hypertension/en/) 2013. (A Global Brief on Hypertension)

[World Health Organization. Definition of an older or elderly person: Proposed Working Definition of an Older Person in Africa for the MDS Project, <http://www.who.int/healthinfo/survey/ageingdefnolder/en/>