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Cardiovascular diseases and their Correlates among adult residents of Masala Township in Ndola City, Zambia

Kayabwe Leonard, MBChB[1], Kabelenga Elijah, M.Sc.[1,2*] Mwanakasale Victor, Ph.D.[1]

[1]Michael Chilufya Sata School of Medicine, Copperbelt University, P.O. Box 71191, Ndola 10101 Zambia.
[2*]Ndola College of Nursing and Midwifery, Private Agency, Ndola 10101, Zambia.
[*]Correspondence Author: E-mail: ekabelenga@gmail.com

Abstract:

Introduction: In recent years, cardiovascular diseases (CVDs) have emerged as the major cause of death in developing countries. In developing countries like Zambia, there is scant information on cardiovascular diseases and their risk factors. The aim of this study was to determine the prevalence of cardiovascular diseases and their correlates among adult residents of Masala Township in Ndola, Zambia.

Methods: A cross-sectional study was conducted among 168 randomly selected adults at New Masala clinic in Ndola, Zambia using standardized data collection tools between May and July, 2018. Data was analyzed using SPSS version 21. Multivariate logistic regression analysis using a backward variable selection method was done. Unadjusted odds ratio and adjusted odds ratio with their 95% confidence intervals are reported.

Results: The prevalence of CVDs was 28%. Factors that were independently associated with development of CVDs were sex, age and Body Mass Index. Female participants were 3.72 (AOR=3.72, 95% CI [1.912, 7.231]) more likely to have CVDs compared to males. Participants aged between 25 and 44 years old were 68% (AOR=0.32, 95% CI [0.2, 0.501]) less likely to have CVDs than participants who were aged 45 years old and more. Participants with BMI less than or equal to 18.5 and 24.9 were 42% (AOR=0.579, 95% CI [0.351, 0.953]) less likely to have CVDs than participants whose BMIs were 25 or more.

Conclusion: Prevalence of CVDs was high and this is the time for district health authorities to start instituting interventions meant to combat CVDs among men and women who are aged 45 years and above and those whose BMI is 25 or more.

Key words: BMI, Cardiovascular disease, Risk factors, Ndola City, Zambia.

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Background

Cardiovascular diseases (CVDs) are non-communicable diseases which affects the heart and its blood vessels. In recent years, CVDs have emerged as the major cause of death in developing countries. It has been estimated that one third of all deaths is due to CVDs and the

number keep rising in some countries. The world health organization (WHO) through its meeting in Geneva 2002 reported an estimated 85% of all global deaths coming from low- and middle-income countries (WHO, 2002). In 2015 an estimated 17.7 million people died from CVDs alone, representing 31% of all global deaths and of these deaths, an estimated 7.4 million were due to coronary heart disease and 6.7 million were due to stroke (WHO, 2017). Therefore, CVDs are a public health problem especially in developing countries where the impact is significant.

Historically, cardiovascular diseases in developing countries were common in educated and higher socioeconomic groups, but this has now changed as it is now common in low socioeconomic groups (WHO, 2002; Abegunde *et al.,* 2007). CVDs are triggered by the presence of one or several risk factors which include but not limited to diabetes mellitus, physical inactivity, obesity and cigarette smoking (Rudatsikira *et al.,* 2012). Countries with increased mortality due CVDs have reported an increase in the prevalence of cardiovascular risk factors. For instance in their randomised cohort study in Italy, Tragni *et al.,* (2012) observed that 1 out of 2 subjects was suffering from high blood pressure or high cholesterol, 1 out of 5 was obese and 1 out of 10 was a type 2 diabetic.

Rudatsikira *et al.,* (2012) showed in a study on the Prevalence and correlates of obesity in Zambia that 14.0% of their study participants were obese, one of the commonest CVDs risk factors. The study also reported that sex, age, education, cigarette smoking and blood pressure were associated with obesity. This coincides with the noted mortality in Zambia according to WHO statistical profile that estimated that CVDs are responsible for 8% of all deaths and the probability of dying between ages 30 and 70 years from the four main non communicable diseases (NCDs, [cancer, cardiovascular disease, diabetes and chronic respiratory diseases]) was estimated to be 18% (WHO, 2014).

The prevalence of cardiovascular diseases and its risk factors have been high and rising in developing countries (Abegunde *et al.,* 2007), but the patterns of distribution of CVDs and the risk factors in different socioeconomic groups within countries remains a subject of research. Studies conducted in developed world reported high prevalence of cardiovascular risk factors among people of low socioeconomic status, while studies done in developing countries reported a high prevalence of cardiovascular risk factors among people of high socioeconomic status (Tragni *et al.,* 2012; Abegunde *et al.,* 2007).

Adediran *et al.,* (2013) in a study done in Nigeria reported that the prevalence of hypertension was high in the urban than rural dwellers. In their own study conducted in Nepal, Bogati et al (2017) showed that there was a high prevalence of insufficient physical activity, obesity, hypertension, tobacco consumption, dyslipidemia and diabetes among urban population. Baragou *et al.,* (2012) in a study done in Togo also reported the same thing about urban population and prevalence of CVDs risks, in their study it was concluded that the prevalence of hypertension, hypercholesterolemia, obesity, hypertriglyceridemia, smoking, and diabetes were high.

According to our knowledge, no study has been done to determine the prevalence of cardiovascular diseases and their risk factors among adults in Ndola district. This study determined the prevalence of cardiovascular diseases and their correlates among adult residents of Masala Township in Ndola, Zambia.

Methods and Materials

According to Ndola District Health Office, Ndola district is divided into Northern, Central and Southern zone. The study was conducted at New Masala Clinic that is situated in the southern Zone of the Ndola district (City of Ndola, 2007). A cross-sectional study without any baseline data approach was used. A formula for calculating sample proportions by Israel (1992) was used to calculate a sample of 168 after considering non response rate at 90% from a total adult population for Masala of 25 509. The prevalence of 18% (Roth *et al.*, 2015) was used. Simple random sampling using random tables were used to select men and women aged 25 years and above, sick or well who were willing to participant in the study.

A pretested questionnaire comprising modifiable and non-modifiable demographic, socioeconomic factors, health and life styles was used to collect data. Data was collected between May and July, 2018. Height was measured in meters (m) using a Seca brand 214 portable Stadiometers while weight was measured and recorded in kilograms using the Heine Portable Professional Adult Scale 737 (Seca gmbh and Co. kg Humburg, Germany). Weight and height were used to calculate body mass index (BMI). Blood pressure (BP) reading was measured using The Omron Digital Automatic BP Monitor M4-1(OMRON Healthcare Europe BV, The Netherlands). An average of three readings was considered as the final reading for BP instead of the recommended averaging of the last two readings. The questionnaires were initially manually checked for completeness and were number before being entered into Excel computer program. Verified excel data set was then exported to BMI SPSS version 21 for analysis. Further editing was conducted during running of frequencies by checking responses that were out of range.

Modifiable risk factors included in this study were body mass index, diabetes, physical activity, alcohol consumption and smoking. Non-modifiable factors were age, sex and family history of CVDs. Body mass Index (BMI) was categorized as less than or equal to 18.5-24.9 (underweight/normal weight) and 25.0 and above (overweight/obese) kg/m2. The outcome variable CVDs was a combination of hypertension (BP greater than or equal to 140/90mmHg), Stroke and primary heart condition (heart failure, cardiomyopathies) and the, heart failure or stroke medication were also included all participants who were on antihypertensive drugs. Proportions of the outcome variable and independent variables were calculated. Bivariate and multivariate logistic regression analyses were conducted.

Bivariate analysis was compared using Chi-square test, and a result yielding a p value of less than 5% was considered statistically significant. Factors that were statistically significantly associated with the outcome in bivariate analyses were considered in a multivariate logistic regression analysis using a backward variable selection method. Adjusted odds ratio (AOR) with their 95% confidence intervals (CI) are reported. The study protocol was reviewed and approved by the Tropical Disease Research Ethics Committee IRB Registration Number 00002911 and FWA Number 00003729. Permission to conduct the study was obtained from Ndola District Health Office, Zambia. Informed consent was obtained after the researcher explained among others the purpose of the study, benefits and risks for taking part in the study to the eligible participants. Questionnaires were viewed only by approved study personnel.

Results

Overall, a total of 168 participants were recruited at New Masala Clinic Ndola. Ninety-six (57.1%) participants were females. Most (63.7%) of the participants were aged between 25 and 44 years. The mean age of the participant was 39.9 (SD±13.3) years. The majority

(66.1%) of the participants were married and 107 of them had completed secondary school. Most (66.7%) of the participant are unemployed with 62.5% of them having household income of less than K1000 per month. Of the 168 participants, 47 reported having cardiovascular disease, representing a prevalence rate of 28%.

Marital status was the only socio-economical variable that was significantly associated with CVDs (P=0.001) as shown in table 1. Sex and age group as non-modifiable factors while BMI, Diabetes, Exercise category and smoking as modifiable factors were significantly associated with CVDs (tables 2 and 3) respectively. However, in multivariate analysis (Table 4), marital status, diabetes and exercise were no longer significantly associated with CVDs. Female participants were 3.72 (AOR=3.72, 95% CI [1.912, 7.231]) more likely to have CVDs compared to males. Participants aged between 25 and 44 years were 68% (AOR=0.32, 95% CI [0.2, 0.501]) less likely to have CVDs than participants who were aged 45 years or more. Participants with BMI less than or equal to 18.5 and 24.9 were 42% (AOR=0.579, 95% CI [0.351, 0.953]) less likely to have CVDs than participants whose BMIs were greater or equal to 25.

Table 1. Association between participants' socioeconomic factors and development of CVDs-Bivariate analysis, N=168

Factor		Total n (%)	Disease n (%)	No disease n (%)	p-value
Marital status	Married	111 (66.1%)	25 (22.5%)	86 (77.5%)	**0.001**
	Single	35 (20.8%)	6 (17.1%)	29 (82.1%)	
	Others	22 (13.1%)	16 (72.7%)	6 (27.3%)	
Education	Primary	39 (23.2%)	15 (38.5%)	24 (61.5%)	0.187
	secondary school	107 (63.7%)	28 (26.2%)	79 (73.8%)	
	Tertiary	22 (13.1%)	4 (18.2%)	18 (81.8%)	
Household Income	<k1000	105 (62.5%)	32 (30.5%)	73 (69.5%)	0.214
	k1000-k3999	56 (33.3%)	15 (26.8%)	41 (73.2%)	
	>4000	7 (4.2%)	0 (0%)	7 (100%)	
Occupational status	Employed	56 (33.3%)	17 (30.4%)	39 (69.4%)	0.627
	Unemployed	112 (66.7%)	30 (26.8%)	82 (73.2%)	

Others: Divorced, windowed, separated

Table 2. Association between participants' non-modifiable factors and development of CVDs -Bivariate analysis, N=168

Factor		Total n (%)	Disease n (%)	No disease n (%)	p-value
Sex	Female	96 (57.1)	43 (44.8%)	53 (55.2%)	**0.001**
	Male	72 (42.9)	4 (5.6%)	68 (94.4%)	
Age group	25-44 years	107 (63.7%)	13 (12.1%)	94 (87.9%)	**0.001**
	45 years and above	61 (33.3%)	34 (55.7%)	27 (44.3%)	
Family history of CVDS	No	106 (63.1%)	26 (24.5%)	80 (75.6%)	0.193
	Yes	62 (36.9%)	21 (33.9%)	41 (66.1%)	

Table 3. Association between participants' modifiable factors and development of CVDs - Bivariate analysis, N=168

Factor		Total n (%)	Disease n (%)	No disease n (%)	p-value
BMI category	<18.5 - 24.9	64 (38.1%)	10 (15.6%)	54 (84.4%)	**0.005**
	25 and above	104 (61.9%)	37 (35.6%)	67 (64.4%)	
Diabetes	Not on diabetes medication	156 (92.9%)	39 (25%)	117 (75%)	**0.002**
	On diabetes medication	12 (7.1%)	8 (66.7%)	4 (33.3%)	
Exercise Category	No exercise	95 (56.5%)	29 (30.5%)	66 (69.5%)	**0.011**
	1-3 per week	53 (31.5%)	18 (34%)	35 (66%)	
	4 times and above per week	20 (12%)	0 (0%)	20 (100%)	
Smoking	Never smoked	138 (82%)	45 (32.6%)	93 (67.4%)	**0.012**
	Ex-smoker	16 (9.5%)	2 (12.5%)	14 (87.5%)	
	Current smoker	14 (8.3%)	0 (0%)	14 (100%)	
Alcohol use	Never	110 (65.5%)	36 (32.7%)	74 (67%)	0.059
	Current	58 (34.5%)	11(19%)	47 (81%)	

Table 4. Factors associated with development of CVDs at New Masala Clinic- Multivariate Logistic Regression

Factor	OR	S.E	P= < 0.05	AOR	95% CI	
					Lower	Upper
Sex: Female Male	1.313	0.339	**0.001**	3.718	1.9121	7.231
Age Category: 25-44 years 45 and above	-0.547	0.234	**0.001**	0.317	0.21	0.501
BMI Category: <18.5 - 24.9 25 and above	-0.547	0.255	**0.032**	0.579	0.3511	0.953
Exercise Category	6.527	2839.184	0.998	683.111	0.000	-

Discussion

In this study, the prevalence of CVDs among adults in urban Masala Ndola, Zambia was calculated and the risk factors associated with the development of cardiovascular disease were assessed. The study has shown that the prevalence of CVDs was 28% (43% of females and 4% of males). This finding has therefore shown that the prevalence of CVDs is much higher than in a study by Roth et al in 2015 on global burden of cardiovascular diseases who reported age standard prevalence of CVDs as being at 9% in many Africa countries including Zambia (Roth et al, 2015). This prevalence estimates are higher than those reported from South Africa at 25.5% among females and 21.6% for males (Alberts *et al.*, 2005), Uganda (22.0%) (Maher *et al.*, 2011), and Eritrea (16%) overall (Mufunda *et al.*, 2006; Usman *et al.*, 2006). This finding could be attributed to the current trend in which CVDs are now more

common in low socioeconomic groups and among those in urban areas (Abegunde, 2007; Adediran *et al.,* 2013; Solomon *et al.,* 2017). Masala Township is in Ndola urban district but most of the people belong to low socioeconomic group.

Females were more (AOR=3.72) likely to develop CVDs compared to their male counterparts. This finding is similar to studies conducted else such as in Peru on sex differences in risk factors for cardiovascular disease: The Peru migrant study where women were more likely to be obese (OR=5.97; 95%CI: 3.21–11) than men (Bernabe-Ortiz *et al.*, 2012). Similarly, the World Health Organization (WHO) in 2004 reported an overall cardiovascular mortality in Europe of 55% of the cases in women compared to 43% of the cases in men (Stramba-Badiale *et al.,* 2006). This finding could be attributed to higher levels of high-density lipoproteins (HDL) in women compared to men which predispose to CVDs (Jousilahti *et al.,* 1999). In addition most women take oral contraceptive pills which also tend to predispose them to CVDs (Resseguie, 2014).

According to this study, being aged below 45 years was found to be a protective factor as most (94/107) participants had no CVDs when compared to those who were aged 45 years and above (27/63). This finding is similar to what was found in a prospective study conducted in Finland in 1999 on Sex, Age, Cardiovascular Risk Factors, and Coronary Heart Disease that found an increase associated of age-related increase in CHD incidence and mortality in both sexes but to a larger extent in women (Jousilahti *et al.*,1999). In another study in the USA between 2015 and 2016 found that hypertension overall increased with age and was lower among those aged 18–39 (32.5%) than among those aged 40–59 (50.8%) (Cheryl *et al.,* 2017). This finding could there be attributed to arteriosclerosis that take place in older age than in the young age (Wang and Bennett, 2012). In addition, older people exercise less and as a result they are likely to develop CVDs (Tragni *et al.,* 2012; Lillo *et al.,* 2015).

Participants whose BMI was less than 24.9 were less likely to develop CVDs when compared to those whose BMIs were 25 and higher. This finding is consistent to what was in Cameroon by Shey Wiysonge *et al.,* (2004) who reported a significant association between obesity and hypertension and in Egypt, where El-Shafei *et al.,* (2002) reported that elevated BMI was significantly associated with an increased risk of essential hypertension. In addition in Uganda, hypertension was found to be associated with high BMI (Maher *et al.,* 2011). This could be associated with the effect of high levels of HDL in the blood which tend reduce the lumen of arterioles, hence creating higher total peripheral resistance hence CVDs (Jain *et al.,* (2015).

Conclusion

Our study has demonstrated high prevalence of CVDs. Therefore, this is the time for authorities to define a national policy to combat cardiovascular risk factors especially among men and women aged 45 years and above and those whose BMI is 25 or more in order to control CVDs in urban places.

Authors' contributions

LK conceptualized the study, participated in the protocol preparations, data collection, analysis and interpretation, drafting and revision of manuscript.**VM** participated in the conceptualization of the study, protocol preparation and revision of manuscript. **EK** participated in protocol preparations, supervised data analysis, interpretation of findings and preparation of the manuscript.

Conflict of interest: None

References

1. Abegunde, D.O., Mathers, C.D., Adam, T., Ortegon, M. and Strong, K. **2007**. The burden and costs of chronic diseases in low-income and middle-income countries. Lancet, **370: 1929–1938**.

2. Adediran, O.S., Chinyere, O.I., Stephen, A.O. and Kayode, J. **2013**. Hypertension prevalence in an urban and rural area of Nigeria. Journal of Medicine and Medical Sciences, **4(4): 149-154.**

3. Alberts, M., Urdal, P., Steyn, K., Stensvold, I., Tverdal, A., Nel, J.H. and Steyn, N.P. **2005**. Prevalence of cardiovascular diseases and associated risk factors in a rural black population of South Africa. European Journal of Cardiovascular Prevention and Rehabilitation, **12(4): 347-354**.

4. Baragou, S.D., Mohaman, A.B., Damorou, F., Pio, M., Agnon, A. and Koffi, B. **2012**. Prevalence of cardiovascular risk factors in an urban area of Togo: A WHO STEPS-wise approach in Lome, Togo. Cardiovascular Journal of Africa, **23(6): 309-12.**

5. Bernabe-Ortiz, A., Benziger, C.P., Gilman, R.H., Smeeth, L. and Miranda, J.J. **2012**. Sex Differences in Risk factors for Cardiovascular Diseases: The Peru Migrant study. Gong Yed. Plos One, **7(4): e35127**.

6. Bogati, A., Manandhar, R., Sharma, D.G., Baidhya, S., Prajapati, D., Baniya, S., Bista, N., Khanal, S. and Ranabhat, S. **2017**. Prevalence of Cardiovascular risk factors among the residents of urban community of Kathmandu municipality. Nepalese Heart Journal, **14(1): 3-7.**

7. Cheryl D. Fryar, Yechiam Ostchega, R.N., Craig M. Hales, Guangyu Zhang, M.P.H. and Deanna Kruszon-Moran, M.S. **2017.** Hypertension Prevalence and Control Among Adults: United States, 2015–2016. NCHS Data Brief, **289.**

8. City of Ndola. **2007**. District Situation Analysis 2006. Ndola: Ndola City Council.

9. El-Shafei, S.A., Bassili, A., Hassanien, N.M. and Mokhtar, M.M. **2002**. Genetic determinants of essential hypertension. The Journal of Egyptian Public Health Association, **77(3-4): 231-246**.

10. Israel, G.D. **1992**. Sampling the Evidence of Extension Program Impact. Program Evaluation and Organizational Development, IFAS: University of Florida.

11. Jain, S. and Ward, M.A. **2015**. HDL and its Role in Cardiovascular Disease: A Primary Care Perspective. Journal of Family Medicine and Community Health, **2(3):1037**.

12. Lillo, N., Palomo-Vélez, G., Fuentes, E. and Palomo, I. **2015**. Role of physical activity in cardiovascular disease prevention in older adults. Sport Sciences for Health, **11: 1-7**.

13. Maher, D., Waswa, L., Baisley, K., Karabarinde, A. and Unwin, N. **2011**. Epidemiology of hypertension in low-income countries: a cross-sectional population-based survey in

rural Uganda. Journal of Hypertension, **29(6):1061-8, doi: 10.1097/HJH.0b013e3283466e90.**

14. Mufunda, J., Mebrahtu, G., Usman, A., Nyarango, P., Kosia, A., Ghebrat, Y., Ogbamariam, A., Masjuan, M. and Gebremichael, A. **2006**. The prevalence of hypertension and its relationship with obesity: results from a national blood pressure survey in Eritrea. Journal of Human Hypertension, **20: 59-65**.

15. Pekka, J., Erkki, V., Jaakko, T. and Pekka, P. **1999**. Sex, Age, Cardiovascular Risk Factors, and Coronary Heart Disease Finland. Circulation, **(9):1165-117272.**

16. Resseguie, A.R. **2014.** Contraception Choices for Women at Risk for Venous Thromboembolism. Brigham and Women's Hospital. Boston: Massachusetts.

17. Roth, G.A., Johnson, C., Abajobir, A., *et al.*, **2017**.Global, Regional, and National Burden of Cardiovascular Diseases for 10 Causes, 1990 to 2015. Journal of the American College of Cardiology, **70(1): 1-25, DOI: 10.1016/j.jacc.2017.04.052.**

18. Rudatsikira, E, Muula, A, Mulenga, D and Siziya, S. **2012**. Prevalence and correlates of obesity among Lusaka residents, Zambia: A population-based survey. International Archives of Medicine, **5: 14.**

19. Shey Wiysonge, C.U, Ngu Blackett, K and Mbuagbaw, J.N. **2004**. Risk factors and complications of hypertension in Yaounde, Cameroon. Cardiovascular Journal of South Africa, **15: 215-219**.

20. Stramba-Badiale, M, Fox, K.M, Priori, S.G.P, *et al.*, **2006**. Cardiovascular diseases in women: a statement from the policy conference of the European Society of Cardiology. European Heart Journal, **27: 994-1005.**

21. Tragni, E, Filippi, A, Casula, M, Favato, G, Brignoli, O, Cricelli, C, Poli, A and Catapano, A. **2012**. Risk factors distribution and cardiovascular disease prevalence in the Italian population: The CHECK study. Open Journal of Epidemiology, **2: 90-100, doi: 10.4236/ojepi.2012.24014**.

22. Usman, A, Mebrahtu, G, Mufunda, J, Nyarang'o, P, Hagos, G, Kosia, A, Ghebrat, Y, Mosazghi A, Aranga, S.J and Equbamichael, M.M. **2006**. Prevalence of noncommunicable disease risk factors in Eritrea. Ethnicity and Disease, **16: 542-546**.

23. Wang, J.C. and Bennett, M. **2012**. Aging and Atherosclerosis Mechanisms, Functional Consequences, and Potential Therapeutics for Cellular Senescence. Circulation Research, **111(2):245-59, doi: 10.1161/CIRCRESAHA.111.261388.**

24. WHO. **2002**. World Health Report on Reducing Risks, Promoting Healthy Life. Geneva: World Health Organization, **7-14pp.**

25. WHO. **2014**. Zambia: WHO statistical profile Available: http://www.who.int/nmh/countries/zmb_en.pdf?ua=1. Accessed: 19th September 2018.

26. WHO. **2017**. Cardiovascular Diseases Factsheet. [Online].