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Hypertension, its correlates and differences in access to healthcare services by gender among rural Zambian residents: a cross-sectional study

Yukiko Tateyama [iD],[1,2] Teeranee Techasrivichien,[2,3] Patou Masika Musumari,[2,3] S. Pilar Suguimoto,[3,4] Anita Nyaboke Ongosi,[3] Richard Zulu,[5] Christopher Dube,[6] Masako Ono-Kihara,[2,3] Masahiro Kihara[2,3]

ABSTRACT

Objectives To examine the prevalence of hypertension and access to related healthcare services among rural residents of Mumbwa district in Zambia.

Design Cross-sectional study with probability cluster sampling.

Setting Rural Zambia.

Participants We recruited 690 residents from Mumbwa district aged 25–64 years who had been living in the study area for ≥6 months and had adopted the lifestyle of the study area. Pregnant women and women who had given birth in the past 6 months were excluded. The data collection—questionnaire survey and anthropometric and biological measurements—was conducted between May and July 2016.

Results In the overall sample, 39.7% and 33.5% of the men and women had hypertension (systolic blood pressure (BP)≥140 or diastolic BP ≥90 mm Hg), respectively. Among the participants without a previous diagnosis of hypertension, 30.3% presented with hypertension at the time of measurement. In the multivariable analysis, alcohol intake and urban residence in men, and older age group, higher education and body mass index ≥25 kg/m² in women were significantly associated with hypertension. Among the 21.8% who never had their BP measured, 83.8% were men; among these men, older age (adjusted OR (AOR), 0.43; 95% CI 0.25 to 0.73) and HIV positive status (AOR, 0.37; 95% CI 0.14 to 0.97) were negatively associated, while current smoker status (AOR, 2.09; 95% CI 1.19 to 3.66) was positively associated with the lack of BP measurements.

Conclusion We found that hypertension is prevalent in the target rural area. However, many were not aware of their hypertension status and many never had their BP measured, indicating a serious gap in cardiovascular disease prevention services in Zambia. There is an urgent need for health promotion and screening for hypertension, especially in the primary health services of rural Zambia. Issues related to healthcare accessibility in men require particular attention.

INTRODUCTION

Hypertension is a major global health concern; currently, 17.9 million mortality cases are reported yearly due to coronary heart disease and stroke worldwide.[1] The burden of hypertension has increased globally during the past quarter century and accounts for 7% of disability-adjusted life-years.[2] It has been reported that if no action is taken to control hypertension, economic losses will outstrip public healthcare spending.[3]

It is difficult to be aware of hypertension without assessment during the early stages because it is asymptomatic.[3] To address the increasing prevalence of hypertension, early detection and awareness are important, particularly at the primary healthcare level. However, many people with hypertension in sub-Saharan Africa (SSA) may remain undiagnosed, untreated or uncontrolled because of an inadequate healthcare system.[4] In fact, a systematic review of SSA studies reported that only 22.5% of people with hypertension were aware of their status.[2] Additionally, a South African study found that among people with hypertension, 51% ever had their blood pressure (BP) measured, of which nearly half had not been informed of their high BP.[5] This indicates a lack of necessary health services

Strengths and limitations of this study

► This study assessed the prevalence and factors associated with hypertension stratified by gender, to understand the current hypertension status among rural residents of Zambia.

► We employed a multistage cluster random sampling method and obtained a relatively high response rate, which helped ensure that the results are representative of the target population.

► Socially desirable responses due to face-to-face interviews might have affected the results.

for prevention and screening of hypertension, particularly in low/middle-income countries.

SSA has been reporting rising rates of hypertension, with the highest prevalence rate worldwide (46% of adults aged ≥25 years),[6] and the prevalence remains high in Zambia as well (19.0% in 2017).[7] A recent study in Zambia found that the prevalence of hypertension in people aged over 25 years in rural settings was 23.1%.[8] However, this information was obtained from the clinical visit records at primary healthcare facilities and did not include people without access to health facilities.

The aforementioned evidence underscores the importance of strengthening the assessment and treatment of hypertension. However, research on screening and diagnosis of hypertension has been limited in Zambia.[8 9] Therefore, we aimed to investigate the prevalence of hypertension including undiagnosed cases to understand the current status and access to healthcare service for hypertension among rural residents in Zambia. We also examined the correlation of demographic, behavioural and biological factors with hypertension.

METHODS
Design and settings
This was a cross-sectional study conducted between May and July 2016 in Zambia. We selected Mumbwa district in Central Province as our study area because it is a typical rural area experiencing urbanisation and economic growth while maintaining traditional culture. The district is located 150 km west of the capital Lusaka city and is home to approximately 210 847 inhabitants—15% in urban areas and 85% in rural areas.[10] The target population included residents aged 25–64 years. Since the objective of this study was to investigate lifestyle-related risk factors, we only included residents who had been living in the study area for ≥6 months and had adopted the prevalent lifestyle of the study area. Pregnant women and women who had given birth in the last 6 months were excluded because of potentially different dietary habits and lifestyles and the fact that prepartum and postpartum weight could affect their anthropometric and biological data.

Sampling
We employed a three-stage probability proportional to size (PPS) cluster sampling. The sample size calculation was based on the recommendations of the WHO STEP-wise approach to surveillance (STEPS),[11] assuming a 95% confidence level, 5% margin of error (e2) and 30% prevalence of hypertension in rural areas.[11] The minimum sample size required was 167 subjects, which was increased to 800 to address design effects (loss of sampling efficiency due to cluster sampling), an assumed 20% non-response rate, and planned subgroup and multivariate analyses.

The Central Statistical Office (CSO) of Zambia provided the list of study sampling clusters and Standard Enumeration Areas (SEAs). In the first stage, we selected 32 SEAs through PPS sampling without replacement using the sampling frame of the Zambia Population and Housing Census 2010.[10] In the second stage, mappers from CSO and research assistants mapped each selected SEA and listed all households and their eligible members. Then, using the list of each SEA created, a total of 25 households in each SEA were selected through systematic sampling, which uses a random starting point and a sampling interval calculated by dividing the total number of households in each SEA. In the third stage, from each selected household, only one individual was selected using the Kish Household Coversheet based on the WHO STEPS.[11] We scheduled a date and place to administer the questionnaire survey and take anthropometric and biological measurements as per the participants' convenience. We met with all recruited individuals (if absent, their family members or closest neighbours) 1–2 days before testing to request them to start fasting at 8:00 pm on the day prior to the biological measurements and to visit the testing venue on the scheduled date.

Data collection
The questionnaire was developed in English and three local languages based on the review of Zambian and international literature[9 12] and the results of an earlier qualitative study.[13] A pilot study was conducted to resolve language discrepancies, to assess the face validity of the questionnaire and test–retest reliability, and confirm the feasibility of anthropometric and biological measurements. Face-to-face interviews were carried out by field staff at venues such as the participant's home, community meeting places, or schools. Additionally, licensed nurses were recruited and trained to collect anthropometric measurements and biological samples. A nurse explained the results of blood and urine tests to the participants following their cooperation with the study, then soap and washing paste were given as rewards for participation.

Measurements
BP was measured using electronic equipment (Omron HEM-7130-HP, Omron, Kyoto, Japan). Three measurements were taken from the participants at 3 min intervals while they were seated after 15 min of rest, and the average of the last two readings was recorded. Weight was measured while the participants were barefoot and wearing light clothing using an electronic scale (Omron HBF-223-G, Omron). Glycated haemoglobin (HbA1c) and blood lipids (total cholesterol, LDL-cholesterol, HDL-cholesterol and triglycerides) were measured using point-of-care testing device (Cobas b 101, Roche Diagnostics K.K., Tokyo, Japan). Other variables used in the analysis included sociodemographic characteristics, food security using the Household Food Insecurity Access Scale,[14] medical history and current medications, psychological distress using the Kessler-6 scale[15] and lifestyle-related variables (tobacco, alcohol, physical activity and dietary habits). The results of the measurements were explained by local nurses and given to each participant. Those who

had extremely abnormal results were encouraged to visit the nearest health facilities with the reports.

Patient and public involvement

Participants were not involved in the design, conduct, reporting and dissemination plans of our research.

Statistical analysis

We analysed the data using the Complex Sample module in IBM SPSS Statistics V.21 (IBM) to adjust for the effects of multistage sampling, clustering and weighting. Sample weights accounted for different selection probabilities at each sampling stage, non-response rate in each SEA and poststratification adjustments to correct for differences between our sample and the district population estimates based on the 2010 census. Total weights were standardised as the final weight. Bivariate analyses were performed to determine statistically significant associations between independent variables and high BP (systolic BP (SBP) ≥140 or diastolic BP (DBP) ≥90 mm Hg) using logistic regression. Variables that showed significant associations with high BP (p<0.10) in the bivariate analysis were entered into the multiple logistic regression models stratified by gender.

RESULTS

Of the 800 targeted subjects, 712 agreed to participate. We excluded 22 participants from the analyses due to missing interviews or anthropometric/biological data. The final valid response rate was 86.3%. Table 1 shows the weighted characteristics of the study population by gender. The proportion of men was 48.6%, and the mean age was 41.9 years (SE 0.6). Most of the participants were married (80.8%), had only primary education (74.3%), and were self-employed (69.7%). Nearly one-half had a monthly income of US$50 or less (Zambia's minimum wage), and one-quarter were living with severe food insecurity. For the self-reported medical history, 10.4% had HIV and were receiving antiretroviral therapy. Only 8% and 0.7% of participants had been diagnosed with hypertension and diabetes, respectively. More than 50% of both men and women had family members or relatives who had hypertension, and about 20% reported having family members or relatives who had experienced a stroke.

Table 2 shows the prevalence of hypertension in each stage and the current status of access to health services for hypertension stratified by gender. The prevalence of hypertension (stage 2 and hypertensive crisis) was 36.6% in the overall sample and was greater in men than in women but without statistical significance (39.7% vs 33.5%, p=0.10). In contrast, the prevalence of hypertensive crisis, which refers to severe BP elevation, was slightly higher in women than in men (5.1% vs 3.2%) (p=0.32). Prehypertension (SBP, 120–139 or DBP, 80–89 mm Hg (elevated and stage 1)), which is the risk of developing future hypertension and cardiovascular disease (CVD), was found in 39.9% of the men and 30.6% of the women,

and the difference was statistically significant (p=0.02). There was a significant association between the stage of hypertension and age in both men and women (men, p=0.02; women, p<0.01). Area of residence in the district had a significant association with hypertension in men (p=0.02) but not in women (p=0.82). Regarding access to healthcare services for hypertension, the prevalence of hypertension was higher among men than among women, and the proportion of men who had 'never had their BP measured' was significantly higher than that of women (37.3% (125/335) vs 6.8% (24/354); p<0.01). The proportion of participants who were previously diagnosed with hypertension was 5.4% (18/335) for men and 10.5% (37/354) for women, and 2.4% (8/335) and 4.5% (16/354) received antihypertensive treatment, respectively (p=0.09, p=0.25).

The present status of hypertension screening and diagnosis is shown in figure 1. Among the residents, 21.8% (150/689) never had their BP measured and the main reasons given were 'do not know where to obtain the service' (41.6%), 'do not have the time or opportunity to check' (24.8%), and 'I think it is not important or I am healthy' (18.8%). Among the participants who never had their BP measured, 41.9% (63/150) presented with hypertension at the time of measurement in this study. Among participants who had their BP measured previously, 89.8% (485/539) had not been diagnosed with hypertension but 30.3% (147/485) presented with hypertension. Among the participants already diagnosed with hypertension, 56.4% (31/55) were not using antihypertensive medication, of which 71.0% (22/31) presented with hypertension. Furthermore, most participants using antihypertensive medication (20/24) presented with hypertension, indicating poor BP control. Among individuals with HIV-positive status (n=71), the distribution of hypertension and its stages showed no difference from the overall distribution, but subgroup analysis showed that the proportion of individuals who had never had their BP measured was lower than the overall proportion for both men and women (online supplemental table 1).

Table 3 shows the prevalence of hypertension in relation to each covariate and the association of each covariate with hypertension by multivariable analysis (adjusted for the variables with p<0.10 in the bivariate analysis) in the overall sample analysis and the analysis stratified by gender online supplemental table 2. In the overall sample, older age group (45–64 years) (adjusted OR 1.95, 95% CI 1.35 to 2.80), higher education (≥college) (2.00, 95% CI 1.04 to 3.82), alcohol intake (a few times/week or everyday) (2.14, 95% CI 1.28 to 3.58) and body mass index (BMI) 25 kg/m^2 (1.83, 95% CI 1.24 to 2.71) were positively associated, while HIV-positive status was negatively associated with hypertension (0.53, 95% CI 0.29 to 0.96). Gender, marital status, food insecurity, smoking,

Table 1 Sociodemographic characteristics and related medical histories among overall participants in the Mumbwa district, central province of Zambia, 2016

	Overall		Male		Female	
	n	%	n	%	n	%
Number						
Unweighted	690		332		358	
Weighted	689	100	335	48.6	354	51.4
Age, years (SE)	41.9	(0.6)	42.7	(0.8)	41.1	(0.7)
Residential area of the district						
Urban area	87	10.4	35	14.7	52	12.6
Rural area	602	89.6	300	85.3	302	87.4
Marital status						
Not married	27	3.9	20	5.8	7	2.0
Married	557	80.8	300	89.4	257	72.6
Divorced/widow/widower	106	15.4	16	4.8	90	25.4
Education						
Primary	513	74.3	229	68.3	284	80.1
Secondary	127	18.5	77	23.0	50	14.2
Tertiary	49	7.2	29	8.7	20	5.7
Monthly income (US$)						
≤US$50	326	47.4	157	46.9	169	47.8
>US$50	362	52.6	178	53.1	185	52.2
Work status						
Employed	85	12.4	58	17.2	28	7.8
Self-employed	481	69.7	255	76.2	225	63.6
Unemployed/retired	123	17.9	22	6.6	101	28.6
Food security						
Secure	192	27.9	107	32.1	85	23.9
Mildly insecure	45	6.6	25	7.4	21	5.8
Moderately insecure	261	37.9	132	39.4	129	36.4
Severely insecure	191	27.7	71	21.2	120	33.8
Medical history (self-reported)						
HIV positive*	71	10.4	28	8.4	43	12.2
Hypertension	55	8.0	18	5.4	37	10.4
Diabetes	5	0.7	3	0.9	2	0.6
History within family and relatives (self-reported)						
Hypertension	381	55.3	174	52.0	207	58.5
Stroke	140	20.3	68	20.4	71	20.2
Heart disease	64	9.3	25	7.5	39	11.0
Diabetes	123	17.9	52	15.5	71	20.2

Data are numbers (%).
Totals of percentages may differ from 100 due to rounding. Weighted values are rounded to the nearest integer.
*All have been receiving antiretroviral treatment.

physical activity, cooking oil intake, sugar intake and HbA1c were not associated with hypertension. There was a significant association between hypertension and alcohol intake in both genders (men≥a few times/week or everyday: 2.28, 95% CI 1.24 to 4.17; women ≤a few times/month: 1.79, 95% CI 1.01 to 3.19), but the association with urban residence was significant only in men (2.46, 95% CI 1.09 to 5.56). Older age (45–64 years) (2.68, 95% CI 1.56 to 4.63), higher education (≥college) (3.39, 95% CI 1.19 to 9.64), and BMI ≥25 kg/m^2 (1.98, 95% CI 1.18 to 3.29) showed significant association with hypertension only in women.

Table 2 Stage of hypertension relative to demographics and access to care and services among all participants in the Mumbwa district, central province of Zambia, 2016

| Male | Overall | Normal | Prehypertension | | Hypertension | | P value |
			Elevated	Stage 1	Stage 2	Hypertensive crisis	
Total n (%)	335	68 (20.4)	33 (9.8)	101 (30.1)	122 (36.5)	11 (3.2)	
Age							
25–44	203	45 (22.0)	26 (12.7)	62 (30.6)	68 (33.4)	3 (1.3)	0.02
45–64	132	24 (17.9)	7 (5.4)	39 (29.2)	54 (41.2)	8 (6.2)	
Residential area of the district							
Urban area	35	5 (13.2)	1 (2.9)	8 (22.1)	17 (48.5)	5 (13.2)	0.02
Rural area	300	64 (21.2)	32 (10.6)	93 (31.0)	105 (35.1)	6 (2.1)	
Access to hypertension care and services							
Have never blood pressure measured	125	27 (21.3)	8 (6.1)	35 (27.9)	55 (43.9)	1 (0.8)	0.11
Diagnosed as hypertensive	18	2 (11.4)	0 (0.0)	2 (11.4)	8 (45.7)	6 (31.4)	<0.01
On treatment	8	0 (0.0)	0 (0.0)	1 (13.3)	2 (26.7)	5 (60.0)	<0.01
Medical history (self-reported)							
HIV positive	28	8 (29.1)	2 (7.3)	9 (30.9)	9 (32.7)	0 (0.0)	0.69
Diabetic	3	0 (0.0)	0 (0.0)	1 (33.3)	2 (66.7)	0 (0.0)	0.80

| Female | Overall | Normal | Prehypertension | | Hypertension | | P value |
			Elevated	Stage 1	Stage 2	Hypertensive crisis	
Total n (%)	354	127 (35.8)	12 (3.3)	97 (27.3)	101 (28.4)	18 (5.1)	
Age							
25–44	226	105 (46.4)	5 (2.3)	63 (27.7)	50 (22.0)	4 (1.6)	<0.01
45–64	128	22 (17.3)	7 (5.2)	34 (26.5)	51 (39.8)	14 (11.2)	
Residential area of the district							
Urban area	52	16 (31.7)	2 (3.0)	17 (32.7)	15 (28.7)	2 (4.0)	0.82
Rural area	302	111 (36.6)	10 (3.4)	80 (26.4)	86 (28.4)	16 (5.3)	
Access to hypertension care and services							
Have never blood pressure measured	24	8 (31.9)	1 (2.1)	9 (38.3)	7 (27.7)	0 (0.0)	0.53
Diagnosed as hypertensive	37	2 (4.2)	0 (0.0)	7 (19.4)	15 (40.3)	13 (36.1)	<0.01
On treatment	16	0 (0.0)	0 (0.0)	3 (18.8)	6 (34.4)	8 (46.9)	<0.01
Medical history (self-reported)							
HIV positive	43	19 (44.0)	3 (6.0)	11 (26.2)	10 (23.8)	0 (0.0)	0.36
Diabetic	2	1 (50.0)	0 (0.0)	0 (0.0)	1 (50.0)	0 (0.0)	0.90

Data are numbers (%)
Totals of percentages may differ from 100 due to rounding. Weighted values are rounded to the nearest integer.
BP category: Normal (SBP<120 and DBP<80), Elevated (SBP 120-129 and DBP < 80), Stage 1 (SBP 130-139 or DBP 80-89), Stage 2 (SBP≥140 or DBP≥90), Hypertensive crisis (SBP>180 and/or DBP>120)

Table 4 shows factors associated with 'never had BP measured' among men, as 83.8% (125/150) of participants who never had their BP measured were men. In the multivariable analysis, older age (0.43, 95% CI 0.25 to 0.73) and HIV positive status (0.37, 95% CI 0.14 to 0.97) were negatively associated, while being a current smoker was positively associated with 'never had BP measured' (2.09, 95% CI 1.19 to 3.66). In contrast, in women, though not shown in the table, older age was positively associated with 'never had BP measured' (4.53, 95% CI 1.81 to 11.4) (online supplemental tables 3 and 4).
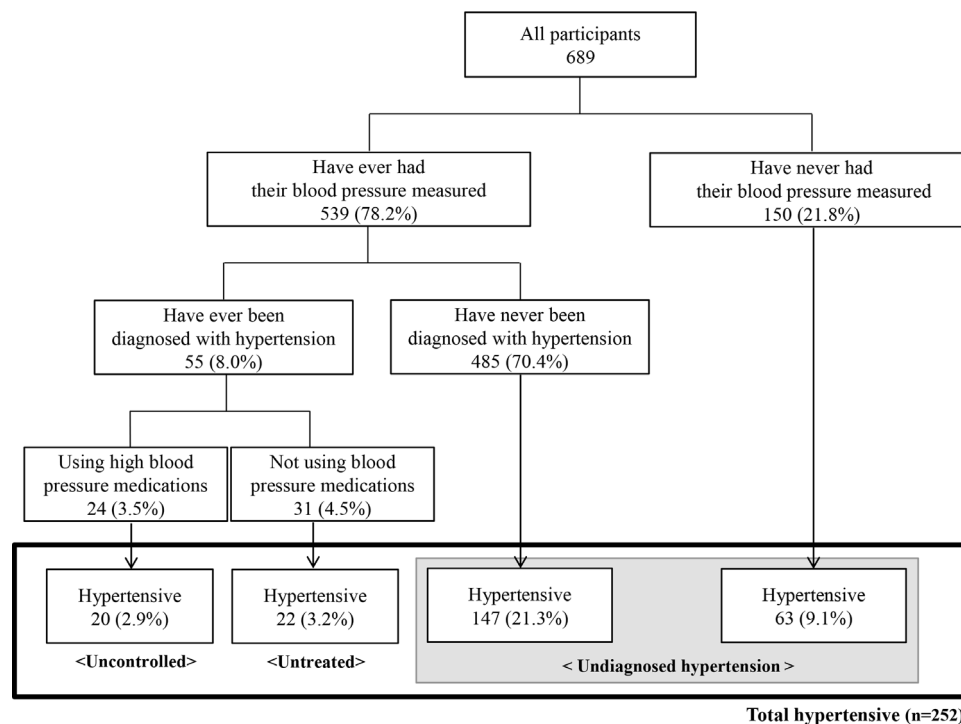
Figure 1 Status of screening and diagnosis of hypertension among all participants in the Mumbwa district, Central Province of Zambia, 2016 (weighted)

DISCUSSION

In this study, we assessed the prevalence and the risk factors for hypertension by gender to understand the current situation of hypertension among rural residents in Zambia. We also explored the status of screening and diagnosis of hypertension and its correlates to evaluate the situation of access to healthcare services for hypertension.

We found that more than 35% of the participants had hypertension, and the profile of hypertension correlates was different between men and women. More than 80% of the people with high BP measurements had never been previously diagnosed with hypertension, and 30% of them had never had their BP measured, suggesting the lack of access to or availability of healthcare services for BP control.

The prevalence of hypertension in rural areas

The prevalence of hypertension among the targeted rural residents of this study in 2016 was 39.7% in men and 33.5% in women, both being much higher than the national averages found in the Zambia STEPS Survey of 2017 (20.5% and 17.6%, respectively).[7] Previous research has reported mixed findings regarding the prevalence of hypertension in rural areas of Zambia. While a similar rate (46.9%) was reported among people attending health check-ups in other rural areas of Zambia,[16] 23.1% was reported in a primary healthcare-based study conducted in several rural districts between 2011–2014.[8] However, comparing our results with those of previous studies is difficult due to methodological differences. For example, previous studies used convenient sampling with potential selection bias, while we conducted probability sampling of the whole area. Studies using probability sampling are required for documenting the accurate BP status among Zambian rural populations. The prevalence rates of prehypertension and hypertension were slightly higher in men than in women in our study, a tendency that has been observed throughout the African region.[6]

Gender differences in factors associated with hypertension

In this study, a gender difference was found not only in the prevalence of hypertension, but also in the profile of the correlates of hypertension. In men, residence in the urban area of the district and high frequency of alcohol intake were significantly associated with hypertension. While in women, older age, higher education level, low frequency of alcohol intake and BMI ≥ 25 kg/m^2 were associated with hypertension, suggesting the different mechanism(s) involved in the development of high BP between the genders. This implies that different pathways for hypertension including behavioural and sociocultural factors exist between men and women, which could affect prevention strategies[17]

Alcohol consumption was the only factor moderately associated with hypertension in both genders, which is in line with well-established findings worldwide.[18] Although the exact mechanism is unclear, it can be caused directly through the chronic effect of alcohol and/or indirectly through related socioeconomic status and lifestyles among the study population.[18] Regardless of the mechanism, it is important to follow the trend of alcohol intake over time with special attention to the type, amount and

Table 3 Multivariate correlates of hypertension among all participants in the Mumbwa district, central province of Zambia, 2016

	Overall						Male						Female					
	Total	Hypertension n	Hypertension %	Adjusted OR	95% CI	P value	Total	Hypertension n	Hypertension %	Adjusted OR	95% CI	P value	Total	Hypertension n	Hypertension %	Adjusted OR	95% CI	P value
Sociodemographic characteristics																		
Gender																		
Male	335	133	39.7	–			–	–	–	N/A			–	–	–	N/A		
Female	354	119	33.5	–			–	–	–				–	–	–			
Age																		
25–44	429	124	28.9	1	Reference		203	70	34.7	1	Reference		226	53	23.6	1	Reference	
45–64	260	128	49.2	1.95	1.35 to 2.80	<0.01	132	63	47.5	1.57	0.95 to 2.58	0.07	128	65	51.0	2.68	1.56 to 4.63	<0.01
Marital status																		
Not married	27	8	30.8	1	Reference		20	7	34.2	–	–		7	2	21.4	–	–	
Married	557	200	36.0	1.57	0.63 to 3.90	0.33	300	120	40.0	–	–		257	81	31.4	–	–	
Divorced/widow/widowed	106	43	40.8	1.83	0.68 to 4.97	0.23	16	7	41.9	–	–		90	36	40.6	–	–	
Education																		
≤Primary	513	185	36.1	1	Reference		229	90	39.6	–	–		284	95	33.3	1	Reference	
Secondary	127	44	34.7	1.03	0.66 to 1.61	0.89	77	32	41.3	–	–		50	12	24.5	0.68	0.32 to 1.45	0.32
≥College	49	23	45.8	2.00	1.04 to 3.82	0.04	29	11	36.8	–	–		20	12	59.0	3.39	1.19 to 9.64	0.02
Work status																		
Employed	85	29	33.7	–	–		58	19	33.0	1	Reference		28	10	35.2	–	–	
Self-employed	481	178	37.1	–	–		255	102	39.8	1.43	0.74 to 2.78	0.29	225	77	34.0	–	–	
Unemployed/Retired	123	45	36.3	–	–		22	12	55.8	1.95	0.66 to 5.75	0.22	101	32	32.0	–	–	
Residential area of the district																		
Urban area	87	39	44.4	–	–		35	22	61.8	2.46	1.09 to 5.56	0.03	52	17	32.7	–	–	
Rural area	602	213	35.4	–	–		300	112	37.2	1	Reference		302	102	33.7	–	–	
Food security																		
Secure	192	58	30.2	1	Reference		107	33	31.1	–	–		85	25	29.1	–	–	
Insecure	497	194	39.0	1.46	0.99 to 2.16	0.06	228	100	43.8	–	–		269	94	34.9	–	–	
Family planning																		
Not used	–	–	–	–	–		–	–	–	–	–		249	96	38.6	1	Reference	
Used	–	–	–	–	–		–	–	–	–	–		101	96	21.8	0.61	0.32 to 1.153	0.13
No data	–	–	–	–	–		–	–	–	–	–		4	1	14.3	–	–	
Behavioural and psychological characteristics																		
Smoking																		
Never	525	179	34.1	1	Reference		185	66	35.8	–	–		340	113	33.1	–	–	
Ex-smoker	86	37	43.1	1.26	0.73 to 2.18	0.41	74	33	44.4	–	–		12	4	34.8	–	–	

Continued

Table 3 Continued

	Overall						Male						Female					
	Total	Hypertension n	%	Adjusted OR	95% CI	P value	Total	Hypertension n	%	Adjusted OR	95% CI	P value	Total	Hypertension n	%	Adjusted OR	95% CI	P value
Current smoker	79	36	45.8	1.27	0.71 to 2.29	0.42	76	34	44.6	–	–	–	3	2	80.0	–	–	–
Alcohol																		
Never	354	106	30.0	1	Reference		102	30	29.3	1	Reference		252	77	30.3	1	Reference	
≤A few times/month	206	80	39.0	1.49	0.98 to 2.27	0.06	123	49	39.6	1.43	0.78 to 2.59	0.24	82	31	38.1	1.79	1.01 to 3.19	0.046
≥A few times/week or everyday	130	65	50.4	2.14	1.28 to 3.58	<0.01	110	54	49.5	2.28	1.24 to 4.17	<0.01	20	11	55.3	1.61	0.58 to 4.49	0.37
Physical activity (activities of daily life and sports ≥once a week)																		
Neither	54	25	46.2	1	Reference		16	8	46.9	–	–	–	38	17	45.9	1	Reference	
Either	497	182	36.6	0.62	0.34 to 1.15	0.13	215	96	44.7	–	–	–	282	86	30.4	0.51	0.24 to 1.08	0.08
Both	138	45	32.5	0.66	0.32 to 1.35	0.25	104	29	28.2	–	–	–	34	15	45.5	1.60	0.54 to 4.71	0.40
Cooking oil intake																		
Low <20.83 mL	510	198	38.8	1	Reference		244	103	42.2	–	–	–	266	95	35.7	–	–	
High ≥20.83 mL	177	54	30.5	0.71	0.48 to 1.07	0.10	92	30	33.1	–	–	–	85	24	27.7	–	–	
Don't know	1	0	0.0	–			–	–		–			1	0	0.0	–		
No data	2	0	0.0	–			–	–		–			2	0	0.0	–		
Sugar intake																		
Low <28.0 g	353	136	38.6	1	Reference		168	70	42.0	–	–	–	185	66	35.6	–	–	
High ≥28.0 g	335	114	33.9	0.79	0.56 to 1.12	0.18	167	62	37.0	–	–	–	168	52	30.9	–	–	
No data	2	2	100.0	–			1	1	100.0	–			1	1	100.0	–		
Clinical characteristics																		
Body mass index (kg/m²)																		
Normal (<25)	505	167	33.1	1	Reference		281	106	37.9	1	Reference		224	61	27.1	1	Reference	
Overweight/obese (≥25)	185	85	46.0	1.83	1.24 to 2.71	<0.01	54	27	49.1	1.73	0.91 to 3.29	0.09	130	58	44.7	1.98	1.18 to 3.29	<0.01
HbA1c																		
Normal (<5.7)	404	144	35.6	1	Reference		222	89	40.1	–			182	55	30.1	1	Reference	
High risk (5.7–6.4)	266	96	36.1	1.05	0.73 to 1.50	0.80	111	42	38.1	–			156	54	34.7	1.02	0.61 to 1.71	0.93
Diabetes (≥6.5)	18	12	65.7	2.69	0.91 to 7.96	0.07	3	2	66.7	–			15	10	65.5	2.33	0.68 to 7.96	0.18
No data	1	0	0.00	–			0	0	0.0	–			1	0	0.0	–		
Medical history (self-reported)																		
HIV status (self-reported)																		
Negative	618	232	37.6	1	Reference		307	124	40.4	–			311	108	34.9	1	Reference	
Positive	71	20	27.3	0.53	0.29 to 0.96	0.04	28	9	32.7	–			43	10	23.8	0.54	0.24 to 1.24	0.15

Continued

Table 3 Continued

	Overall					Male					Female				
	Hypertension		Adjusted		P	Hypertension		Adjusted		P	Hypertension		Adjusted		P
Total	n	%	OR	95% CI	value	Total n	%	OR	95% CI	value	Total n	%	OR	95% CI	value

Data are numbers (%).
Totals of percentages may differ from 100 due to rounding. Weighted values are rounded to the nearest integer.
Hypertension is defined as SBP 140 ≥mm Hg or DBP ≥90 mm Hg.
No data' and 'don't know' were excluded from statistical test.
DBP, diastolic blood pressure; HbA1c, glycated haemoglobin; SBP, systolic blood pressure.

pattern since it may rapidly change in both quantity and quality with future economic growth.

Living in the urban area of the district was significantly associated with hypertension only in men. Although the study region was 'rural' in general (neighbouring the capital city, Lusaka), there are some areas with relatively easy access to the capital city. Men living in such areas may be involved in urbanised lifestyles, probably in relation to their jobs, in terms of eating habits and lifestyles, including high calorie diets and lack of exercise. Studies in Cameroon and Mali have shown a similar tendency with higher prevalence of hypertension among men in 'urban areas' than in rural areas.[19 20]

The relationship between age and hypertension has been reported in SSA countries.[5 21 22] In our study, a significant association with age was observed only in women, reflecting the age-related distribution of hypertension between the genders, where the difference in prevalence between younger (25–44 years) and older (45–64 years) age groups was large (23.6% vs 51.0%, respectively) in women, but small in men (34.7% and 47.4%, respectively). Similar age disparities in the prevalence of hypertension by gender have been reported in previous studies of Zambia and Senegal.[8 23] This may suggest that men are more likely to develop hypertension at a younger age than women. The reasons for this age disparity by gender should be one of the focus points in future research.

An association between hypertension and education level was observed only among women. Slightly high odds of hypertension in people with higher levels of education were also observed in a study in Malawi.[21] This may suggest that in SSA countries that experienced rapid economic growth in recent years, the risk of hypertension has increased among people with higher levels of education due to spread of urbanised eating habits and lifestyles (overnutrition and physical inactivity).[23] The reason why the association was detected only in women in our study is unclear; however, higher education may be related to urbanised eating habits and lifestyles more in women than in men.

The association of overweight and obesity (BMI ≥25 kg/m^2) with hypertension has been reported in SSA countries including Zambia, with its tendency being stronger in women than in men.[24] Similarly in our study, although the association was observed in both genders, it was significant only in women. This may be related to biological factors such as an increase in obesity with age in women in African societies and their cultural preferences. In men, behavioural factors such as alcohol consumption and psychological stress are more likely to be associated with developing hypertension than obesity.

Status of hypertension management

In this study, only 16.7% of the participants who presented with hypertension had previously been diagnosed. Among the participants with documented hypertension but no previous diagnosis, 30% never had their BP measured. Our results concur with findings from a

Table 4 Bivariate and multivariate correlates of 'never had blood pressure measured' (men only)

	Male (n=335)	Never had blood pressure measured (n=125)				
	Total	n of total (%)	Crude OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age						
25–44	203	83 (41.0)	1 (reference)		1 (reference)	
45–64	132	42 (31.9)	0.48 (0.30 to 0.77)	<0.01	0.43 (0.25 to 0.73)	<0.01
Residential area of the district						
Urban area	35	6 (16.2)	1 (reference)		1 (reference)	
Rural area	300	120 (39.9)	3.60 (1.35 to 9.61)	0.01	2.79 (0.98 to 7.93)	0.06
Education						
Primary	229	96 (42.0)	1 (reference)		1 (reference)	
≥Secondary	106	29 (27.5)	0.62 (0.38 to 1.01)	0.05	0.84 (0.48 to1.45)	0.53
Work status						
Employed	58	13 (23.2)	1 (reference)		1 (reference)	
Unemployed/Retired	278	112 (40.4)	2.04 (1.08 to 3.83)	0.03	1.86 (0.92 to 3.76)	0.09
HIV infection						
No	307	119 (38.7)	1 (reference)		1 (reference)	
Yes	28	7 (23.6)	0.40 (0.16 to 1.02)	0.06	0.37 (0.14 to 0.97)	0.04
Smoking						
Never, ex-smoker	259	87 (33.7)	1 (reference)		1 (reference)	
Current smoker	76	38 (50.0)	2.01 (1.19 to 3.38)	<0.01	2.09 (1.19 to 3.66)	<0.01
Alcohol						
Never or a few times/month	225	85 (37.9)	1 (reference)		–	
≥a few times/week or everyday	110	40 (36.4)	1.03 (0.64 to 1.66)	0.91	–	
Body mass index (kg/m²)						
Normal (<25)	281	111 (39.6)	1 (reference)		1 (reference)	
Overweight/obese (≥25)	54	14 (26.4)	0.43 (0.22 to 0.85)	0.02	0.66 (0.32 to 1.40)	0.28

Data are numbers (%).
Totals of percentages may differ from 100 due to rounding. Weighted values are rounded to the nearest integer.

systematic review of hypertension in SSA indicating that only 22.5% of people with hypertension had already been diagnosed.[2] This indicates the need to strengthen hypertension screening and diagnosis, particularly at the primary healthcare level which is the entry level to healthcare systems in most SSA countries.

Moreover, only 8% of the participants in this study reported having been previously diagnosed with hypertension, which was much lower than the actual proportion presenting with hypertension. In addition, only fewer than half of the participants diagnosed with hypertension were using antihypertensive medications, and many of them presented with hypertension at the time of the measurement, indicating challenges in accessing treatment for hypertension. A previous study in Zambia reported that 18% of people who presented with hypertension at the time of the study had been prescribed antihypertensive medication at a health centre.[8] In our study, only 7.9% of the participants with hypertension had been prescribed

antihypertensive medication. Furthermore, about 83% of the participants who reported using antihypertensive medication in our study presented with hypertension at the time of measurement. This was consistent with the results of a previous study in Zambia where nearly 90% had poorly controlled hypertension,[8] and other reports from the entire SSA region.[2] These results indicate that there are various challenges in the management of hypertension in the rural areas of Zambia, as in other SSAs, in terms of 'difficulties in accessing appropriate treatment and health services including hypertension', 'lack of screening and diagnostic opportunities for hypertension' and 'lack of awareness of the importance of BP control'.

Access to healthcare services related to hypertension
We also assessed the differences in access to healthcare services related to hypertension between the genders. Identifying the management status of hypertension (care cascade) can contribute to health policy and

interventions.[25] We focused on the history of BP measurement as it relates to the awareness of hypertension status. In our study, more than 20% of the participants had never had their BP measured previously, suggesting the difficulties in accessing screening and diagnostic services for hypertension care. Despite the higher prevalence of hypertension among men than among women, the proportion of men who 'never had their BP measured' was 37.4%, which was 5.5 times higher than that of women. Men also tended to be less likely to have been diagnosed with and treated for hypertension.

There was a significant positive association between smoking and 'never had their BP measured' in men. While this finding requires further assessment in future, it may suggest that people who engage in high-risk health behaviours such as smoking tend to be less concerned about their health and less likely to engage in health seeking behaviours than those who do not engage in such behaviour. In this study, we also included self-reported HIV status in the analysis as a factor affecting access to healthcare services. Men in older age groups and men with HIV-positive status were less likely to have 'never had their BP measured', suggesting that they were likely to be aware of their BP. The association with 'older age group' may be because they were likely to receive medical care during their lifetime. Regarding the association with HIV-positive status, all HIV-positive individuals were receiving HIV treatment, so regular medical consultations at a healthcare facility may have provided the opportunity for BP measurement.

Men have fewer opportunities to access healthcare services besides illness or injury, compared with women who visit for maternal and child health services. Patients with asymptomatic conditions like hypertension may not receive the required healthcare services due to psychological and geographical barriers, for example, low level of attention to health or distance to healthcare facilities. In Zambia, access to quality essential healthcare services remains limited due to weak health systems including workforce shortage. For instance, the proportion of medical doctors per 10 000 population was 0.93 in 2016 and the universal health coverage service coverage index in 2017 was lower than the global average.[26] Therefore, along with strengthening hypertension screening, we suggest that the use of existing mobile health services, such as vaccination campaigns, mobile voluntary counselling and testing services, and cooperation with community health workers may be advantageous in treating many people.[27] For women, although only a few never had their BP measured, the odds of never having BP measured were significantly higher in the older age group. This gender difference should be examined in further research with a large sample size.

Strengths and limitations

The strength of our study is that we used multistage cluster random sampling and obtained a relatively high response rate. Thus, our results are representative of patients at risk of CVD in the target population in the rural area. Regarding limitations, the recorded BP may have been higher than usual due to white coat hypertension. A previous study that used the same hypertension criteria as our study reported that the prevalence of white coat hypertension (false-positive) was 13%, masked hypertension (false-negative) 14% and correctly classified hypertension 73%.[28] Therefore, data on the prevalence of hypertension in this study should be interpreted cautiously. Socially desirable responses due to face-to-face interviews could also have affected the results, even though we trained the interviewers before the study. Unmeasured factors may have affected some of the associations found in our study.

CONCLUSION

More than one-third of the participants in a rural district in Zambia had hypertension; most were not diagnosed yet and one-quarter of them never had their BP measured. These results indicate a lack of CVD prevention services, including access to and availability of healthcare services for hypertension, among rural residents in Zambia. Therefore, health promotion and screening strategies for hypertension are urgently required, especially in primary healthcare settings in rural areas. Particular attention should be paid to healthcare access, specifically among men.

Author affiliations
[1]Kyoto University Health Service, Kyoto, Japan
[2]Global Health Interdisciplinary Unit, Center for the Promotion of Interdisciplinary Education and Research, Kyoto University, Kyoto, Japan
[3]International Institute of Socio-epidemiology, Kyoto, Japan
[4]National Institute of Health, Lima, Peru
[5]Center for Primary Care Research, University of Zambia School of Medicine, Lusaka, Zambia
[6]Ndola District Health Office, Ndola, Zambia

Health Research Authority, Zambia (MH/101/23/10-1) granted approval for the main survey. Participants gave informed consent to participate in the study before taking part.

ORCID iD
Yukiko Tateyama http://orcid.org/0000-0002-4649-8428

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