

# Prevalence of unhealthy lifestyle practices among adults with hypertension aware and unaware of their hypertensive status: Results from the 2013 WHO STEPS survey in Burkina Faso

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## Research Article

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# Abstract

## Background

We compared the prevalence of unhealthy lifestyle factors between the hypertensive adults who were aware and unaware of their hypertensive status and assessed the factors associated with being aware of one's hypertension among adults in Burkina Faso.

## Methods

We conducted a secondary-analysis of data from the World Health Organization Stepwise approach to surveillance survey conducted in 2013 in Burkina Faso. Lifestyle factors analysed were fruits and vegetables (FV) consumption, tooth cleaning, alcohol and tobacco use, body mass index and physical activity.

## Results

Among 774 hypertensive adults, 84.9% (95% CI: 82.2–87.3) were unaware of their hypertensive status. In those aware vs unaware respectively, frequencies of unhealthy lifestyle practices were: 92.3 vs 96.3%  $p = 0.07$  for not eating at least five or more FV servings, 63.2 vs 70.5%  $p = 0.12$  for not cleaning the teeth at least twice a day, 35.9 vs 42.3%  $p = 0.19$  for tobacco and/or alcohol use, 53.9 vs 25.4%  $p = 0.0001$  for overweight/obesity and 17.1 vs 10.3%  $p = 0.04$  for physical inactivity. In logistic regression analysis, older age, primary or higher education, being overweight/obese (aOR = 3.2;  $p < 0.0001$ ), intake of adequate FV servings daily (aOR = 2.9;  $p = 0.023$ ) and non-use of alcohol and tobacco (aOR = 0.6;  $p = 0.028$ ) were associated with being aware of one's hypertensive status.

## Conclusion

Undiagnosed hypertension was very high among hypertensive Burkinabè adults. Those aware of their hypertension diagnosis did not necessarily practise healthier lifestyles than those not previously aware of their hypertension. Current programmes at control of hypertension should aim to improve its awareness and risk reduction behaviour.

## Background

In 2019, an estimated that 1.28 billion people aged 30–79 years worldwide lived with hypertension of whom 82% lived in low- and middle-income countries (LMICs) [1]. Over the long term, hypertension leads to risk for cardiovascular events, such as heart disease, stroke, kidney failure, disability, and premature mortality [2]. The challenge in reducing the burden of cardiovascular diseases, particularly in LMICs, includes efforts to improve diagnosis and ensure adequate management or treatment for persons living with hypertension [3]. Undiagnosed hypertension and inadequate treatment hinder the effective control of hypertension. Effective strategies for hypertension management (non-pharmacological interventions) include the adherence to

healthy lifestyle and dietary behaviours such as avoidance of tobacco or harmful use of alcohol, weight control, physical activity, fruit and/or vegetables (FV) consumption, as well as oral hygiene [4–7].

There is some evidence to suggest that persons living with hypertension who are aware of their condition or have knowledge about the disease may practice healthier lifestyles than those who do not [8]. We, therefore, presumed that Burkinabè adults who were aware of their hypertensive status would have healthier lifestyle measures than those who were not. Using data from the first World Health Organization (WHO) stepwise approach to surveillance (STEPS) survey in Burkina Faso, we compared the distribution of lifestyle factors between the adults living with hypertension who were aware and unaware of their hypertensive status. We also assessed the factors associated with being aware of one's hypertensive status.

## Methods

### Description of the Burkina Faso STEPS Survey

The WHO STEPS surveys use a standardized tool for data collection which includes specific sections on behavioural risk factors (tobacco and alcohol consumption, oral hygiene practices, FV intake, physical activity); anthropometric [body mass index (BMI)] and blood pressure measurements; and blood biochemistry [9].

The first WHO STEPS survey in Burkina Faso, conducted from 3 September to 24 October 2013, was nationally-representative and covered all the country's 13 administrative regions. It involved interviews on behavioural or lifestyle factors as well as anthropometric and blood pressure measurements [9]. The survey enrolled adults aged 25–64 years, based on a calculated sample size, large enough to allow sub-group comparisons. The sample was weighted by sex, age group, and rural/urban residence. Face-to-face interviews were conducted in a language spoken by the participant and data captured using personal digital assistants pre-loaded with eSTEPS software.

All methods were carried out in accordance with relevant guidelines and regulations. The protocol of the STEPS survey was approved by the Ethics Committee for Health Research of the Ministry of Health of Burkina Faso (deliberation No: 2012-12092; December 05, 2012). Written informed consent was systematically obtained from each participant in the STEPS survey.

### Study variables

Sociodemographic data collected included living environment, sex, age, marital status, education level and occupation. Self-reported data on the modifiable lifestyle factors were also collected: alcohol and/or tobacco use, oral hygiene practices, FV consumption, and physical inactivity. The anthropometric measurements of weight, height, as well as blood pressure were taken. Current alcohol consumption was defined as alcohol intake in the past one month while current tobacco use was defined as ever use of smoked or smokeless tobacco in the past 12 months. The oral hygiene practices were categorized based on the frequency of cleaning teeth per day, with, at least twice daily cleaning being recommended [10]. Daily FV intake was derived from the number of servings of FV consumed per day during a typical week. Five or more daily FV

servings is recommended [11]. Physical activity was investigated via the amount of time being physically active in three domains; transport, at work and during leisure time and participants were asked about the frequency, intensity and duration of their work-, travel- and leisure-related physical activity (vigorous or moderate), in a typical week [12]. We considered participants who reported no vigorous- or moderate physical activity during a typical week as being physically-inactive. BMI, calculated as a subject's weight divided by height<sup>2</sup>, in kg/m<sup>2</sup>, was characterized as underweight (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>) or obesity (BMI ≥30 kg/m<sup>2</sup>) states [13].

We defined persons living with hypertension as those with higher than or equal to 140 mmHg and/or diastolic blood pressure higher than or equal to 90 mmHg or those who reported current antihypertensive therapy use [1, 14]. Of those with hypertension, those who reported having been told by a doctor or a health professional as having raised blood pressure or hypertension were considered as being aware of their condition.

**Sample size:** Of a sample of 4800 individuals enrolled, 105 were not eligible; 10 had invalid data on sociodemographic variables. The number with missing or implausible data on lifestyle factors was as follows: 1 for tobacco, 6 oral hygiene practice; 279 for FV intake, 205 for BMI, 7 for blood pressure The 3413 normotensive individuals were excluded and finally, only the 774 hypertensive individuals with complete data were included in our secondary data analyses.

## Statistical analyses

We used StataCorp Stata Statistical Software for Windows (Version 14.0, College Station, Texas, US) to analyse the data. The quantitative variables were expressed as the means ± standard deviations, and the qualitative variables expressed as percentages (%) with 95% confidence intervals (CIs). Student's t test was used to compare quantitative variables, and the chi-square or the Fishers exact tests were used to compare categorical variables.

In the stepwise logistic regression models, we dichotomized the outcome variable (yes/no) as being aware or unaware of one's hypertension status, while the lifestyle factors were the explanatory variables, with adjustment on sociodemographic factors (sex, age, urban-rural residence, marital status, education and occupation). The Hosmer-Lemeshow test was performed to determine the goodness-of-fit of the logistic regression models. A p-value greater than 0.05 in the Hosmer-Lemeshow chi-square test was considered significant. Excluding the Hosmer-Lemeshow test, for all analyses, a p-value below 0.05 was considered statistically significant.

## Results

The mean age of the 774 persons living with hypertension was 43.8 ± 11.6 years. The participants were predominantly male (53.9%), rural residents (71.6%), illiterates (77.5%), or engaged in an occupation without formal income (92.0%) (Table 1).

Table 1  
Sociodemographic characteristics of overall hypertensive adults, according to the awareness of the diagnostic status.

	Overall hypertensive adults			Undiagnosed hypertensive adults			Diagnosed hypertensive adults			P
	N	%	95% CI	N	%	95% CI	N	%	95% CI	
	N = 774			657			N = 117			
Residence										0.0001
- Rural area	554	71.6	68.3–74.7	494	75.2	71.7–78.4	60	51.3	41.9–60.6	
- Urban area	220	28.4	25.3–31.7	163	24.8	21.6–28.3	57	48.7	39.4–58.1	
Sex										0.069
- Male	417	53.9	50.3–57.4	363	55.2	51.4–59.1	54	46.1	36.9–55.6	
- Female	357	46.1	42.6–49.7	294	44.8	40.9–48.6	63	53.9	44.4–63.1	
Age range (years)										0.0001
- 25–34	205	26.5	23.4–29.7	190	28.9	25.5–32.6	15	12.8	7.4–20.3	
- 35–44	193	26.0	21.9–28.1	174	26.5	23.1–30.0	19	16.2	10.1–24.2	
- 44–54	197	25.4	22.4–28.7	161	24.5	21.3–28.0	36	30.8	22.6–40.0	
- 55–64	179	23.1	20.2–26.3	132	20.1	17.1–23.4	47	40.2	31.2–49.6	
Marital status										0.73
- Married/cohabitating	650	84.0	81.2–86.5	553	84.2	81.2–86.9	97	82.9	74.8–89.2	
- Single	124	16.0	13.5–18.8	104	15.8	13.1–18.8	20	17.1	10.8–25.2	
Occupation										0.009
- Employees with formal income*	62	8.0	6.2–10.2	45	6.9	5.0–9.1	17	14.5	8.7–22.2	
- Others **	712	92.0	89.8–93.8	612	93.1	90.9–95.0	100	85.5	77.8–91.3	

\*: Workers with formal monthly salary in the public or private sectors; \*\*: Others: Self-employed, house maker, jobless, students); CI: confidence interval at 95%.

	Overall hypertensive adults			Undiagnosed hypertensive adults			Diagnosed hypertensive adults			
Education level										0.0001
- No formal education	584	75.5	72.3–78.4	519	79.0	75.7–82.1	65	55.6	46.1–64.7	
- Primary school	111	14.3	11.9–17.0	89	13.5	11.0–16.4	22	18.8	12.2–27.1	
- Secondary or higher	79	10.2	8.2–12.6	49	7.5	5.6–9.7	30	25.6	18.0–34.5	
*: Workers with formal monthly salary in the public or private sectors; ** Others: Self-employed, house maker, jobless, students); CI: confidence interval at 95%.										

Overall, 84.9% (95% CI: 82.2–87.3) of them were not aware of their hypertensive status (Table 2). About 43% of persons living with hypertension had recently used alcohol or tobacco or both, 69.4% did not clean their teeth frequently, 11.4% were physically inactive, 95.7% consumed inadequate FV servings and 29.7% were overweight or obese.

Table 2  
Lifestyle behaviours among overall hypertensive adults, according to the awareness towards the hypertension status.

Variable	Overall hypertensive adults			Undiagnosed hypertensive adults			Diagnosed hypertensive adults			P
	N	%	95% CI	N	%	95% CI	N	%	95% CI	
	N = 774			N = 657			N = 117			
Alcohol and/or tobacco use										0.027
- Used neither alcohol nor tobacco	454	58.7	55.1–62.2	379	57.7	53.8–61.5	75	64.1	54.7–72.8	
- Used either alcohol or tobacco	244	31.5	28.3–34.9	206	31.3	27.8–35.1	38	32.5	24.1–41.8	
- Used both alcohol and tobacco	76	9.8	7.8–12.1	72	11.0	8.7–13.6	4	3.4	0.9–8.5	
Oral hygiene practices: tooth cleaning frequency										0.12
- Did not clean the teeth at least twice a day	537	69.4	66.0–72.6	463	70.5	66.8–73.9	74	63.2	53.8–72.0	
- Cleaning the teeth at least twice a day	237	30.6	27.4–34.0	194	29.5	26.1–33.2	43	36.8	28.0–46.2	
Physical lifestyle (frequency of physical activity per week)										0.04
- Physically active	686	88.6	86.2–90.8	589	89.7	87.1–91.9	97	82.9	74.8–89.2	
- Physically inactive	88	11.4	9.2–13.8	68	10.3	8.1–12.9	20	17.1	10.8–25.2	
Fruits and vegetables consumption										0.076
- Inadequate FV intake	741	95.7	94.1–97.0	633	96.3	94.6–97.6	108	92.3	85.9–96.4	
- Adequate FV intake	33	4.3	3.0–5.9	24	3.7	2.4–5.4	9	7.7	3.6–14.1	
Body mass index categories										0.0001

Variable	Overall hypertensive adults			Undiagnosed hypertensive adults			Diagnosed hypertensive adults		
	n	%	95% CI	n	%	95% CI	n	%	95% CI
- Underweight	76	9.8	7.8–12.1	69	10.5	8.3–13.1	7	6.0	2.4–11.9
- Normal weight	468	60.5	56.9–63.9	421	64.1	60.3–67.8	47	40.2	31.2–49.6
- Overweight	151	19.5	16.8–22.5	117	17.8	15.0–21.0	34	29.0	21.0–38.2
- Obese	79	10.2	8.2–12.6	50	7.6	5.7–9.9	29	24.8	17.3–33.6

The differences in the lifestyles between those aware and unaware of their hypertension with respect to alcohol or tobacco use, physical activity and BMI were statistically significant (Table 2). Those who were aware that they had hypertension were more likely than those with undiagnosed hypertension to have abstained from tobacco or alcohol (64.1% versus 57.7%,  $p = 0.027$ ). They were, however, less likely to be physically active (82.9% versus 89.7%,  $p = 0.04$ ) and more than twice as likely to be overweight or obese (53.8% versus 25.4%,  $p < 0.001$ ). The differences in oral hygiene practices and daily FV intake were not statistically significant.

In multivariable analysis, participants with hypertension who were older, had primary education or higher, were overweight/obese, were currently using and had recently used alcohol/tobacco and those who consumed adequate FV servings were significantly more likely to report having been previously diagnosed as having hypertension (Table 3). The strongest predictors of being aware of one's hypertension were older age, educational level and BMI status. Participants aged 55–64 years old were 7.2 times as likely as those aged 25–34 years to be aware of their hypertension. Those with secondary or higher education were 5.6 times as those with no formal education to be aware of their hypertension. Participants who were overweight/obese were 3.2 times as those with normal BMI to be aware of their hypertensive status. In contrast, marital status, occupation, physical activity and frequency of teeth cleaning were not significantly associated with awareness of one's hypertension status. Regarding the goodness-of-fit test for this logistic regression model, the Hosmer-Lemeshow chi-square test yielded a p-value over 0.05.

Table 3

Associated factors with being warrened of its hypertension status, among hypertensive adults in Burkina Faso (n = 744).

Variables	Univariable analysis			Multivariable analysis		
	cOR	95% CI	p-value	aOR	95% CI	p-value
Residency: Urban vs rural (ref)	2.9	1.9–4.3	0.0001	1.4	0.8–2.3	0.24
Gender: women vs men (Ref)	1.4	>0.9–2.1	0.07	1.4	0.9–2.2	0.15
Age range						
- 25–34	1			1		
- 35–44	1.4	0.7–2.8	0.37	1.4	0.7–3.0	0.37
- 45–54	2.8	1.5–5.4	0.001	3.8	1.9–7.6	0.0001
- 55–64	4.5	2.4–8.4	0.0001	7.2	3.6–14.2	0.0001
Marital status: Married/cohabitating vs singles (Ref)	0.9	0.5–1.5	0.73	1.3	0.7–2.3	0.44
Occupation: employees with formal salary vs others (Ref)	2.3	1.3–4.2	0.006	0.7	0.3–1.7	0.46
Educational level						
- No formal education	1			1		
- Primary school	2.0	1.2–3.4	0.01	2.4	1.3–4.4	0.004
- Secondary or more	4.9	2.9–8.2	0.0001	5.6	3.1–10.1	0.0001
Physical activity: Inactive vs active (Ref)	1.8	1.1–3.1	0.04	0.9	0.5–1.9	0.99
Teeth cleaning at least twice a day: Yes, vs no (ref)	1.4	0.9–2.1	0.12	0.9	0.6–1.5	0.81
BMI categories						
- Normal	1			1		
- Underweight	0.9	0.4–2.1	0.82	0.7	0.3–1.8	0.51

The goodness-of-fit test of this logistic regression reported the  $\chi^2$  of Hosmer-Lemeshow at 8 degrees of freedom of 4.028, with the p-value of 0.86.

Variables	Univariable analysis			Multivariable analysis		
- Overweight/obesity	3.4	2.2– 5.1	0.0001	3.2	2.0– 5.1	0.0001
Recent or current use of alcohol or tobacco						
- Did not use alcohol or tobacco	1			1		
- Used alcohol and/or tobacco	0.8	0.5– 1.1	0.19	0.6	0.4– 0.9	0.028
Adequate FV consumption: Yes vs no (Ref)	2.2	>0.9– 4.9	0.052	2.8	1.2– 6.7	0.023
The goodness-of-fit test of this logistic regression reported the $\chi^2$ of Hosmer-Lemeshow at 8 degrees of freedom of 4.028, with the p-value of 0.86.						

## Discussion

Undiagnosed hypertension was very high (85%) among Burkinabè adults with hypertension. Our finding is similar to that in Tanzania (90%) [15] and Cameroon (81%) [16]. Nevertheless, the level of 78% was reported in Angola [17], 76% in Guinea [18], 71% in Kenya [19], 65% in Ghana [20] and 60% in Nigeria [21]. The high level of undiagnosed hypertension could pose a high risk for cardiovascular complications. In Nigeria, half of all acute stroke cases presented with undiagnosed hypertension [22]. More recently, the proportion of stroke due to undiagnosed hypertension in low-income countries (15.9%) was found to be about three times that in high-income countries (5.6%) [23]. The high level of un-awareness we found could be connected to the high number of cardiocerebrovascular events recorded in Burkina Faso hospitals: in 58%; 66%; 76% and 86% of patients with respectively acute coronary syndromes [24] cardioembolic disorders [25] stroke [26] and non-valvular atrial fibrillation [27], hypertension was reported. Moreover, the magnitude of unhealthy practices (except for physical inactivity, Table 2) could be related to the poor level of awareness of lifestyle modification which is needed in the management of hypertension or low knowledge on its benefits as recognized in Nigerians hypertensive adults [28]. Educational programs are needed [29] and should trigger an increased awareness toward modifiable lifestyle practices that will reduce risk for hypertension or cardiovascular disease onset.

Overall, the pattern of modifiable unhealthy lifestyle practices between persons living with hypertension in Burkina Faso who aware and unaware of their hypertensive status was mixed. Those aware of their hypertension being more likely to be non-current or recent users of alcohol or tobacco but then more likely to be physically inactive and overweight/obese.

Our findings of healthier smoking and alcohol use habits among adults aware of their hypertension agree with those of others. Those aware of their hypertension were more likely to adhere to reducing their alcohol consumption in Korea [8] and to accept smoking cessation (6.5%) in Nigeria [28]. In Ghana, undiagnosed adults with hypertension were more likely to be current users of alcohol (aOR = 3.2 CI: 2.1–4.8 for current drinking) or tobacco (aOR = 7.1, CI: 1.5–33.8 for current smoking) [29]. It is imperative to improve the

diagnosis of hypertension through measures such as opportunistic screening at health facilities and in communities to identify asymptomatic persons with hypertension and counsel them on harmful effects of tobacco and alcohol use.

Overall, only 4.3% of persons living with hypertension in Burkina Faso reported consuming adequate fruit and/or vegetable servings daily. Despite similar FV intake among persons with hypertension in Burkina Faso who were aware and those unaware of their hypertension, multivariable analysis showed significant positive association between being aware and adequate FV intake (Table 2). The low FV intake reflects the general low FV consumption ranging from 79–96% in West African countries [30]. FV consumption is considered to protect against hypertension [31] and stroke [32]. There is, therefore, the need for systematic dietary programmes to improve FV intake from childhood. The challenge is the ingrained cultural tastes and dietary preferences among Africans, even when the food habit is known to be unhealthy [33].

Awareness of hypertension among Burkinabe adults did not necessarily translate into healthier lifestyles. In other studies, greater awareness of hypertension did not always translate into better treatment and control of hypertension [34] or healthier lifestyles [35]. In six LMICs, overweight/obesity was associated with a lower risk of undiagnosed hypertension [36]. It is gratifying that those overweight/obese, a known risk factor for hypertension, were also more likely to be aware of their hypertension. Overweight and obese may have co-morbidities that increase their encounters with healthcare professionals and their opportunity to learn about their hypertensive status.

Consistent with our study finding in Burkina Faso, a study in Ghana found that the awareness of the hypertensive status did not influence their level of exercise practised (aOR = 1.03, CI: 0.7–1.5) [29]. A Sudanese study found that the lifestyle change that hypertensive subjects were least adherent to was regular exercise [37]. Lower adherence rates for either weight control or exercise have been commonly reported in hypertensive individuals [8]. In Ethiopia, non-adherence to physical exercise (aOR = 1.8, CI: 1.1–2.8) and non-adherence to weight management (aOR = 2.1, CI: 1.3–3.2) were associated with uncontrolled hypertension [38].

Healthy oral hygiene practices including frequent tooth brushing improves dyslipidaemia, particularly high-density lipoprotein cholesterol and triglyceride levels [39], and may help in the control of hypertension [40]. Choi et al demonstrated that systolic blood pressure levels progressively decreased as the frequency of toothbrushing increased [41]. Nonetheless, there is insufficient knowledge about adequate management of patients with hypertension in dental practice [42]. Preventive dental interventions could be used to reduce the development of hypertension [7]. Awareness programs are useful [43] to promote oral health and its benefits on blood pressure level in general population in Burkina Faso. We did not find differences in the oral hygiene practices between those aware and not aware of their hypertension among adults in Burkina Faso.

The strengths of our study include the large representative sample and the use of standard definitions of variables. Our study also has some limitations. First, hypertension was measured at a single visit and so may likely overestimate its prevalence [44]. Secondly, awareness was self-reported and could not be independently verified. Thirdly, it may have been socially desirable to report healthier lifestyles such as non-use of alcohol or tobacco, for example, among women and religious faithfuls. Fourthly, there may be the

issue of reverse causality in the cross-sectional design; for example, whether FV intake preceded or was as a result of hypertension. Fifthly, measurements of variables such as physical activity levels or fruit and vegetable intake were quite difficult, particularly for a largely illiterate population, even with the use of showcards. Reported values may reflect differences in the understanding of the questions. Sixthly, there were several variables such as salt intake [8], psychological stress and sleep quality [45] that were not included in the regression model. Finally, the level undiagnosed hypertension in 2013 may not reflect the current situation although it provides a relevant baseline against which future national surveys may be compared.

## Conclusion

The prevalence of undiagnosed hypertension is very high among Burkinabè adults. Whereas most participants were physically active, most did not consume adequate amounts of fruits and vegetables daily. Participants living with hypertension who reported being aware of their condition did not necessarily practise healthier lifestyles than those who had not been previously diagnosed. Further analysis is required to assess how awareness of hypertension relates to the control of hypertension. Current educational programmes for hypertension control should be intensified, starting from childhood with the aim of improving awareness, early reduction and promotion of risk reduction behaviour.

## Abbreviations

aOR  
Adjusted odds ratios  
BMI  
Body mass index  
CI  
Confidence interval  
cOR  
Crude odds ratio  
FV  
Fruits and/or vegetables  
kg/m<sup>2</sup>  
kilogramme per square metre  
LMICs  
Low and middle-income countries  
OR  
Odds ratio  
STEPS  
Stepwise approach to surveillance  
US  
United States  
WHO  
World Health Organization.

## Declarations

All methods were carried out in accordance with relevant guidelines and regulations. Ethics approval and consent to participate: The protocol of the STEPS survey was approved by the Ethics Committee for Health Research of the Ministry of Health (deliberation No: 2012-12092; December 05, 2012). Written informed consent was systematically obtained from each participant in the STEPS survey.

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**Authors' contributions:** JD, JK, ANZ and WKB contributed to drafting the manuscript, JD and WKB performed the statistical analysis, SWJ, PVO, AAS, FG and AM, provided the first interpretation of the results, JD and WKB reviewed the final version. All authors read and approved the final manuscript.

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**Data Availability Statement:** The database of the STEPS survey used for this secondary analysis is available at the Ministry of Health of Burkina Faso and can be requested from bicababrico78@gmail.com.

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