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Comparison of Stroke Risk Perception among General Population, People at Risk, Stroke Patients and Healthcare Workers in Burkina Faso

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Abstract

Background: Prevalence of stroke has been increasing in African countries. Obesity and smoking are well-known risk factors for stroke. However, few studies have focused on whether obese individuals and smokers perceive obesity and smoking, respectively, as personal risk factors for stroke.

Methods: Face-to-face interviews were administered to the participants. The sample of 1600 included 750 individuals from the general population, 110 patients with stroke, 400 individuals at risk, and 340 healthcare workers. The participants were asked whether they thought that stroke is preventable, whether they considered obesity and smoking as risk factors for stroke in general, and whether they perceived these factors as personal risk factors for stroke. Factors associated with accurate perception were analyzed using logistic regression with a model-building process.

Results: Accuracy of risk perceptions for stroke is extremely low in Burkina Faso. Only 56% and 37.25% of the general population and people at stroke risk, respectively, knew stroke was preventable. We found that health care workers significantly outperformed other population's inaccuracy for all questions. However, <50% of obese healthcare workers perceived obesity as a personal risk factor for stroke. Among the current smokers, 27%, 45%, 38% and 84% of the general population, patients with stroke, individuals at risk, and healthcare workers, respectively, perceived smoking as a personal risk factor for stroke.

Conclusion: Non-communicable diseases such as stroke have often been overlooked in lower-income countries. Burkina Faso suffers from low accuracy of risk perception for stroke. The significantly higher accuracy of healthcare workers suggests the importance of providing health education to all people.

Keywords: Non-communicable diseases; Risk Factors; Risk perception; Stroke; Developing countries

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Introduction

African countries are experiencing a surge in the incidence of cardiovascular diseases and stroke and their related disease burdens [1,2]. Stroke is the leading cause of death and disability related to cardiovascular diseases in 2010 in sub-Saharan Africa [1]. Among the African countries, Burkina Faso had the highest percentage change in age-standardized ischemic and hemorrhagic stroke mortality rates from 1990 to 2010 [2].

Obesity and smoking are two well-established risk factors for ischemic stroke [3-5]. Smoking is also a risk factor for recurrent stroke [6]. Nevertheless, individuals must perceive that these factors can increase their probability of developing a stroke if personal behavior changes to reduce stroke are to be established [7].

A common misconception is that obesity exists only in high-income countries [8]. Low- and middle-income countries such as sub-Saharan African countries have been increasingly encountering double burdens from risk factors for both infectious and non-communicable diseases. African countries are also experiencing increased tobacco consumption owing to increased purchasing power and tobacco accessibility [8].

Risk perception is the key driver for change in health behavior [9], but knowledge about stroke does not necessarily predict individual risk perceptions [10]. Several studies have investigated whether people are aware of certain stroke risks. Kleindorfer et al. [11] found that although stroke risks in the general U.S. population increased between 1995 and 2005, only 4.8% of individuals could identify at least three risk factors for stroke [11]. In another US study, found that even individuals with a history of stroke or risk factors for stroke lacked knowledge of stroke risks. However, Kraywinke et al. [7] conducted a survey *via* mailed questionnaires among 1,483 participants from Germany and found that 93.1% of the smokers were aware that smoking is a risk factor for stroke.

The perception of one's own risk of stroke has rarely been investigated. In addition, studies have not investigated whether a gap exists among the risk perceptions of the general population, individuals at risk, patients with stroke, and healthcare workers, especially in African countries. This study determined the level of accurate risk perception for stroke, with specific emphasis on overweight or obesity and smoking. We selected obesity and smoking for analysis because they are well-known factors for stroke, with a high prevalence. This study also analyzed whether such perceptions vary among different population strata, defined as general population, patients with stroke, individuals at risk, and healthcare workers.

Methods

Questionnaire design

The data from this study were retrieved from a larger project investigating the attitudes and perceptions of stroke in Burkina Faso. The questionnaire was designed to suit the local sociocultural contexts and practices based on previous studies conducted in sub-Saharan Africa [12-14]. Face-to-face interviews were conducted by trained interviewers. The survey lasted approximately 30 min per participant.

Sampling method

General population: A three-stage stratified random sampling method was adopted for the general population. Initially, the country was stratified into 13 strata based on the administrative regions. Two strata were then randomly selected using the ballot method. One province from each strata was randomly selected (Kossi and Comoé). Finally, the rural communes of each selected province were listed, and one urban commune (defined as our Primary Sampling Unit [PSU]) was randomly selected from each province. Nouna from Kossi province and Banfora from Comoé province were eventually selected.

In the second stage, all households in each PSU were enumerated. Then, the households to be surveyed were randomly selected using random digits. At the third stage, an individual aged at least 20 years from each selected household was randomly selected using the Kish method [15]. If the selected person was unavailable, a later appointment was made for the interview. If the selected person was unwilling to participate, no substitution was made in that household and the next household was considered. The final allocation of sample size of a selected area was proportional to the number of households in the area and was estimated to be 750.

Patients with a diagnosis of stroke or transient ischemic attack: Patients with at least one recent stroke were included because they represent individuals with the highest risk. Multicenter, prospective, and consecutive study methods were used. The survey was conducted in three tertiary teaching hospitals: The university hospitals of Yalgado Ouédraogo, Blaise Compaoré, and Souro Sanou. These are referral hospitals that offer specialized neurological care, and they were selected according to their service coverage and their capacity for treating strokes or Transient Ischemic Attack (TIA). They are the only centers in the country that provided treatment to patients with stroke or TIA.

At the Emergency Department (ED) and neurology units in each hospital, patients with a diagnosis of stroke or TIA were recruited and interviewed. All patients were admitted through the ED. Cases of stroke or TIA were confirmed through a clinical examination of patients presenting with neurological symptoms. Only patients who were evaluated by the physician as suitable to participate in the study and who provided consent were interviewed. The sample size was estimated as

$$N = Z^2 \times P\,(1-P)/e^2,$$

where Z denotes the α error (5%), P is the proportion of individuals with an overall cardiovascular risk factor of at least 30% in previous findings in the country (7.8%), and e denotes the precision (5%). Accordingly, we estimated the sample size to be 110 patients.

Individuals at risk: Within the previously selected tertiary hospitals, outpatients from the departments of cardiology, internal medicine, and nephrology were consecutively recruited. Detailed information regarding the study procedures was provided to all eligible individuals. Only patients presenting at least one documented stroke risk factor and those who provided written informed consent to participate were interviewed. Documented stroke risk factors were related to cardiology (atrial fibrillation, myocardial infarction, or hypertension), internal medicine (diabetes mellitus), and nephrology (hypertension). Moreover, healthcare professionals were excluded from this study population.

The sample size was calculated as before,

$$N = Z^2 \times P\,(1-P)/e^2,$$

where Z denotes α error (5%; =1.96), P denotes the urban prevalence in previous findings in the country (24%, 8%, and 6.3% for cardiology, nephrology, and diabetes, respectively), and e denotes precision (5%). The estimated minimal sample size was 378 287+91 (=378). Eventually, 400 participants were recruited.

Health care workers: We conducted a hospital-based survey in the previously selected tertiary hospitals to recruit healthcare workers, which included physicians, pharmacists, and nurses. Of all the hospitals in the country, the selected hospitals combined accounted for 60.65% of all hospital physicians, 56.41% of all hospital pharmacists, and 40.57% of all hospital nurses. The March 2016 Directorate General for sectoral studies and statistics provided the number of facilities and number of healthcare workers at the district, hospital, and regional levels. The sample sizes for this group were computed using the Raosoft sample size calculator. We set an acceptable margin of error at 5%, the confidence level at 95%, and a response distribution at 50%, which provided a larger sample size. In these hospitals, 353 physicians (275 specialists and 78 general practitioners), 44 pharmacists, and 903 nurses were included. The total targeted sample size was 1300 healthcare workers, which provided a minimal sample size of 297 healthcare workers. The final sample size of each specialty was proportionally allocated according to the total number of healthcare workers in that specialty. Therefore, we required 81 physicians, 10 pharmacists, and 206 nurses, and we finally included 100 physicians, 25 pharmacists, and 215 nurses.

Table 1: Sample characteristics.

	General population		Stroke patient		People at risk			
	n=750%		n=110%		n=400%		n=340%	
Age	35.39	13.06	62.42	12.84	44.28	14.78	33.27	7.63
Sex (male)	587	78.3	78	70.9	199	49.8	225	66.2
Education								
No education	155	20.69	22	20.18	77	19.25	0	
Primary	146	19.49	21	19.27	122	30.5	10	2.95
Secondary	33	4.41	8	7.34	79	19.75	137	40.41
Tertiary	415	55.41	58	53.21	122	30.5	192	56.64
Religion								
Catholic	147	19.6	24	21.82	147	19.6	104	30.59
Muslim	382	50.93	56	50.91	382	50.93	140	41.18
Protestant	166	22.13	16	14.55	166	22.13	80	23.53
Traditional and others	55	7.2	14	11.82	55	7.2	17	4.41
Disease history								
Hypertension (Yes)	48	6.4	80	72.73	319	79.75	42	12.35
Diabetes (Yes)	659	87.87	43	39.09	139	34.75	304	89.41
Family history of stroke (Yes)	692	92.3	23	20.91	2	0.5	286	84.12
Current smoker (Yes)	217	28.9	42	38.18	69	17.25	94	27.65
Body mass index (BMI, mean, sd)	23.54	3.47	25.49	4.3	24.4	4.39	24.15	3.24
Underweight	42	5.6	0	0	21	5.25	2	0.59
Normal	461	61.47	53	48.18	216	54	222	65.29
Overweight	217	28.93	21	19.09	114	28.5	83	24.41
Obese	30	4	36	32.73	49	12.25	33	9.71
Is stroke preventable?	426	56.8	42	38.18	149	37.25	324	95.29
All p<0.0001								

Sample characteristics: This table shows various characteristics of the study participants by four categories: General population, stroke patients, people at risk and healthcare workers

This study was approved by the Institutional Review Board of National Yang-Ming University and Ministry of Health, Burkina Faso. Informed consent had been obtained from participants in written form.

Data Collection

Data were collected through direct interviews from June 1st to September 30th, 2017. The interviews used a modified standardized questionnaire. Field teams with previous experience were trained by the project leader to conduct the survey. All the interviewers responsible for data collection met the required ethical standards. Informed consent was obtained before interviews from all participants. Quality control checks were performed when a questionnaire was returned by the interviewer. A pilot test was conducted before official data collection. Interviews were performed in the participants' homes or at the hospital (or other suitable locations) and at times that were suitable and convenient and could ensure the confidentiality of the participants.

Outcome Variables

The respondents were first asked whether they thought that stroke is preventable, considering that if people do not think that stroke is preventable, they would not make efforts to do so. They were then asked regarding their smoking status (current smoker, previous smoker, and never smoked). Because the number of people in the categories of previous smoker and never smoker was small, these two groups were combined for analysis. Weight and height were reported by the respondents and Body Mass Index (BMI) was calculated by the authors. According to the World Health Organization standards, weight statuses were defined as follows: Underweight (BMI<18.8 kg/m^2), normal weight (18.5 kg/m^2 ≤ BMI<25 kg/m^2), overweight (25 kg/m^2 ≥ BMI<30 kg/m^2), and obese (BMI ≥ 30 kg/m^2). The respondents were then asked whether they thought that overweight or obesity and smoking were the risk factors for stroke, and in a separate question, whether they thought that overweight or obesity and smoking were their personal risk factors for stroke.

Statistical Methods

The characteristics of the participants by population strata (general population, patients with stroke, individuals at risk, and healthcare workers) are presented in Table 1. Unadjusted responses to the three dependent variables were stratified by population strata and health behaviors (weight and smoking status).

Separated regression models for factors associated with correct answers for personal risk factors for stroke were then estimated. Initially, a regression for factors associated with the accurate answer for the question on whether stroke is preventable (regression 1) was estimated. A participant was coded 1, if they were overweight or obese and responded that they knew that overweight or obesity was a

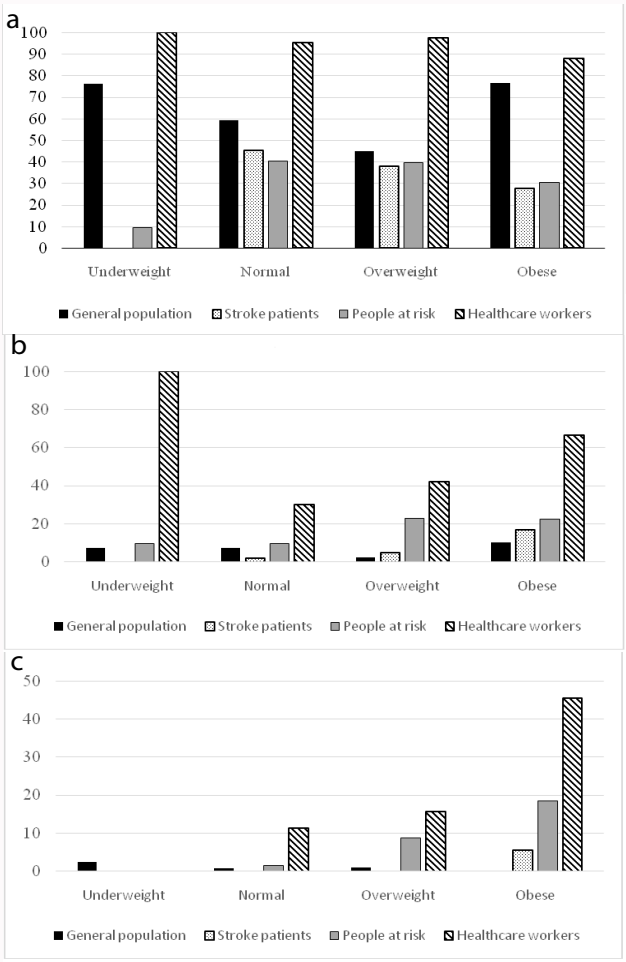

Figure 1: Percentage of respondents who (a) answered "yes" to the question "Do you think stroke is preventable?" by weight status, (b) indicated that overweight or obesity is a risk factor for stroke, and (c) indicated overweight or obesity as a personal risk factor for stroke.
Figure 1a: Is stroke preventable? (By weight status).
Figure 1b: Did you know that obesity is a risk factor for stroke?
Figure 1c: Do you think that obesity is your personal risk factor for stroke?

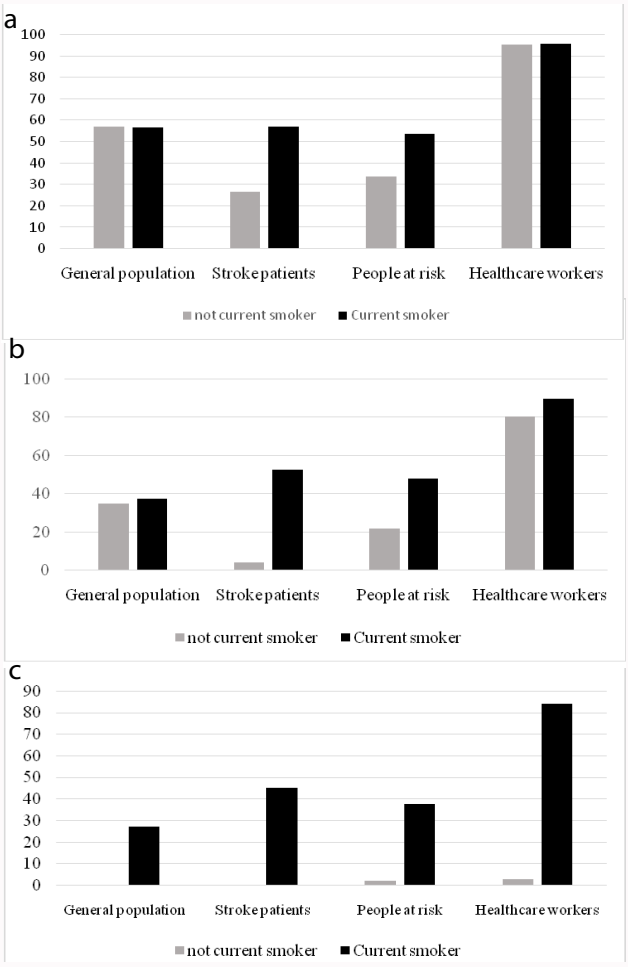

Figure 2: Percentage of respondents who (a) answered "yes" to the question "Do you think stroke is preventable?" by smoking status, (b) indicated that overweight or smoking is a risk factor for stroke, and (c) indicated smoking as a personal risk factor for stroke.
Figure 2a: Is stoke preventable? (By smoking status).
Figure 2b: Did you know that smoking is a risk factor for stroke?
Figure 2c: Do you think that smoking is your personal risk factor for stroke?

personal risk factor. A participant was coded 0, if they were overweight or obese and responded that they did not perceive overweight or obesity as a personal risk factor for stroke. Only overweight or obese individuals were included in this part of analysis (regression 2). Individuals who reported to be current smokers and responded that they knew that smoking was a personal risk factor were coded 1, and otherwise, they were coded 0. Only current smokers were included in this part of the analysis (regression 3).

A model-building approach was employed to determine the variables that would enter our final regression. A base model with baseline age, sex, education, religion, population strata, hypertension, diabetes, family history of stroke, BMI, and smoking status was first employed; note that for regression 3, the variable of smoking status was removed as only current smokers were included in the analysis. These variables were selected based on past studies [cite]. The baseline models were tested for Goodness of Fit (GOF). If a baseline model passed the GOF test, it was retained. Because both regression 1 and 3 passed the GOF test, they were retained. However, regression 2 failed the GOF test. Various models were then tested based on known factors associated with stroke and health behaviors by adding different functional forms and interaction terms. The final model was based on GOF test (necessary condition) and Bayesian information criterion.

Results

Table 1 lists the sample characteristics. All variables significantly differed among the four groups at a 5% significance level. Health care workers had the highest proportion of tertiary education among all groups.

Figure 1a shows the percentage of correct answers for the question whether stroke is preventable, stratified by population strata and weight status. Less than 70% of the participants in the general population were unaware that stroke is preventable. For all weight categories, patients with stroke and individuals at risk scored the lowest, and the lowest percentage of underweight and obese individuals answered correctly.

Figure 1b illustrates the percentage of correct answers for the question whether overweight or obesity is a risk factor for stroke. All underweight healthcare workers correctly answered this question; where as only 30% of the healthcare workers with normal weight correctly answered this question. Less than 10% of the general population knew that overweight or obesity is a risk factor for stroke.

Table 2: Multiple logistic regression for correct answers.

				Correctly perceive obesity as a personal risk factor		Correctly perceive smoking as a personal risk factor	
	n=1,536			n=481		n=414	
	aOR	95% CI		aOR	95% CI	aOR	95% CI
Age	0.99*	(0.98,	1.00)	1.02	(0.99, 1.05)	0.98	(0.96, 1.01)
Sex (female)	0.95	(0.71,	1.26)	1.06	(0.49, 2.31)	1.85	(0.27, 12.68)
Education							
No education (reference)	1			1		1	
Primary	2.75***	(1.90,	3.98)	1.46	(0.41, 5.18)	3.03***	(1.45, 6.34)
Secondary	3.81***	(2.39,	6.08)	2.32	(0.63, 8.50)	8.35***	(3.41, 20.45)
Tertiary	0.97	(0.71,	1.34)	0.22	(0.04, 1.31)	1.82	(0.92, 3.62)
Religion							
Catholic (reference)	1			1		1	
Muslim	1.1	(0.82,	1.49)	0.35*	(0.15, 0.85)	1.34	(0.76, 2.39)
Protestant	1.09	(0.76,	1.56)	1.35	(0.51, 3.58)	0.68	(0.33, 1.38)
Traditional and others	0.85	(0.50,	1.45)	0.66	(0.10, 4.27)	0.55	(0.21, 1.44)
Population strata							
General population (reference)	1			1		1	
Stroke patient	0.49*	(0.26,	0.92)	2.53	(0.18, 36.60)	5.10*	(1.26, 20.63)
People at risk	0.23***	(0.14,	0.40)	3.39	(0.51, 22.33)	1.78	(0.50, 6.41)
Healthcare workers	7.70***	(4.12,	14.38)	6.34*	(1.19, 33.67)	7.51***	(3.31, 17.05)
Disease history							
Hypertension (Yes)	1.1	(0.66,	1.82)				
Diabetes (Yes)	0.88	(0.62,	1.26)	1.66	(0.47, 5.78)	1.17	(0.26, 5.21)
Family history of stroke (Yes)	0.69	(0.36,	1.32)	1.1	(0.41, 2.96)	1.35	(0.65, 2.79)
Current smoker (Yes)	1.49**	(1.11,	2.00)	0.8	(0.21, 3.03)	1.05	(0.18, 6.17)
Body mass index (BMI, mean, sd)	0.95***	(0.92,	0.98)	1.13	(0.97, 1.32)	0.91*	(0.85, 0.98)
Population strata*weight categories							
Stroke patient/Obese (reference)				1			
People at risk/obese				1.85	(0.40, 8.58)		
Healthcare workers/obese				6.66*	(1.49, 29.82)		
Goodness of fit							
Pearson chi2	1569.5			419.3			424.4
(degrees of freedom)	-1513			-461			-396
p-value	0.152			0.918			0.16

Multiple logistic regression for correct answers: This tables shows factors associated with correct answers for the questions: 1. Is stroke preventable? 2. Correctly perceive obesity as a personal risk factor, and 3. Correctly perceive smoking as a personal risk factor

Although the highest percentage of correct answers was observed among obese health care workers, only 46% of them perceived overweight or obesity as their own risk factor, and this percentage dropped significantly for the other population groups (Figure 1c). About 18.37% of obese individuals at risk and only 1.4% obese individuals among the general population perceived obesity as a personal risk factor for stroke.

Healthcare workers had the highest proportion of participants who correctly answered the question whether stroke is preventable, regardless of their smoking status (Figure 2a). Similar results were observed for the question whether smoking is a risk factor for stroke (Figure 2b). However, not all healthcare workers scored correctly; only 80% of nonsmoking healthcare workers knew that smoking is a risk factor for stroke. Less than 40% of the general population knew that smoking is a risk factor for stroke.

Regardless of population strata, smokers performed better for the question whether they perceived smoking as a personal factor for stroke (Figure 2c). However, other than healthcare workers, less than 50% of the current-smoking respondents from all other population strata perceived smoking as a personal risk factor for stroke. This number was as low as 27% for the general population.

In the regression models (Table 2), population strata was a significant predictor for all three dependent variables, with healthcare workers having higher odds of reporting correct answers, as expected. Individuals with higher education had higher odds of answering correctly regarding whether stroke is preventable (OR=2.75, 95% CI= 1.90 to 3.98 for primary school and OR=3.81, 95% CI= 2.39 to 6.08 for secondary school) and whether they perceive smoking as a personal

risk factor (OR=3.03, 95% CI= 1.45 to 6.34 for primary school and OR=8.35, 95% CI =3.41 to 20.45 for secondary school). However, the results were not linear, and the effect of education stopped after secondary high school. The estimates for tertiary education were insignificant and in opposite directions for all dependent variables.

For whether the respondents correctly perceived overweight or obesity as a personal risk factor, a significant interaction was found between population strata and weight categories; for example, obese healthcare workers were the best at identifying being overweight or obese as a personal risk factors for stroke (OR=6.66, 95% CI= 1.49 to 29.82).

Discussion

Having a correct perception of risk is key to bringing about behavioral changes [16]. However, limited studies on patients with stroke have focused on this aspect in developing countries. In this study, we investigated whether the population in Burkina Faso knew that stroke is preventable and whether they correctly perceived overweight or obesity and smoking as personal risk factors for stroke. We found an extremely low proportion of accurate perceptions in Burkina Faso. We specifically emphasized healthcare workers, because although healthcare workers play an important role in primary care prevention, they may not be equipped with adequate knowledge in Burkina Faso [17]. Less than half of the obese healthcare workers perceived obesity as their own personal risk factor for stroke. This situation of low health awareness among healthcare workers is not unique to this study. One study showed that only one-third of the healthcare workers in South Africa had undergone flu vaccinations [18], which was significantly lower than the corresponding proportion in developed countries such as United Kingdom [19]. Thus, findings from studies on healthcare workers from developed countries should not be generalized to those from developing countries.

It should be noted that a considerable proportion of our respondents from the general population, patients with stroke, and those at risk thought that stroke is not preventable. This is a unique question that has rarely been investigated by other studies. As healthcare workers are, by definition, trained in health knowledge, the significantly higher proportion of healthcare workers who answered this question correctly clearly indicates that lack of health education is a key issue that the government of Burkina Faso should target for stroke prevention.

We found that perceptions of risks can vary significantly among different population strata. Efforts to improve knowledge and bring about changes in health behaviors should be designed in a way that specifically targets the characteristics of the different strata. We found that individuals at risk had more accurate risk perceptions than those of patients with stroke and the general population. However, the percentage of accurate perception remained low. A US study, with most participants being Caucasian women, found that only 5.4% of the participants with atrial fibrillation and 15.5% of the participants with heart diseases identified their health condition as a risk factor for stroke [10]. A study conducted in Greece demonstrated that only 15.0% of respondents who were current smokers considered themselves as being at high risk for stroke [20].

The limitations of this study should be noted. First, the survey data may have suffered from reporting biases. Smoking status is unlikely to be unknown; however, weight and height may have been answered inaccurately by the respondents. This problem, however, is not unique to this study. Second, we did not have data to analyze any interactions between risk perceptions for other diseases or to employ a broader range of stroke risks. For instance, an obese individual or a smoker may not perceive that they have a risk of stroke because of obesity or smoking; however, they may perceive that they have a high risk of stroke because of risk factors other than obesity and smoking and hence attempt to make behavioral changes. In such cases, the low accuracy in risk perception found in this study may be less concerning. However, this should be analyzed using other richer datasets. Given that obesity and smoking are well-known risk factors for stroke, we do not expect a significantly higher accuracy in other risk perceptions in Burkina Faso.

Conclusion

Obesity and smoking, which are strongly associated with stroke, are becoming more prevalent in African countries. Low accuracy of risk perceptions among overweight or obese individuals and current smokers is a cause of concern and warrants changes in public health policy. Here, healthcare workers outperformed other population strata in the accuracy of risk perception, thus indicating the importance of education as a promising intervention in this regard.

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