Prevalence of Stroke Risk Factors in an Urban Community at Parakou (Northern Benin) in 2016

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Abstract

Background: Sub-Saharan Africa faces a high burden of stroke due to growing of their risk factors. We aimed to estimate the prevalence of stroke risk factors and to identify associated factors in the district of Titirou in Parakou (northern Benin), in 2016.

Methods: It was a cross-sectional study. It included adults living in Titirou and having given their consent. A door-to-door survey was performed from 15 march to 15 July 2016 in each neighbourhood or village until the expected number reached. We recorded the socio-demographic data, medical histories, anthropometric and blood pressure measures using WHO steps approach. Prevalences of stroke risk factors were calculated and a logistic regression was done to identify factors associated with metabolic risk factors.

Results: A total of 4671 participants was included with a mean age of 27.7±12.9 years and a sex ratio of 0.97. Prevalences of behavioural risk factors were estimated at: 17.2% of alcohol consumption, 21.5% of low fruits and vegetables consumption, 51.1% of low physical activity practice, and 3.5% of smoking. Metabolic risk factors prevalence's amounted to: 8.7% of obesity, 7.1% of high blood pressure, 1.7% of self-reported diabetes and 2.2% of dyslipidaemia. Age ($p<0.001$), sex ($p<0.001$), marital status ($p<0.001$) and professional occupation ($p=0.010$) were associated with obesity. Age was also associated with high blood pressure ($p<0.001$) and diabetes ($p<0.001$). Dyslipidaemia varied according to smoking ($p=0.033$) and low physical activity practice ($p=0.003$).

Conclusion: The study showed high prevalences of low physical activity practice and obesity. Targeted local interventions focused on these factors should be conducted for primary prevention of stroke in this community, or even beyond in Benin.

Background

Cardiovascular diseases are a public health problem in the world. The World Health Organization estimated that around 17.9 million people died of cardiovascular disease in 2016, or one-third of global mortality [1]. The majority of these deaths are due to vascular diseases such as heart attack and stroke. They have occurred in low-and middle-income countries. While the incidence and mortality of stroke are declining in high-income countries, they are increasing in low-income countries [2].

The burden of stroke can be reduced by carrying out interventions on risk factors. The promotion of a healthy diet, regular physical activity, smoking cessation and reducing alcohol consumption are the keys of the primary prevention [1]. They allow to control metabolic risk factors (obesity, high blood pressure, raised blood sugar and raised blood cholesterol) [1].

Sub-Saharan African (SSA) countries face a double burden of communicable and non-communicable diseases. The increase in life expectancy, changes in eating habits and growing sedentary lifestyle are leading to high frequencies of stroke risk factors as shown by the results of STEPS surveys among adults

in SSA [3]. According to the STEPS survey conducted in Benin in 2015 among adults aged 18 to 69 years old: 5% used tobacco and 26.5% alcohol; about 93.1% had insufficient fruit and vegetable intake and 15.9% had low physical activity practice. Almost a tenth (7.4%) had obesity, 25.9% high blood pressure, 12.4% raised blood sugar and 4.4% raised blood cholesterol [4].

Advances in the control of infectious diseases in SSA are threatened by the burden of non-communicable diseases. The stroke prevalence in Benin varied from 0.2 to 1.5%, according to cross-sectional studies [5–7]. The stroke mortality at the Parakou University Hospital in Benin was estimated at 23.5% at 5 years, among 247 patients followed between 2012 and 2018 [8]. Stroke management is expensive; the direct hospital cost was estimated at around 620 USD in Parakou University hospital in 2011 [9].

For an effective fight against stroke in SSA countries, particularly in Benin, it is necessary to strengthen the primary prevention measures accessible to the local health system and communities. It is relevant to take into account epidemiological data and to update them periodically for the implementation of targeted interventions.

Methods

Aim, design, and frame

We aimed to estimate the prevalence of stroke risk factors and to identify associated factors in the district of Titirou in Parakou (Benin), in 2016. This was a cross-sectional study conducted in the district of Titirou in Parakou in 2016.

Parakou is located in the northern Benin, 425 km from Cotonou. The population was estimated 255,478 inhabitants, according to 2013 census [10]. It covers an area of 441 km², including about 70 km² urbanized areas. Parakou has three districts and 41 neighbourhoods and villages. The local economy is dominated by logging, agriculture, trade and the transport of goods. It houses a university. Parakou has many peripheral health centers and two university hospitals that are the Military hospital and the University Teaching Hospital/Borgou-Alibori where two neurologists and two cardiologists work full time. Titirou is the second most populated district of Parakou. The population was 25,530 inhabitants with 12,816 aged 15 years and over. It is subdivided into seven neighbourhoods and villages.

Participants and sampling

The study included people aged 15 years old or over, living in Titirou, present at the date of the survey at home, and having given their written consent to participate in the study. People unable to answer questions were not included.

A door-to-door survey was performed. In each neighbourhood or village, the investigators randomly determined a direction from the center. All subjects living in households and meeting the inclusion criteria in the selected direction were interviewed up to the expected number. When this number is not reached, they returned to the center and repeated the operation for another direction until the expected number.

The sample size was initially computed for a survey focused on the stroke prevalence with an expected value of 4.6 per 1000, a precision of 0.002 and an alpha risk of 0.05. The minimal number of subjects was 4600. The size by neighbourhood or village was proportional to their resident's number older than 15 years. This sample size corresponded to a precision 1.5% to estimate the prevalences of stroke risk factors, taking to account a theoretical value 50%, and an alpha risk 0.05.

Variables

The behavioural risk factors were defined through self-report as described below: (1) low consumption of fruit and vegetable by the consumption of less than 5 servings of fruit and vegetable per day during the last 12 months; (2) current smoking by the consumption of tobacco during the last 12 months; (3) alcohol consumption by the consumption of alcoholic beverages during the 30 last days ; (4) low physical activity practice by the practice of less than 150 minutes per / week of moderate physical activity or equivalent of vigorous physical activity or a combination of moderate and vigorous activities, during the last 12 months.

The metabolic risk factors were the main outcomes. They were defined as described below : (1) obesity by a body mass index (BMI) ≥30kg/m² calculated by dividing the weight (kg) by the square of the size (m); (2) high blood pressure by a systolic blood pressure ≥140 mmHg and/or a diastolic blood pressure ≥ 90 mmHg during the survey; (3) diabetes by self-report of history of diabetes (results of two fast venous blood glucose tests ≥ 1,26 g/l or using diabetes drugs during the survey) ; (4) dyslipidaemia was defined by self-report of history of blood total cholesterol (result of blood total cholesterol test ≥ 2,40 g/l or using statin during the survey).

Data collection

Two medical students at the end of their training in the Faculty of Medicine of Parakou University collected the data from 15 March to 15 July 2016. They have been trained on data collection tools before the survey. The data collection form was written in French from WHO STEPS instrument [1]. It comprised data on socio-demographic factors (age, sex, marital status, occupations, religion and ethnicity), medical histories (family history of stroke, hypertension and diabetes), behavioural risk factors (smoking, consumption of fruits and vegetables, physical activity practice, alcohol consumption), height, weight, and blood pressure. The data collection tools have been tested before the survey in a neighbourhood of another district (Bannikani) in Parakou.

At the participant home, an individual structured interview was performed in French or local language. Then the weight was taken using a weight scale (SECA, United Kingdom) with a precision of 100g. The height was measured using a height rod with a precision of 1 cm (SECA, United Kingdom). At the end, each subject had been lying for at least 5 minutes in a room in the house. After the 5-minute rest lying down, blood pressure was measured with an electronic device (OMRON M3, Japon), in a seated position, on the left arm, the hand resting on a support. Three consecutive measures were taken at 3-minute interval (between two readings). The mean value of two last measurements was considered.

Statistical analysis

Statistical analysis were performed thanks to Epi-Info version 7.1.3.10. Software (Epi info, CDC Atlanta, USA). The categorical variables were described as number and percentage. Continuous variables were described by using mean ± standard deviation. The Chi2 test or exact Fisher test were used to compare percentages between two groups. The prevalence of stroke risk factors were estimated with their 95% confidence interval. The association between metabolic risk factors, socio-demographic and behavioural variables were explored through a logistic regression. All variables with a p-value of 0.20 or less were simultaneously introduced in multivariate analysis by using step-by-step background approach. The crude and adjusted odds ratios (cOR, aOR) and their confidence intervals at 95% were determined. P-value under 0.05 was considered significant.

Ethical considerations

The administrative authorization of the local authorities was obtained before the survey. The Local Ethical Committee of Biomedical Research of the University of Parakou approved the research (Reference: 029/CLERB-UP/P/SP/R/SA). Each participant gave written consent before inclusion. The data were managed with confidentiality.

Results

General characteristic of participants

A total number of 4671 participants were included with a mean age of 27.6 ± 12.9 years and a sex-ratio of 0.98. No refusal was recorded during the survey. The socio-demographic data are described in table 1. Among the participants, 68.5% were under 30 years old. Almost a fifth of them were living in couple (16.7%) and had no formal education (16.7%). Resellers were most represented (20.4%).

Prevalence of stroke risk factors

The prevalences of behavioural risk factors were estimated at: 17.2% (95% confidence interval (CI) [16.1-18.3]) of alcohol consumption, 21.5% (95%CI [20.1-22.5]) of low fruit and vegetable consumption, 51.1% (95%CI [49.6-52.5]) of low physical activity practice and 3.5% (95%CI [2.9-4.0]) of smoking.

The prevalences of metabolic risk factors were estimated at: 8.7% (95%CI [7.9-9.6]) of obesity and 7.1% (95%CI [6.4-7.9]) of high blood pressure. Self-reported diabetes and dyslipidemia amounted to: 1.7% (95%CI [1.0-1.6]) and 2.2% (95%CI [1.9-2.7]), respectively.

Associated factors to metabolic risk factors

Data on univariate analysis are displayed in table 1 and table 2. All socio-demographic were associated to the obesity and to the high blood pressure, except sex (p = 0.653) for high blood pressure (table 1). No

behavioural factors were associated to obesity nor to high blood pressure, except low physical activity practice (p = 0.002) for obesity (table 1).

Only age (p < 0.001) and smoking (p = 0.034) were associated to self-reported diabetes mellitus (table 2). For dyslipidemia, the association with age (p < 0.001), professional activity (p < 0.001), low physical activity practice (p = 0.035) and smoking (p = 0.003) were significant (table 2).

Data on multivariate analysis are displayed in table 3 and table 4. Age (p<0.001), sex (p<0.001), marital status (p<0.001) and professional occupation (p=0.010) were associated to obesity (table 3). The obesity was less prevalent in men (adjusted prevalence-ratio (aOR) = 0.4; 95% CI [0.3-3.3]) compared to women. Conversely, it was more prevalent in older participants compared to “15-29” years old. It was also more prevalent in participants living in couple (aOR = 2.2; 95% CI [1.6-3.1]) than those living alone. The resellers had the highest prevalence (aOR = 3.5; 95% CI [2.1-5.6]) compared to participants who had others occupations.

Regarding high blood pressure, only the association with age (p<0.001), and marital status (p<0.001) were significant (table 3). The prevalence of high blood pressure was higher in older participants compared to “15-29” years old: “30-44” years old (aOR = 1.7; 95% CI [1.2-2.4]), “45-59” years old (aOR = 4.4; 95% CI [3.1-6.2]), and “≥60” years old (aOR = 3.5; 95% CI [2.2-5.4]). It was also higher in participants living in couple (aOR = 1.7; 95% CI [1.2-2.5]) compared to those living alone.

The prevalence of diabetes increased with the age (table 4). The highest prevalence was observed among the participants aged “≥60” years old (aOR = 5.9; 95% CI [2.9-12.1]). As for dyslipidemia, it was more prevalent among smokers (aOR = 2.3; 95% CI [1.1-4.8]); a lower prevalence was observed among participants who had a low practice physical activity (aOR = 0.7; 95% CI [0.4-0.9]) compared to those physically active (table 4).

Discussion

This study showed the magnitude of stroke risk factors in sample of relatively young people (mean age: 27.6 ± 12.9 years), in Titirou in Parakou (northern Benin), in 2016.

The slight female predominance and the high proportion of out of school people are in line with national demographic data [10].

The prevalence of alcohol consumption (21.5%) is in the range reported during STEPS surveys conducted in SSA from 2013 to 2016 (1.4-40.7%) [3]. Smoking (3.5%) was less prevalent compared to STEPS surveys results (4.2-13.3%). The same observation was made for low fruit and vegetable consumption (21.5%) ; the prevalences varied between 67.9-97.6% [3]. On the other hand, low physical activity practice prevalence (51.1%) was higher compared to STEPS surveys data (4.3-17.7%) [3].

The prevalence of obesity (8.7%) was in line with the STEPS surveys results (1.2-20.5%) while that of high blood pressure (7.1%) was very lower. For example, considering the same definition, 17.6% was reported

in Burkina-Faso in 2013, 23.1% in Uganda in 2014, 25.2% in Benin in 2015 [3]. Our result could be explained by the fact the sample comprised younger people.

Regarding diabetes mellitus and dyslipidemia, lower self-reported diabetes mellitus (0.7%) and total high blood total cholesterol (0.4%) were previously noted in Benin STEPS survey. The department of Borgou where Parakou is located is an area of high prevalence of diabetes [11,12]; further studies in the target area including blood glucose measurement could allow comparisons.

Age and gender were associated with obesity. The results are consistency with the literature data. The increasing of obesity with age as observed in this study, was previously described [3]. A positive association between obesity and female gender is noted during several cross-sectional studies in community: in SSA, Brazil, and China [3,13–17]. However, a contrary result, higher prevalence of obesity in men than women, was reported by Boua et al. during a study in demographic and health surveillance site in Burkina Faso [18].

Obesity prevalence was higher among participants living in couple than those living alone probably because people living as a couple are older and might be more sedentary than those living alone. Dagne et al. in Ethiopia had also noted that be married increased the risk of obesity [19]. Resellers seems more obese than the people who practice other activities probably because of differences in life style.

High blood pressure prevalence increase with the age but the classic linear association [20–22] was not observed. Contrary to literature data, no association was noted between obesity and behavioural factors nor between high blood pressure and behavioural factors.

The link between age and diabetes was confirmed in this study. Indeed, diabetes increase linearly with the age as previously reported in some steps surveys in SSA [3]. As one might expect, a positive association was observed between dyslipidaemia and smoking. On the contrary, dyslipidaemia was inversely linked to physical activity practice; it seems that people who knew their status regarding cholesterol are more sensibilized to regular physical activity practice than the others.

Strengths and limits of the study

This study used a methodology which allow to extrapolate the results to Titirou District. Otherwise, the sample comprised young people aged “15-17” years old, not taken into account in STEPS surveys. The results provides data on stroke risk factors that can be used for the implementation of targeted interventions in Titirou. They call for actions against sedentarity and obesity. They can also be used as advocacy for strengthening of early detection and management of metabolic risk factors in the peripheral health centers of Parakou.

Except obesity and high blood pressure, stroke risk factors were self-reported. Information bias due to wrong or not sincere declaration could have been introduced. Another limitation is that the population of Titirou is not representative of the population of Parakou. So we cannot extrapolate our results to the entire population of Parakou.

Conclusion

The study showed high prevalence of low physical activity practice and obesity particularly among females, elders, people living in couple and resellers. Collective actions focused on promotion of physically activity practice will be relevant among target people and even beyond in other localities of Benin with similar characteristics. Promotion of physical activity during leisure time would be a relevant goal. However, the actions should take into account socio-cultural realities.

Abbreviations

BMI: body mass index

SSA: sub-Sahara Africa

USD: US dollars

Declarations

- Ethics approval and consent to participate

The study was approved by the Local Ethical Committee of Biomedical Research of the University of Parakou (Reference: 029/CLERB-UP/P/SP/R/SA). Written consent was obtained from each participant.

- Consent for publication

Not applicable

- Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

- Competing interests

No competing interests

- Funding

No funding

- Authors' contributions

TA, MA, and HH: conception; HH: data collection; YCH and OK: data analysis; YCH and MA: manuscript draft; all authors: manuscript revision

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Tables

Table 1: Prevalence of obesity and high blood pressure according to socio-demographics and behavioural characteristics, Parakou 2016

		Obesity			High blood pressure		
	N (%)	N (%)	Crude OR [95%CI]	p	N (%)	Crude OR [95%CI]	p
Sample	4167 (100)	407 (8.7)			332 (7.1)		
Age (years)				<0.001			<0.001
15-29	3198 (68.5)	134 (4.2)	1		131 (4.1)	1	
30-44	927 (19.8)	182 (19.6)	5.6 [4.4-7.1]		89 (9.6)	2.5 [1.9-3.1]	
44-59	362 (7.8)	73 (20.2)	5.8 [4.2-7.9]		79 (21.8)	6.5 [4.2-7.9]	
≥60	184 (3.9)	18 (9.8)	2.5 [1.5-4.2]		33 (17.9)	5.1 [1.5-4.2]	
Sex				<0.001			0.653
Female	2365 (50.6)	315 (13.3)	1		172 (7.3)	1	
Male	2306 (49.4)	92 (4.0)	0.3 [0.2-0.4]		160 (6.9)	1.0 [0.8-1.2]	
School education level				<0.001			<0.001
None	807 (17.3)	135 (16.7)	1		89 (11.0)	1	
Primary	875 (18.7)	132 (15.1)	0.9 [0.7-1.1]		78 (8.9)	0.8 [0.6-1.1]	
Secondary	2581 (55.3)	124 (4.8)	0.3 [0.2-0.3]		129 (5.0)	0.3 [0.3-0.6]	
Universitary	408 (8.7)	16 (3.9)	0.2 [0.1-0.3]		36 (8.8)	0.8 [0.5-1.2]	
Marital status				<0.001			<0.001
Couple	2022 (43.3)	337 (16.7)	1		233 (11.5)	1	
Alone	2649 (56.7)	70 (2.6)	0.2 [0.1-0.3]		99 (3.7)	3.4 [2.6-4.3]	
Professional activity				<0.001			<0.001
craftsman	1859 (39.8)	31 (1.7)	1		61 (3.3)	1	
Worker/farmer	1320 (28.3)	170 (12.9)	8.7 [5.9-12.9]		112 (8.5)	2.7 [2.0-3.8]	
Resellers	759 (16.3)	155 (20.4)	15.1 [10.2-22.5]		80 (10.5)	3.5 [2.5-4.9]	
No economic activity/others	733 (15.6)	51 (7.0)	4.4 [2.8-6.9]		79 (10.8)	3.6 [2.5-5.0]	
Alcohol consumption				0.204			0.292
No	3867 (82.8)	346 (8.9)	1		282 (7.3)	1	
Yes	801 (17.2)	61 (7.6)	0.8 [0.6-1.1]		50 (6.2)	0.9 [0.6-1.2]	
Low fruit and vegetable consumption				0.406			0.303
No	990 (21.3)	80 (8.0)	1		78 (7.9)	1	
Yes	3667 (78.7)	327 (8.9)	1.1 [0.9-1.4]		254 (6.9)	0.9 [0.7-1.1]	
Low physical activity practice				0.001			0.484
No	2380 (51.0)	238 (10.0)	1		175 (7.4)	1	
Yes	2284 (49.0)	169 (7.3)	0.7 [0.6-0.9]		156 (6.8)	0.9 [0.7-1.2]	
Smoking				0.264			0.156
No	4510 (96.5)	397 (8.8)	1		16 (9.9)	1	
Yes	161 (3.5)	10 (6.2)	0.7 [0.4-1.3]		316 (7.0)	0.9 [0.9-2.5]	

CI: confidence interval; OR: Odds ratio

Table 2: Prevalence of diabetes mellitus and dyslipidaemia according to socio-demographic and to behavioural characteristics

		Diabetes			Dyslipidaemia		
	N (%)	N (%)	Crude OR [95%CI]	p	N (%)	Crude OR [95%CI]	p
Sample	4671 (100)	59 (1.3)			104 (2.2)		
Age (years)				<0.001			<0.001
15-29	3198 (68.5)	32 (1.0)	1		67 (2.1)	1	
30-44	927 (19.8)	7 (0.8)	0.8 [0.3-1.7]		18 (1.9)	0.9 [0.6-1.6]	
44-59	362 (7.8)	9 (2.5)	2.5 [1.2-5.3]		11 (3.1)	1.5 [0.8-2.8]	
≥60	184 (3.9)	11 (6.0)	6.2 [3.1-12.7]		8 (4.4)	2.1 [1.0-4.5]	
Sex				0.179			0.457
Female	2365 (50.6)	35 (1.5)	1		49 (2.1)	1	
Male	2306 (49.4)	24 (1.0)	0.7 [0.4-1.2]		55 (2.4)	1.2 [0.8-1.7]	
School education level				0.721			0.115
None	807 (17.3)	11 (1.4)	1		17 (2.1)	1	
Primary	875 (18.7)	13 (1.5)	1.1 [0.5-2.5]		19 (3.3)	1.6 [0.9-2.9]	
Secondary	2581 (55.3)	32 (1.2)	0.9 [0.5-1.8]		50 (2.0)	0.9 [0.5-1.6]	
Universitary	408 (8.7)	3 (0.7)	0.5 [0.2-1.9]		8 (2.0)	0.9 [0.4-2.2]	
Marital status				0.241			0.572
Couple	2022 (43.3)	30 (1.5)	1		48 (2.4)	1	
Alone*	2649 (56.7)	29 (1.1)	0.7 [0.4-1.2]		56 (2.1)	0.9 [0.6-1.3]	
Professional activity				0.116			<0.001
Craftsman	1859 (39.8)	19 (1.0)	1		38 (2.1)	1	
Worker/farmer	1320 (28.3)	13 (1.0)	1.0 [0.5-1.9]		27 (2.1)	1.0 [0.6-1.6]	
Resellers	759 (16.3)	12 (1.6)	1.6 [0.8-3.2]		24 (3.2)	1.6 [0.9-2.6]	
No economic activity/others	733 (15.6)	15 (2.1)	2.0 [1.0-4.0]		15 (2.1)	1.0 [0.5-1.8]	
Alcohol consumption				0.178			0.756
No	3867 (82.8)	45 (1.2)	1		85 (2.2)	1	
Yes	801 (17.2)	14 (1.8)	1.5 [0.8-2.8]		19 (2.4)	1.1 [0.7-1.8]	
Low fruits and vegetables consumption				0.716			0.246
No	1004 (21.5)	11 (1.1)	1		28 (2.8)	1	
Yes	3667 (78.5)	46 (1.3)	1.1 [0.6-2.2]		76 (2.1)	0.8 [0.5-1.2]	
Low physical activity practice				0.223			0.033
No	2291 (49.0)	33 (1.5)	1		61 (2.7)	1	
Yes	2380 (51.0)	25 (1.1)	1.4 [0.8-2.3]		43 (1.8)	0.7 [0.4-0.9]	
Smoking				0.034			0.003
No	4510 (96.5)	54 (1.2)	1		95 (2.1)	1	
Yes	161 (3.5)	5 (3.1)	2.6 [1.1-6.7]		9 (5.6)	2.7 [1.4-5.5]	

CI: confidence interval; OR: Odds ratio

Table 3: Factors associated to obesity and high blood pressure, mutivariate analysis, Parakou 2016

	Obesity		High blood pressure	
	aOR [95% CI]	p	aOR [95% CI]	p
Age (years)		<0.001		<0.001
30-44/15-29	2.5 [1.9-3.3]		1.7 [1.2-2.4]	
45-59/15-29	2.4 [1.7-3.4]		4.4 [3.1-6.2]	
≥60/15-29	1.2 [0.7-2.1]		3.5 [2.2-5.4]	
Sex (male/female)	0.4 [0.3-0.5]	<0.001	--	--
Marital status (couple/alone)	2.2 [1.6-3.1]	<0.001	1.7 [1.4-2.6]	<0.001
Professional occupation		0.010		--
Worker or farmer/craftsman	2.7 [1.7-4.4]		--	
Reseller / craftsman	3.5 [2.1-5.6]		--	
No occupation or other /craftsman	1.8 [1.1-3.0]		--	

CI: confidence interval; aOR: adjusted odds ratios

Table 4: Factors associated to self-reported diabetes mellitus and dyslipidaemia, multivariate analysis, Parakou 2016

	Diabetes		Dyslipidaemia	
	aOR [95% CI]	p	aOR [95% CI]	p
Age (years)		<0.001		--
30-44/15-29	0.7 [0.3-1.7]		--	
45-59/15-29	2.4 [1.1-5.1]		--	
≥60/15-29	5.9 [2.9-12.1]		--	
Low physical activity practice (yes/no)	--	--	0.7 [0.4-0.9]	0.036
Smoking (yes/no)	--	--	2.3 [1.1-4.8]	0.032

CI: confidence interval; aOR: adjusted