Ten-year change in blood pressure levels and prevalence of hypertension in urban and rural Cameroon

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Abstract

Background

Hypertension is becoming increasingly important in sub-Saharan Africa. However, evidences in support of this trend with time are still not available. The aim of this study was to evaluate the 10-year change in blood pressure levels and prevalence of hypertension in rural and urban Cameroon.

Methods

Two cross sectional population-based surveys in Yaounde (urban area) and Evodoula (rural area) in 1994 (1762 subjects) and 2003 (1398 subjects) used similar methodologies in women and men aged ≥ 24 years. Data on systolic and diastolic blood pressures (SBP and DBP), body mass index, educational level, alcohol consumption and tobacco smoking were collected during the two periods.

Results

Between 1994 and 2003, blood pressure levels significantly increased in rural women (SBP +18.2 mmHg, DBP +11.9 mmHg) and men (SBP +18.8 mmHg, DBP +11.6 mmHg), all p<0.001. In the urban area, SBP increased in women (+8.1 mmHg, p<0.001) and men (+6.5 mmHg, p<0.001), and DBP increased only in women (+3.3 mmHg, p<0.001). The odds ratio (95% CI) adjusted on confounders comparing the prevalence of hypertension (blood pressure ≥ 140/90 mmHg and/or treatment) between 2003 and 1994 ranged from 1.5 (1.1–2.2) in urban men to 5.3 (3.2–8.9) in rural men.

Discussion

Blood pressure levels of this population have deteriorated over time and the prevalence of hypertension has increased by two to five folds. Adverse effects of risk factors could account for some of these changes. Prevention and control programs are needed to reverse these trends and to avoid the looming complications.

Author Keywords Hypertension ; blood pressure ; trends ; developing countries ; sub-Saharan Africa ; Cameroon

INTRODUCTION

Sub-Saharan African countries (SSA) are experiencing rapid demographic and epidemiologic transitions.[1] These transitions are associated with increase susceptibility to non-communicable diseases (NCDs), dominated by cardiovascular diseases (CVD) and related risk factors: obesity, diabetes mellitus and hypertension.[1] [–5] Hypertension is a massive health problem, affecting about 20% of the adult population in developing countries.[6] It has been projected that by 2025, 29% of the world adult population will suffer from hypertension and most of those affected will be found in developing countries.[6] Conscious efforts in many affluent countries, both at population and individual levels have lowered the burden of CVD over the past few decades.[4] [, 7] Part of this change has resulted from the improvement in detection and control of individual risk factors and better management of cases.

Besides the already reported high prevalence of hypertension and other cardiovascular risk factors among African populations,[8] [–11] we do not know how these factors change with time in the rapidly evolving African rural and urban settings, both as the result of their natural history and as the consequence of control and prevention programs.

To explore some of these issues, we studied the temporal change in blood pressure levels and prevalence of hypertension in urban and rural Cameroonian adults over a ten year period. We also sought to characterise urban-rural differences and to identify potential predictors of the changing prevalence of hypertension.

MATERIAL AND METHODS

Study design, setting and participants

Two cross sectional surveys were conducted in 1994 and 2003 at the same sites in Cameroon, using similar methodology.[12–14] The study sites were the Cité Verte urban health district in Yaounde (the Capital City of Cameroon) and three villages of Evodoula rural health area, 60 km from Yaoundé. In 1994, all individuals aged 24 years and above were invited to participate. The age of those finally recruited into the study ranged from 24 to 74 Years. To keep the same age range across surveys, in 2003 we invited only individuals aged 24–74 years to participate. For each survey the selection of participants were restricted to people who have been living on the study sites for at least one year prior to the surveys. The response rates in rural and urban areas were 95% and 91% in 1994, and 92% and 87% in 2003. The main reasons for not participating in the study were fears about the quantity of blood to be collected, and of possible screening for HIV. A total of 1804 subjects took part in the 1994 survey and 1762 of them had complete data. In 2003, 1478 subjects were recruited into the study, and 1398 had completed data. Only the participants with complete data were included in the analysis.

Data Collection

Data collection took place at the nearest health facility and was conducted by nurses trained for the purpose of the study.[9] Initial screening of participants included assessment their alcohol consumption and tobacco smoking, their level of education, history of established hypertension and treatment, and family history of hypertension. The classification used was: non-smoker (had never smoked), ex-smoker (had stopped smoking for at least one year) and smokers (current smokers). Alcohol consumption was based on the intake of alcoholic beverages during the last year, with three classes: non-drinkers (had never drunk alcohol), ex-drinkers (had drunk alcohol in the past, but had stopped for at least one year) and drinkers (current drinkers). The type of last educational institution attended was used, giving three categories: illiterate (never attended), primary (1 to 7 years) and secondary or higher (7 to 14 years) in rural area, and primary or lower (< 7 years), secondary (7 to 14 years) and university (more than 14 years) in urban area.

Height (to the nearest centimetre) and weight (to the nearest kilogramme) were measured using standard methods and body mass index (BMI) calculated for all subjects. They were classified as underweight (BMI < 18.5 kg/m^2), normal weight (BMI ≥ 18.5 and BMI < 25 kg/m^2), overweight (BMI ≥ 25 kg/m^2 and BMI < 30 kg/m^2) and obese (BMI ≥ 30 kg/m^2).

Participants had to be seated for at least 30 minutes before blood pressure measurement. Diastolic (DBP) and systolic blood pressures (SBP) were recorded three times on the right arm using a standard mercury sphygmomanometer and appropriate cuff sizes. The 1st and 5th Korotkoff sounds were used as indicators of SBP and DBP respectively. The average of the second and third measures was used to define hypertension following two sets of criteria to account for the change in the definition of hypertension between 1994 and 2003:

- Old criteria: SBP ≥ 160 mmHg, and/or DBP ≥ 95 mmHg, or use of blood pressure lowering drugs;

- Recent criteria: SBP ≥ 140 mmHg, and/or DBP ≥ 90 mmHg, or use of blood pressure lowering drugs.

Statistical analyses

STATA$^{\text{®}}$ 8.2 was used for statistical analyses and statistical significance was set at $p < 0.05$. Analyses were stratified by sex and site of study (urban, rural). The results are reported as percentages (95% confidence intervals (CI)) and means ($\pm$ standard deviation). The prevalence of hypertension was age-standardised according to the Cameroonian 2000 population distribution.[15] Differences between means were compared using Student t-tests and Chi-square tests were used to compare frequencies. Multivariate logistic regression models were used to assess the association between hypertension across surveys and potential predictors including age groups (24–34, 35–44, 45–54, $\geq$55 years), alcohol consumption, tobacco smoking, education level, and categories of BMI.

Ethical Issues

The Helsinki declaration on medical ethics was respected in the surveys. Approvals were obtained from the National Ethical Committee and the Ministry of Health, and signed informed consent obtained from all participants.

RESULTS

General characteristics of the study population

The 1994 and the 2003 participants were relatively young with no age difference between men and women within sites. Urban participants were always younger than rural participants (p<0.001) (Table 1). Men had a higher educational level, drank and smoked more often than women. Rural men and women had similar BMI while urban women had a significantly higher BMI than urban men (p<0.001 for both surveys).

Rural-Urban and gender differences in blood pressures levels and prevalence of hypertension

Mean blood pressures levels were significantly higher in men compared to women across surveys and sites. Urban and rural participants in the 1994 survey had similar SBP while DBP was significantly lower in rural participants (p<0.001) in the same year. However, in 2003, SBP and DBP were all significantly higher in rural participants (p<0.001), probably because they were older. Reported family history of hypertension was more frequent among urban participants across surveys (all p<0.05). In 1994, rural women had a slightly higher prevalence of hypertension than rural men (Table 2). The opposite was observed in the urban population. In 2003, using the ≥ 140/90 mmHg cut-off values, rural and urban men displayed higher prevalences of hypertension compared to women. Assuming the ≥ 160/90 mmHg cutoffs, urban women had a slightly higher prevalence of hypertension than urban men.

Changes in risk factors levels and prevalence

The mean age slightly increased within sites between 1994 and 2003, in men and women. This change however, reached significance only for urban women (p<0.003). In the rural population, BMI significantly increased between surveys by 1.2 and 0.6 kg/m^2 in women (p<0.01) and men (p<0.02); in the urban population there was no significant increase. During the study interval, the prevalence of alcohol drinking increased in both genders and across sites, while tobacco smoking decreased in men (Table 1).

Changes in blood pressure levels and prevalence of hypertension between surveys

Across sites and in men and women, there was a systematic and significant increase in mean levels of SBP and DBP. As depicted in Figure 1 , the cumulative distribution curves of blood pressures were shifted to the right in 2003 in comparison to 1994. This trend was more pronounced in rural participants. The prevalence of hypertension, crude and age-adjusted, for the cut-off values ≥ 140/90 mmHg and ≥ 160/95 mmHg, significantly increased by 2- to 5- fold in rural and urban men and women over the ten-year period (Table 2). These prevalences increased more in rural men and women than in their urban counterparts. Taken separately, the crude prevalences of both newly diagnosed and known hypertension increased between the two surveys. After taking into account age groups, BMI, education level, alcohol consumption and tobacco smoking, the prevalence of hypertension (BP ≥ 140/90 mmHg and/or treatment) in 2003 in comparison to 1994 increased significantly in both genders in both rural (women: OR, 3.6, 95% CI, 2.2–5.9; men, 5.3, 3.2–8.9) and urban (women, 2.7, 1.9– 3.8; men, 1.5, 1.1–2.2) areas (Table 3).

Changes in the prevalence of hypertension and predictors

Irrespective of gender and place of residence, the prevalence of hypertension significantly increased with age and BMI groups (Table 3). The highest odd of having hypertension, after adjusting for all other risk factors, was seen in the oldest subjects, aged 55 to 74 years. Classes of BMI were tightly associated with hypertension in men than women. Using the normal weight group as reference, being overweight was associated with significantly increased risk of hypertension in urban participants, but not in the rural ones. There was a different association of hypertension with alcohol consumption across sites, with a positive association in rural area (significant only in men) and a negative association in urban area (significant only in women). Education level was inversely associated with hypertension in women, although significant only in the urban area (Table 3).

DISCUSSION

This is the first study describing the temporal changes in blood pressure levels and prevalence of hypertension in Black Africans, either in the context of it natural history or as an evaluation of control and prevention strategies. Average blood pressure levels in these populations significantly increased over the 10 year interval across sites in both men and women. The resulting increase in the prevalence of hypertension was higher in rural participants, reducing the rural-urban gradient previously observed. Age was a major predictor of the increasing prevalence of hypertension while different associations were observed with BMI, education levels, alcohol consumption and smoking. One positive finding of this study was the increase absolute prevalence of known hypertension across sites between the two surveys, most noted in the rural men.

We carried out the two cross-sectional surveys on the same sites using similar methodology, and included individuals in the same age range. We were therefore able to minimize the impact of unknown cofounders. Our sample size was large enough to provide stable estimates across sites and study groups as seen by the narrow confidence intervals for most of our estimates. High DBP has been shown to regress by close to 5 mmHg, and SBP by as much as 10 mmHg in untreated patients over 8 weeks.[16] This raises the possibility of an overestimation of untreated hypertension in our population. However, SBPs above 160 mmHg have been shown to remain elevated in more than 85% of subjects after three reviews.[17]

There was a general rightward shift of blood pressure with time, of up to 2 mmHg and 1 mmHg per year on a linear scale for SBP and DBP respectively, more pronounced in the rural area. This is mainly due to the increase in adiposity of Cameroonians between 1994 and 2003. Age was the main risk factor associated with hypertension in our study, followed by BMI. They are both established risks factors of hypertension. The prevalence of alcohol consumption increased between the two study periods, irrespective of place of residence and gender. It is positively related with hypertension. A decrease in physical activity levels, not documented in these surveys, particularly in the rural area, is another possible explanation for the trends found in our study. Between the two surveys, a highway was created, linking

Evodoula to Yaoundé, the capital city of Cameroon, creating more opportunities for sedentary-prone occupations. During the same period, with more electrification of Evodoula, more people probably acquired TV sets and cars, and these would incur less leisure-time physical activity. This added to unhealthy eating habits may explain the increase in weight and BMI noted between 1994 and 2003. The rapid urbanisation of Evodoula could explain why the changes in blood pressure levels were more pronounced in the rural area. Rapid urbanisation in fact is said to be the main driving force of the increasing prevalence of hypertension and NCDs in developing countries.18 Some other factors such as the lower level of blood pressures in 1994, and the more rapid increase in educational level and alcohol consumption may also have contributed. Further, before 2003 there were no public health prevention programmes in Cameroon warning the population about the health effects of weight gain and sedentarity. Neither physical activity levels nor dietary intakes were taken into account when adjusting for confounding variables in the present study. They are both related to hypertension, and could have reduced the odds ratios found in multivariate analysis between 2003 and 1994.

Meissner and co-workers 19 in Minesota reported the reduction by 6.6 mmHg and 3.6 mmHg respectively for SBP and DBP over a ten year period. However their data were from two different populations, even though they were reported to have the same characteristics. More importantly their population was relatively old (≥ 45 years), hence it is difficult to compare the two studies. In Tunisia, no significant change in the prevalence of hypertension was reported by Ben Romdhane over a 4 year period.20 In many developed countries, studies have reported a reduction in the community level of blood pressure over time, mostly as a result of control programs.5 Despite these achievements, the prevalence of hypertension tended to increase with time in these countries. This highlights the fact that the reported reduction in the absolute level of blood pressure probably occurred as a result of active management of cases through widespread use of drug treatment. In fact the downward trends of blood pressure as consequence of community prevention programs have been reported by a few studies, including the North Karelia study7 and the Mauritian non-communicable prevention program.21 Countries that have reported improvements in the community level of blood pressure over time have had effective prevention and control programs.22 NCDs were only recognised as a health priority in Cameroon in 2006 and prevention and control strategies are still at an embryonic stage. Communicable diseases, dominated by malaria and HIV/AIDS, and financial constraints are likely to limit the government's efforts.

One positive finding of this study is the increased absolute prevalence of known hypertension across sites between the two surveys, most noted in the rural men. This can be explained by the increased prevalence of hypertension in the community. It is also likely to be the result of the efforts of the population and health care providers to diagnose hypertension, as well as the lowering of diagnostic criteria for hypertension between the two surveys. However, the ratio of known to undiagnosed hypertension has worsened. Our study confirms the persistently high rate of undiagnosed hypertension in both surveys, as previously reported in Cameroon.9

This report shows an increasing prevalence of hypertension in the studied populations over time. The results of this study confirm the rapid epidemiological transitional process underway in SSA. Part of the observed changes can be explained by the adverse profile of other risk factors, notably obesity. The absence of concerted prevention and control efforts is another explanation, as shown by the high proportion of undiagnosed cases. Other factors not readily apparent in this study may have also contributed. The exploration of all these contributing factors should lay the foundation of any strategy aimed at reversing the observed trend. A plea is made for much greater epidemiological research with regular monitoring of trends of hypertension and other cardiovascular risk factors. This is necessary in order to obtain reliable figures for the prevalence of disease, to determine the best ways of applying current knowledge with existing and future resources, and to obtain information regarding both determinants of these changing trends and its impact on the incidence of attendant cardiovascular diseases.

Footnotes:
Contributors: JCM initiated the first survey, LF, APK JCM and PKA initiated the second survey and developed study protocols. LF, APK and BB developed the analysis plan and LF and BB did the analyses. LF and APK wrote the first manuscript, supervised by JCM and BB. All authors participated in interpreting the data and critically revising the manuscript for important intellectual content. APK is the guarantor.

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Figure 1

Cumulative distributions of systolic and diastolic blood pressures in 1994 and 2003 by sex and place of residence in Cameroonians aged 24 to 74years
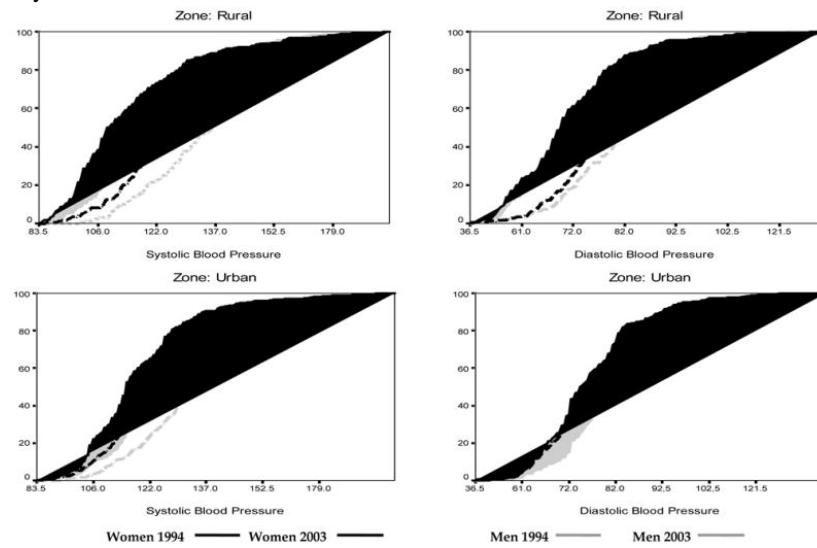
Table 1

Clinical characteristics [mean (standard deviation) or percentages] of the study populations in 1994 and 2003, by sex and place of residence

Years of study	Women			Men			1994	2003
	1994	2003	P[1]	1994	2003	P[1]	W[2] vs M[3]	W[2] vs M[3]
RURAL (n)	**421**	**222**		**296**	**193**		**P**	**P**
Age (years)	45.9 (12.7)	47.5 (13.6)	0.1	46.0 (13.9)	47.0 (14.6)	0.4	0.9	0.7
Family history of hypertension (%)	10.4	18.0	0.007	7.8	13.4	0.049	0.3	0.3
Secondary or higher education (%)	12.1	17.4	0.07	29.9	43.7	<0.001	0.005	0.003
Current drinkers (%)	33.9	70.1	<0.001	65.9	79.5	<0.001	0.002	0.04
Current smokers (%)	1.4	3.8	0.04	25.0	15.8	0.01	<0.001	< 0.001
Weight (kg)	57.5 (9.7)	60.5 (11.8)	0.002	63.8 (10.4)	65.5 (10.1)	0.09	<0.001	<0.001
Height (cm)	160.6 (6.4)	162.2 (5.6)	0.001	170.4 (7.7)	170.4 (7.1)	1.0	<0.001	<0.001
Body mass index (kg/m^2)	22.2 (3.2)	23.4 (5.6)	0.01	21.9 (2.7)	22.5 (3.1)	0.02	0.2	0.09
Systolic blood pressure (mmHg)	115.0 (20.2)	133.2 (26.1)	< 0.001	121.0 (19.3)	139.8 (23.5)	<0.001	<0.001	0.02
Diastolic blood pressure (mmHg)	71.0 (11.9)	82.9 (18.3)	< 0.001	73.6 (12.0)	85.2 (15.8)	<0.001	0.003	0.2
URBAN (n)	**584**	**567**		**461**	**416**			
Age (years)	37.5 (9.2)	39.3 (11.1)	0.003	37.8 (9.0)	37.0 (11.0)	0.3	0.7	0.02
Family history of hypertension (%)	31.0	39.6	0.003	27.4	35.6	0.009	0.2	0.09
University (education) (%)	22.6	27.5	0.054	57.8	51.9	0.09	<0.001	<0.001
Current drinkers (%)	22.1	59.9	<0.001	43.7	68.2	<0.001	<0.001	0.03
Current smokers (%)	2.7	3.1	0.6	19.4	14.9	0.09	<0.001	<0.001
Weight (kg)	70.2 (13.7)	73.4 (15.4)	< 0.001	74.4 (12.5)	75.3 (13.4)	0.3	<0.001	0.05
Height (cm)	161.4 (5.8)	164.0 (6.7)	<0.001	172.4 (6.8)	174.2 (7.1)	< 0.001	<0.001	<0.001
Body mass index (kg/m^2)	26.9 (5.0)	27.6 (6.3)	0.056	25.0 (3.7)	24.9 (4.4)	0.7	<0.001	<0.001
Systolic blood pressure (mmHg)	113.6 (15.5)	121.7 (20.1)	< 0.001	121.8 (18.7)	128.3 (17.7)	<0.001	<0.001	<0.001
Diastolic blood pressure (mmHg)	74.5 (11.1)	77.8 (14.8)	< 0.001	81.0 (13.8)	80.3 (12.7)	0.4	<0.001	0.006

[1] 1994 versus 2003.

[2] W = women;

[3] M = men.

Table 2

Crude and age-standardised prevalences of screened and known hypertension in 1994 and 2003, by sex and place of residence

Hypertension	Women			Men		
Year of study	1994	2003	P	1994	2003	P
RURAL	**421**	**222**		**296**	**193**	
Hypertension defined by BP ≥ 140/90 mmHg or treatment:						
Crude prevalence of hypertension			<0.001			<0.001
Screened hypertension	9.1 (6.4 – 11.8)	29.2 (23.0–35.4)		13.6 (9.7–17.5)	41.0 (33.7–48.9)	
Known hypertension	7.0 (4.6 – 9.4)	10.3 (6.5 – 14.8)		3.2 (1.2 – 5.3)	9.0 (5.2 – 13.1)	
Age-standardised prevalence of hypertension						
Hypertension (Screened +Known)	14.6 (11.2– 15.7)	34.1 (27.9–40.3)	<0.001	13.8 (9.9–17.6)	44.0 (36.8–50.9)	<0.001
Hypertension defined by BP ≥ 160/95 mmHg or treatment:						
Crude prevalence of hypertension			0.0001			<0.001
Screened hypertension	5.0 (2.9 – 7.1)	17.2 (12.1–22.0)		4.2 (1.9 – 6.5)	23.0 (17.2–29.1)	
Known hypertension	7.0 (4.6 – 9.4)	10.3 (6.5 – 14.8)		3.2 (1.2 – 5.3)	9.0 (5.2 – 13.1)	
Age-standardised prevalence of hypertension						
Hypertension (Screened +Known)	10.7 (6.9 – 13.6)	23.4 (17.9–28.9)	<0.001	6.7 (3.9 – 9.5)	27.4 (21.1–33.7)	<0.001
URBAN	**584**	**567**		**461**	**416**	
Hypertension defined by BP ≥ 140/90 mmHg or treatment:						
Crude prevalence of hypertension			<0.001			0.005
Screened hypertension	8.3 (5.1 – 10.5)	14.4 (11.5–17.3)		18.2 (14.7–21.7)	22.1 (18.1–26.0)	
Known hypertension	7.1 (5.0 – 9.2)	16.9 (13.8–20.1)		7.0 (4.7 – 9.3)	13.3 (10.0 –16.6)	
Age-standardised prevalence of hypertension						
Hypertension (Screened +Known)	20.1 (16.7–23.4)	37.2 (33.1–41.2)	<0.001	24.4 (20.5–28.3)	39.6 (34.9–45.3)	<0.001
Hypertension defined by BP ≥ 160/95 mmHg or treatment:						
Crude prevalence of hypertension			<0.001			0.001
Screened hypertension	3.5 (2.0 – 5.2)	8.5 (5.2 – 10.8)		8.2 (7.7 – 10.8)	8.8 (6.1 – 11.5)	
Known hypertension	7.1 (5.0 – 9.2)	16.9 (13.8–20.1)		7.0 (4.7 – 9.3)	13.3 (10.0–16.6)	
Age-standardised prevalence of hypertension						
Hypertension (Screened +Known)	13.2 (10.4– 16.1)	29.7 (25.9–33.5)	<0.001	15.5 (12.1–18.9)	25.4 (21.3–29.6)	<0.001

Table 3

Odds ratios and 95% confidence intervals from multiple logistic regression analyses for hypertension (Blood pressure > 140/90 mmHg and or treatment) with year of study, socioeconomic status and body mass index:

Variables in each model	Rural		Urban	
	Women	Men	Women	Men
N	605	467	1098	857
Year of study	$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.02$
1994	1	1	1	1
2003	3.6 (2.2–5.9)	5.3 (3.2–8.9)	2.7 (1.9–3.8)	1.5 (1.1–2.2)
Age (years)	$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$
24 – 34	1	1	1	1
35 – 44	1.3 (0.5–2.9)	3.3 (1.4–8.0)	1.9 (1.3–2.9)	1.4 (1.0–2.2)
45 – 54	3.7 (1.2–5.9)	4.5 (1.8–11)	3.3 (2.1–5.3)	2.0 (1.3–3.2)
55 – 74	7.4 (3.2–17)	8.5 (3.6–20)	9.0 (5.0–17)	3.2 (1.7–6.2)
BMI classes[1]	$p < 0.004$	$p < 0.04$	$p < 0.001$	$p < 0.001$
Underweight	0.4 (0.1–0.9)	0.9 (0.4–2.3)	0.3 (0.1–2.7)	_[3]
Normal weight	1	1	1	1
Overweight	1.3 (0.7–2.3)	1.3 (0.6–2.7)	2.3 (1.5–3.5)	2.1 (1.5–3.1)
Obese	3.4 (1.3–8.7)	9.4 (1.6–54)	3.2 (2.1–4.9)	5.1 (3.1–8.4)
Education level[2]	$p < 0.3$	$p < 0.8$	$p < 0.02$	$p < 0.9$
Low level	1	1	1	1
Intermediate level	1.4 (0.8–2.4)	0.8 (0.3–1.9)	0.6 (0.4–0.8)	1.0 (0.5–1.8)
High level	0.8 (0.3–2.1)	1.0 (0.4–2.6)	0.6 (0.4–1.0)	1.0 (0.5–1.8)
Alcohol consumption	$p < 0.5$	$p < 0.05$	$p < 0.04$	$p < 0.09$
Non drinkers	1	1	1	1
Ex drinkers	1.7 (0.7–4.2)	2.7 (0.9–8.0)	1.1 (0.7–1.7)	0.6 (0.4–1.0)
Current drinkers	1.2 (0.7–2.0)	2.8 (1.2–6.4)	0.7 (0.4–1.0)	0.9 (0.6–1.4)
Tobacco smoking	$p < 0.4$	$p < 0.06$	$p < 0.5$	$p < 0.1$
Non smokers	1	1	1	1
Ex smokers	0.3 (0.1–2.7)	2.3 (1.0–5.0)	1.4 (0.7–2.8)	0.7 (0.4–1.1)
Current smokers	0.4 (0.1–2.4)	1.6 (0.9–3.0)	1.4 (0.6–3.4)	0.7 (0.4–1.1)

[1] Underweight: BMI < 18.5 kg/m^2; normal weight: 18.5 kg/m^2 < BMI < 25.0 kg/m^2; overweight: 25.0 kg/m^2 < BMI < 30.0 kg/m^2; obese: BMI ≥ 30.0 kg/m^2.

[2] Rural area: low = illiterate, intermediate = primary, high = secondary or higher. Urban area: low = primary or lower, intermediate = secondary, high = university.

[3] No cases of hypertension in underweight subjects.