Haya: The Saudi Journal of Life Sciences (SJLS) **ISSN 2415-623X (Print)**
Scholars Middle East Publishers **ISSN 2415-6221 (Online)**
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

Impact of Physical Activity Profile and Tobacco Consumption on Cardiometabolic Diseases of Cameroonians in Dschang Health District

MBS Dandji[1*], FN Zambou[1], FCN Nana[2], EPS Fodja[4], D Lemogoum[5], DSB Dangang[1], FM Tchouanguep[1, 3],
[1]Biochemistry Laboratory of Medicinal Plants, Food Science and Nutrition, Department of Biochemistry, Faculty of Science, University of Dschang, Dschang-Cameroon.
[2]Animal Health Laboratory, Department of Animal Production, Faculty of Agronomy and Agricultural Sciences, University of Dschang, Dschang-Cameroon.
[3]Laboratory of Microbiology and Antimicrobial Substances, Department of Biochemistry, Faculty of Science, University of Dschang, Dschang-Cameroon.
[4]Analytical Structural and Organic Chemistry Laboratory, Department of Organic Chemistry, Faculty of Science, University of Yaounde, Yaounde-Cameroon.
[5]Department of Cardiology, Erasme Hospital, Free University of Brussels, 808 Lennik Road, Belgium

Original Research Article

***Corresponding author**
Dandji Saah Marc Bertarnd

Article History
Received: 08.01.2018
Accepted: 17.01.2018
Published: 30.01.2018

DOI:
10.21276/haya.2018.3.1.8

Abstract: This study aimed at studying the epidemiology and prevalence of risk factors for cardiometabolic diseases. 254 male subjects aged between 30 and 60 years old and apparently in good health having consented freely. They were randomly selected from 10 health areas, including 5 in urban area (n=107) and 5 in rural area (n=147), in Dschang Health District. After obtaining the ethical clearance, the level of physical activity, the data on socio-demographic conditions and smoking were identified by a simplified questionnaire. With the help of nurses and investigators, anthropometric measurements, blood pressure, umbilical perimeter, waist circumference, body mass index and fasting blood glucose were measured. Approximately 5 ml of blood was taken at the elbow for biochemical assays. The collected data were submitted to the EPI-Info™ version 7.1.5.0. Software. Results showed that 83% of people were inactive in rural area and the 41-50 age group was more inactive (18.03%) whereas in the urban area there was 76.19% of inactive people and the 51-60 age group recorded the most inactive individuals (43.83%) (P>0.05). The inactive population showed 38.24% overweight and 14.7% obese. Smokers represented only 20.55% in rural area and 16.82% in urban area. Triglycerides, which were higher among smokers in rural area (349 ±49.23 mg/dl at P>0.05) than in the urban area for former smokers (343.78 ±48.08 mg/dl) who had a higher rate but without significant difference with the other categories of smokers (P>0.05). Atherosclerosis index of smokers from urban area was higher without significant difference compared to other groups.
Keywords: Physical activity**,** Tobacco smoke, Anthropometric measurements, Body mass index, Atherosclerosis index, Cardiometabolic diseases, Dschang Health District.

INTRODUCTION

Urbanisation increases rapidly in developing countries around the world mainly due to rural exodus. Urban lifestyle compared to rural style is very closely associated with a high prevalence of certain chronic and non-communicable diseases (NCD) related to inactivity and smoking [1]. Physical activity today is less practiced because of the modernisation that requires the development of passive leisure and motorization. It can be defined as the movement of the body in all daily activities of live and minimises the risk of heart attack and stroke [2]. Regular physical activity is a good strategy in the prevention and treatment of cardiovascular risk factors [3, 4] since an estimated 3.2 billion deaths were attributable to physical inactivity [5]. Smoking is an acute or chronic intoxication [6]. It represents a global public health problem with nearly 6 million preventable deaths per year [7]. The components of tobacco smoke increase the atherosclerosis index by hardening the arteries especially in the black race [8], they also cause a reduction in life expectancy of more than 10 years [9] and are closely associated with cardiometabolic diseases (CMD) in the population [1]. It is estimated that 16.6% of adults currently use tobacco in all its forms in the world [5] and this number is increasing with the population growth. These unhealthy lifestyle behaviours induce cardiometabolic risks (CMR). CMR represent all of the risk factors for CMD and type 2 diabetes [10]. They represent the leading cause of death

in the world at the beginning of the 21st century [11]. In Africa, NCD are growing faster than in developed countries and their impact is greater [12] with a high economic and social cost [13], hindering its growth [14]. The entry into the working life in Cameroon is synonymous with regular financial accessibility, it very often leads to the rapid acquisition of harmful lifestyles related to changes in physical activity patterns. The risk of cardiometabolic complications increases after the age of 30 years and these metabolic disorders that affect the heart and blood vessels are mainly caused by smoking, sedentary lifestyle, alcoholism and poor nutrition [15]. Cameroon is hardly affected by CMD presented as a "silent killer" affecting more than 4 million people according to the Cameroon Heart Foundation [16]. These statistics are bringing more fears, hence the need to take preventive measures, particularly in urban area [17]. The originality of this research lies therefore in the description of the physical activity and smoking profiles of adults correlated with the occurrence of cardiometabolic pathologies.

MATERIAL AND METHODS

Study area and eligibility criteria

Our study was conducted in the Dschang Health District (DHD), after obtaining the ethical clearance by the "Cameroon Bioethics Initiative" (Protocol number 1061), after enlighted information, free consent expressed by the signature of 254 subjects distributed in 10 health areas (five in urban area and five in rural area) randomly selected. Male, randomly recruited between the ages of 30 and 60 years, were apparently in good health and having lived for at least 6 months in the study environment allowed us to collect data.

Data collection

Six interviewers used a pre-tested questionnaire on twenty-one people in the urban area. The questionnaire was inspired by those of Global Physical Activity Questionnaire [18] and International Physical Activity Questionnaire [19] for physical activity profile and Global Adult Tobacco Survey [20] for questions on tobacco consumption by adapting them to our context. In a face-to-face interview, the indicators related to educational level, marital status, occupation and socio-economic level of our subjects were identified. At the end of the interview, two nurses tested blood glucose from a Roche brand Accu-Chek® Active reader, blood pressure two times with an Arm-type Fully Automatic BP-103H Blood Pressure Monitor arm blood pressure monitor, waist circumference with a tailor meter, body mass index using a Sinbo QE-2003B Max 150kg/100g Electronic Scale and a locally made wooden toise in fasted subjects. They also take 5 ml of blood from the elbow in sterile tubes for lipids, transaminases and proteins assayed by enzymatic-colorimetric method from a commercial kit "INMESCO. The following modified Friedewald's formula was used to calculate the concentration of LDL-c in serum [21].

Serum preparation and dosage

The blood was transported to the laboratory and centrifuged at 3500 rpm for 10 minutes. The serum obtained was stored at -20°c until determination of transaminases, creatinine, uric acid and lipids. Contaminated material was sterilized in an autoclave labelled Sonaclav at 121°c for 20 minutes and at a pressure of 1.2 bar before being poured into a pit to avoid any risk of contamination.

Statistical analysis

The collected data were submitted to the EPI-Info™ version 7.1.5.0 software. The Chi square test allowed us to compare the frequencies and the Fischer Exact Test to compare the averages. The results were expressed as frequency and mean ±SD. Statistically significant differences are defined at the 95% confidence interval.

RESULTS

Main demographic characteristics of the study population

Table-1 showed that the participants were almost informed about the occurrence of strokes and heart attacks in their surroundings, as well in rural and urban areas.

Physical activity profile of the study population

Physical activity profile of the DHD population according to age and living environment

Table-2 provided information on the physical activity profile of the DHD population. It showed that in the rural area, 38.78% of people practiced intense physical activity and the 51-60 age group (45.61%) practiced very significantly (P<0.00) the intense physical activity compared to those of 30-40 age group (26.32%) and 41-50 age group (28.07%). In the urban area, 41.12% of participants who practiced intense physical activity were in the 51-60 age group, which was more active with 50% and 46.84% respectively for intense and moderate physical activities (P>0,05). However, it should be noted that 83% of people were inactive in rural area and the 41-50 age group was more inactive (18.03%) whereas in the urban area there was 76.19% of inactive people and the 51-60 age group recorded the most inactive individuals (43.83%) (P>0.05).

Influence of demography and living environment on physical activity

Table-3 helped to observe the influence of demography and living environment on the practice of physical activity. We noted that physical activity was influenced by education level but not significantly in both rural and urban areas (P>0.05). In the urban area, 2.27% have not been to school, 13.64% have been at primary school, 43.18% attended secondary education

and 40.91% went to university who practiced physical activity. We also noticed that it is the married people who practiced mostly a physical activity as well as in rural (84.21%) and urban (90.91%) areas, but the difference was not significant compared to the singles (12.28% and 6.82%), divorced (1.75% and 2.27%) and widowers (1.75% and 0%). manufacturers (73.68%) in rural area practiced physical activity more significantly (P<0.00) compared to bureaucrat (0%) and those who did strength activities (26.32%). In the urban area, it is the bureaucrat who practiced significantly (P=0.04) less physical activity compared to manufacturers (25.40%) and those doing strength activities (9.52%).

Table-1: Demographic Characteristics of the Urban and Rural Population

Characteristics		Urban area (n = 107)				Rural area (n = 147)			
		Age group							
		30-40	41-50	51-60	*p-value*	30-40	41-50	51-60	*p-value*
		(%)	(%)	(%)		(%)	(%)	(%)	
Level of study	Non educated	0	0	100	< 0.001*	10	10	80	0.465*
	Primary	7.69	23.08	69.23	< 0.001**	14.29	17.14	68.57	< 0.001**
	Secondary	6.67	28.89	64.44		17.54	19.30	63.16	
	University	59.57	19.15	21.28		4	20	40	
Marital status	Single	92.86	0		0.297**	85.71	0	14.29	< 0.001*
	Married	18.68	27.47	53.85		10.08	19.38	70.54	0.297**
	Divorced	100	0	0		0	100	0	
	Widower	0	0	0		0	0	100	
Occupation	Bureaucrat	42.37	20.34	37.29	0.01*	0	0	100	< 0.001*
	Manufacturing	13.89	33.33	52.78	< 0.001**	19.27	19.27	61.47	0.297**
	Strength activity								
Information on stroke and heart attacks	Yes	16.67	8.33	75		19.05	23.81	57.14	
	No	30.39	24.51	45.10	0.267*	17.24	17.93	64.83	0.584*
		20	0	80	0.115**	0	0	100	0.115**

% = percentage by characteristic, * = p-value comparing characteristics and age groups, ** = p-value comparing characteristics, %n = total percentage in area.

Table-2: Physical activity profile of the DHD population

Characteristics		Rural area (N = 147)				Urban area (N = 107)			
		Age group			%N	Age group			%N
		30-40 n = 25	41-50 n = 26	51-60 n = 96		41-50 n = 32	51-60 n = 50	30-40 n = 25	
		n (%)	n (%)	n (%)		n (%)	n (%)	n (%)	
IPA	Yes (n = 57)	15 (26.32)	16 (28.07)	26 (45.61)	38.78	10 (22.73)	12 (27.27)	22 (50)	41.12
	No (n = 90)	10 (11.11)	10 (11.11)	70 (77.78)	61.22	22 (34.92)	13 (20.64)	28 (44,44)	58.88
	p-value	*< 0.00*				*0.38*			
MPA	Yes (n = 121)	22 (18.18)	23 (19.01)	76 (62.81)	82.31	24 (30.38)	18 (22.78)	37 (46,84)	73.83
	No (n = 26)	3 (11.54)	3 (11.54)	20 (76.92)	17.69	8 (28.57)	7 (25)	13 (46,43)	26.17
	p-value	*0,39*				*0.97*			
WPA	Yes (n = 142)	25 (17.61)	25 (17.61)	92 (64.78)	96.60	31 (33.33)	21 (22.58)	41 (44,09)	86.92
	No (n = 5)	0 (0)	1 (20)	4 (80)	3.40	1 (7.14)	4 (28.57)	9 (64,29)	13.08
	p-value	*0.59*				*0.13*			
Inactive	Less than 10 hours/week (n = 25)	6 (17.02)	4 (17.69)	15 (65.31)	17	8 (29.91)	10 (23.36)	17 (46,73)	23.81
	More than 10 hours/week (n = 122)	19 (15.58)	22 (18.04)	81 (66.38)	83	24 (33.33)	15 (20.84)	33 (45,83)	76.19
	p-value	*0.16*				*0.39*			

n (%) = Size and percentage by characteristic, N = Size/area, IPA = Intense Physical Activity, MPA = Moderate Physical Activity , WPA = Weak Pysical Activity, DHD = Dschang Health District.

Table-3: Variation of physical activity practice in relation with demography

Characteristics		PA	Rural area (N = 147)	Urban area (N = 107)
			n (%)	n (%)
Level of education	Non educated	Yes	1 (1.75)	1 (2.27)
		No	9 (10)	1 (1.59)
	Primary	Yes	30 (52.64)	6 (13.64)
		No	40 (44.44)	7 (11.11)
	Secondary	Yes	23 (40.35)	19 (43.18)
		No	34 (37.78)	26 (41.27)
	University	Yes	3 (5.26)	18 (40.91)
		No	7 (7.78)	29 (46.03)
	p-value		*0.22*	*0.94*
Marital status	Single	Yes	7 (12.28)	3 (6.82)
		No	3 (6.82)	11 (17.46)
	Divorced	Yes	1 (1.76)	1 (2.27)
		No	0 (0)	1 (1.59)
	Married	Yes	48 (84.21)	40 (90.91)
		No	81 (90)	51 (80.95)
	Widower	Yes	1 (1.75)	0 (0)
		No	2 (3.18)	0 (0)
	p-value		*0.48*	/
Occupation	Strength activity	Yes	15 (26.32)	6 (13.64)
		No	6 (6.67)	6 (9.52)
	Bureaucrat	Yes	0 (0)	18 (40.91)
		No	17 (18.89)	41 (65.08)
	Manufacturer	Yes	42 (73.68)	20 (45.45)
		No	67 (74.44)	16 (25.40)
	p-value		*< 0.00*	*0.04*

N = Size/area, PA = Physical activity, n (%) = Size and percentage by characteristic.

Influence of demography and age on physical activity practice

Demographics and age can also influence physical activity as shown in Table-4. It appeared that participants from university level of 30-40 age group (32%) have significantly higher physical activity (P=0.01) than those in other levels of education. While in the 41-50 age group, it was the primary (35.71%) and secondary (35.71%) who practiced more physical activities (P>0.05). The same trend was observed in the age group 51-60 with respectively 39.58% in primary and 47.92% in secondary level but without significant difference (P>0.05) compared to non-educated (2.08%) and university level (10.42%). The most active were also observed in the 51-60 age group (97.92%) with no significant difference compared to 41-50 age group (96.43%) and 30-40 years (56%). manufacturers remain the most active regardless of age. Among 30-40 year olds 56% of people were active with a very significant difference (P<0.00) compared to bureaucrat (19%) and those making Strength activities (25%).

Influence of the intensity of physical activity on CMR

Table-5 showed the influence of physical activity intensity on CMR. Regardless of physical activity intensity, the body mass index (BMI) indicated overweight (P>0.05) in all groups (25.38 ±0.33 of intense activity, 26.66 ±0.82 of moderate activity and 26.51 ±0.19 of weak activity). Total cholesterol (TC) was elevated in all groups compared to the norm (<200 mg/dl), but this level was significantly low in the weak activity group (239.69 ±21.61 mg/dl) compared to the moderate activity (306.76 ±25.99 mg/dl). It is noted that the triglyceride (TG) level, although higher than the norm (<150 mg/dl) in all groups, was lower in the group of intense activity (263.04 ±14.09 mg/dl) compared to the moderate activity (265.68 ±9.69 mg/dl) and weak activity groups (282.95 ±59.05 mg/dl) at P>0.05. The risk was increased for HDL-c which in all groups had a value below 35 mg/dl, although the difference was not significant between the group of intense activity (32.95 ±2.16 mg/dl), of moderate (29.18 ±3.27 mg/dl) and that of weak activities (21.37 ±1.89 mg/dl). The same observation was made for the atherosclerosis index which showed no significant difference between the intense activity groups (3.43 ±0.18) compared to the moderate activity groups (3.71 ±0.10) and weak activity groups (3.92 ±0.62).

Table-4: Variation of physical activity practice related to demographics and age

Characteristics			AGE GROUP		
		PA	30-40	41-50	51-60
			n (%)	n (%)	n (%)
Level of education	Non-educated	Yes	1 (4)	0 (0)	1 (2.08)
		No	0 (0)	1 (4.35)	9 (9.18)
	Primary	Yes	7 (28)	10 (35.71)	19 (39.58)
		No	4 (12.50)	5 (21.74)	38 (38.78)
	Secondary	Yes	9 (36)	10 (35.71)	23 (47.92)
		No	4 (12.50)	14 (60.87)	42 (42.86)
	University	Yes	8 (32)	8 (28.58)	5 (10.42)
		No	24 (75)	3 (13.04)	9 (9.18)
	p-value		*0.01*	*0.16*	*0.45*
Marital status	Single	Yes	10 (40)	0 (0)	0 (0)
		No	15 (46.88)	0 (0)	3 (3.06)
	Divorced	Yes	1 (4)	1 (357)	0 (0)
		No	1 (3.12)	0 (0)	0 (0)
	Married	Yes	14 (56)	27 (96.43)	47 (97.92)
		No	16 (50)	23 (100)	93 (94.90)
	Widower	Yes	0 (0)	0 (0)	1 (2.08)
		No	0 (0)	0 (0)	2 (2.04)
	p-value		*0.42*	*0.09*	*0.15*
Occupation	Strength activity	Yes	6 (25)	5 (17.86)	10 (20.83)
		No	0 (0)	1 (4.35)	11 (11.22)
	Bureaucrat	Yes	5 (19)	6 (21.43)	7 (14.58)
		No	20 (62.50)	6 (26.09)	32 (32.66)
	Manufacturer	Yes	14 (56)	17 (60.71)	31 (64.59)
		No	12 (37.50)	16 (69.56)	55 (56.12)
	p-value		*< 0.00*	*0.33*	*0.04*

PA = Physical Activity, n (%) = Size and percentage by characteristic.

Table-5: Variation of CMR according to intensity of physical activity

Parameters		IPA	MPA	WPA	*p-value*
		Yes (n = 57)	Yes (n = 121)	Yes (n = 142)	
BMI (kg/m^2)	Mean ±SD	25.38±0.33	25.66±0.82	26.51±0.19	*P>0.05*
WC (cm)	Mean ±SD	91.99±1.57	94.33±3.03	96.89±1.68	
TC (mg/dl)	Mean ±SD	290.29±5.52	306.76±25.99	239.69±21.61	*P<0.05*
LDL-c (mg/dl)	Mean ±SD	205.16±2.63	223.26±19.91	168.19±8.74	
HDL-c (mg/dl)	Mean ±SD	32.95±2.16	29.18±3.27	21.37±1.89	*P>0.05*
TG (mg/dl)	Mean ±SD	263.04±14.09	265.68±9.69	282.95±59.05	
AI	Mean ±SD	3.43±0.18	3.71±0.10	3.92±0.62	
Gly (g/l)	Mean ±SD	1.27±0.05	1.19±0.06	1.16±0.09	
SBP (mm/Hg)	Mean ±SD	135.98±23.25	138.50±22.05	135.72±20.76	
DBP (mm/Hg)	Mean ±SD	83.69±14.50	86.03±12.38	82.50±12.20	
AST (U/L)	Mean ±SD	19.65±1.39	19.94±2.03	17.79±1.62	
ALT (U/L)	Mean ±SD	17.91±2.59	16.84±2.52	9.28±2.07	*P<0,05*
UA (mg/dl)	Mean ±SD	15.01±1.63	15.18±1.38	11.62±1.44	
Cr (mg/dl)	Mean ±SD	1.26±0.21	0.84±0.13	0.88±0.16	

n = Size/characteristic, BMI = Body Mass Index, WC = Waist Circumference, TC = Total Cholesterol, TG = Triglyceride, AI = Atherosclerosis Index, Gly = Glycaemia, SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, UA = Uric Acid, Cr = creatinine, ALT = Alanine Aminotransferase, AST = Aspartate Aminotransferase, CMR = Cardiometabolic Risk, IPA = Intense Physical Activity, MPA = Moderate Physical Activity, WPA = Weak Physical Activity.

Tobacco profile of the study population

Variation of the smoking profile related to the age and zone

Table-6 showed the smoking profile in the DHD according to age. It indicated that non-smokers made up the largest proportion (69.96%) and were recruited in the 51-60 age group. In the rural area, 68.54% of non-smokers had a significant difference (P=0.02) compared to the urban area (36.25%). Smokers represented only 20.55% in rural area and 16.82% in urban area and most of them had been smoking for more than 10 years, with the finding that the 51-60 age group were the oldest smokers (81.48%) with a significant difference (P<0.00) compared to other

groups of smokers in the rural area. 44.44% of people smoked less than one package in the rural area, with a significant difference compared to urban smokers (29.63%). Also, the place of exposure to tobacco smoke was in public milieu with 91.16% in rural area and 92.45% in urban area and it was still the 51-60 age group that was significantly exposed in rural area (67.91% at P=0.03) and not significant in urban area (45.92% at P=0.87).

Table-6: Tobacco profile related to age and environment

Characteristics		Rural area (N = 147)				Urban area (N = 107)			
		Age group			%N	Age group			%N
		30-40 n = 25	41-50 n = 26	51-60 n = 96		30-40 n = 25	41-50 n = 50	51-60 n = 25	
		n (%)	n (%)	n (%)		n (%)	n (%)	n (%)	
Tobacco status	Non-smoker	14 (15.73)	14 (15.73)	61 (68.54)	69.96	31 (38.75)	20 (25)	29 (36.25)	74.77
	Smoker	9 (30)	8 (26.67)	13 (43.33)	20.55	1 (5.56)	4 (22.22)	13 (72.22)	16.82
	Former smoker	1 (3.70)	4 (14.81)	23 (81.48)	18.49	0 (0)	1 (11.11)	8 (88.89)	8.41
	p-value	0.02				0.00			
Duration of smoking	Less than 5 years	0 (0)	1 (7.69)	12 (92.31)	28.89	0 (0)	1 (33.33)	2 (66.67)	11.11
	5 to 10 years	8 (57.14)	2 (14.29)	4 (28.57)	31.11	0 (0)	0 (0)	7 (100)	25.93
	More than 10 years	2 (11.11)	7 (38.89)	9 (50)	40	1 (5.88)	4 (23.53)	12 (70.59)	62.96
	p-value	0.00				0.54			
Quantity / week	1 to 2 package	1 (5.88)	5 (29.41)	11 (64.71)	37.78	0 (0)	1 (11.11)	8 (88.89)	33.33
	2 packages and more	2 (25)	3 (37.50)	3 (37.50)	17.78	1 (10)	2 (20)	7 (70)	37.04
	Less than one package	7 (35)	2 (10)	11 (55)	44.44	0 (0)	2 (25)	6 (75)	29.63
	p-value	0.14				0.66			
Exposure to tobacco smoke / day	0 time	2 (100)	0 (0)	0 (0)	1.36	0 (0)	0 (0)	1 (100)	0.17
	1 time	3 (9,09)	7 (21.21)	23 (69.70)	22.45	4 (40)	0 (0)	6 (60)	9.34
	2 to 3 times	5 (23.81)	3 (14.28)	13 (61.90)	14.28	8 (29.63)	6 (22.22)	13 (48.15)	25.23
	occasionally	10 (13.70)	10 (13.70)	53 (72.60)	49.66	19 (37.25)	11 (21.57)	21 (41.18)	47.66
	More than 3 times	5 (27.78)	6 (33.33)	7 (38.89)	12.24	1 (5.56)	8 (44.44)	9 (50)	16.82
	p-value	0.01				0.13			

n (%) = Size and percentage by characteristic, N = Size/area

Variation of CMR according to tobacco consumption and living environment

Lipid variation in relation with tobacco consumption

Figure-1 showed the lipid profile influenced by smoking in DHD. Total cholesterol among former smokers was higher (311.42 ±28.51 mg/dl) but the difference was not significant compared to smokers (277.64 ±20.77 mg/dl) and non-smokers (287.95 ±23.99 mg/dl). It was true for triglycerides, which were higher among smokers in rural area (349 ±49.23 mg/dl at P>0.05), but in the urban area there were former smokers (343.78 ±48.08 mg/dl) who had a higher rate with no significant difference compared to other categories of smokers (P>0.05). It can also be seen that the HDL-c rate was lower among non-smokers in all zones, but this rate was comparable to that of smokers (36.39 ±13.51 mg/dl in rural area and 26.24 ±12.33 mg/dl in urban area) and non-smokers (34.7 ±14.03 mg/dl in rural area and 19.89 ±7.04 mg/dl in urban area) although remaining below the normal value (>55 mg/dl).

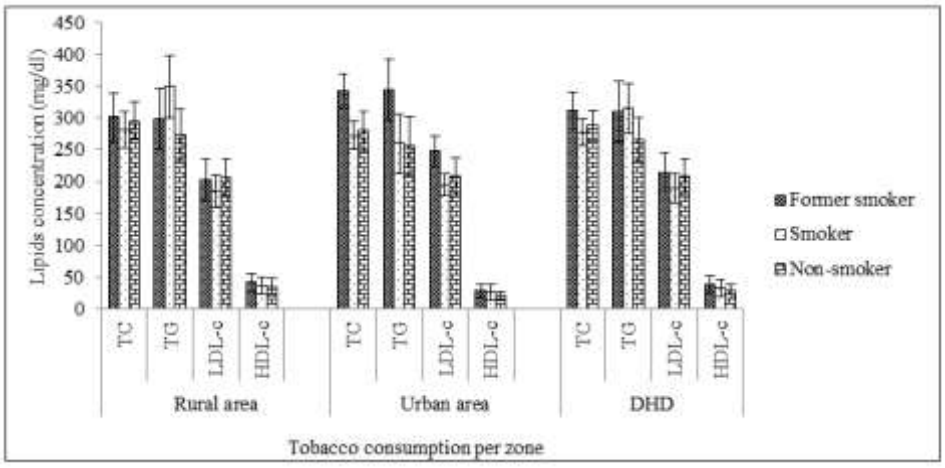

Fig-1: Variation of lipid levels according to tobacco consumption

TC = Total cholesterol, TG = Triglycerides, LDL-c = Low density lipoprotein, HDL-c = High density lipoprotein, DHD = Dschang Health District

Influence of tobacco consumption on transaminase levels

Figure-2 provided information on the influence of smoking on transaminases in the DHD. In all areas and all categories of smokers, it was generally observed that transaminases values were normal (<38 U/L for AST and <41 U/L for ALT). However, smokers had a higher value in these areas with a significant difference in the urban area (10.03 ±1.35 U/L) for AST ($P<0.05$) compared to other groups of smokers. Non-smokers in the rural area, ALT (25.07 ±3.68 U/L) was higher, but this rate was comparable to that of smokers (23.62 ±3.38 U/L) and former smokers (20.71 ±2.75 U/L) ($P>0.05$).

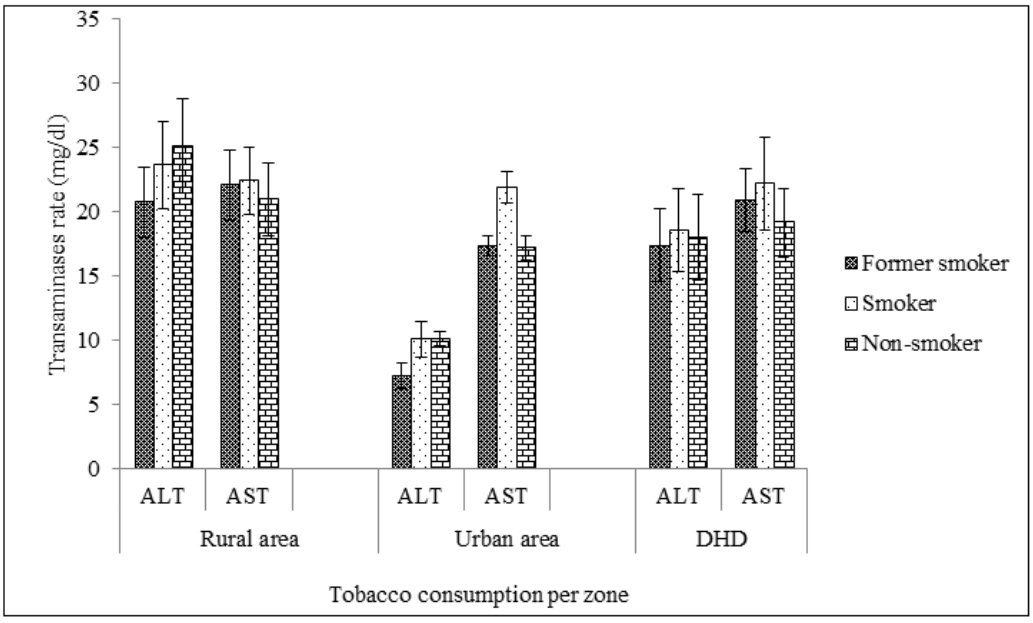

Fig-2: Variation of transaminases level related to tobacco consumption

ALT = Alanine aminotransferase, AST = Aspartate aminotransferase, DHD = Dschang Health District

Influence of smoking on the atherosclerosis index

Figure-3 showed the influence of smoking on the atherosclerosis index in the DHD. This figure indicated that the atherosclerosis index of smokers was higher in all areas and we noted in the urban area a value of 4.28 ±0.76 without significant difference compared to former smokers (4.01 ±0.36) and non-smokers (4.21 ±0.43).

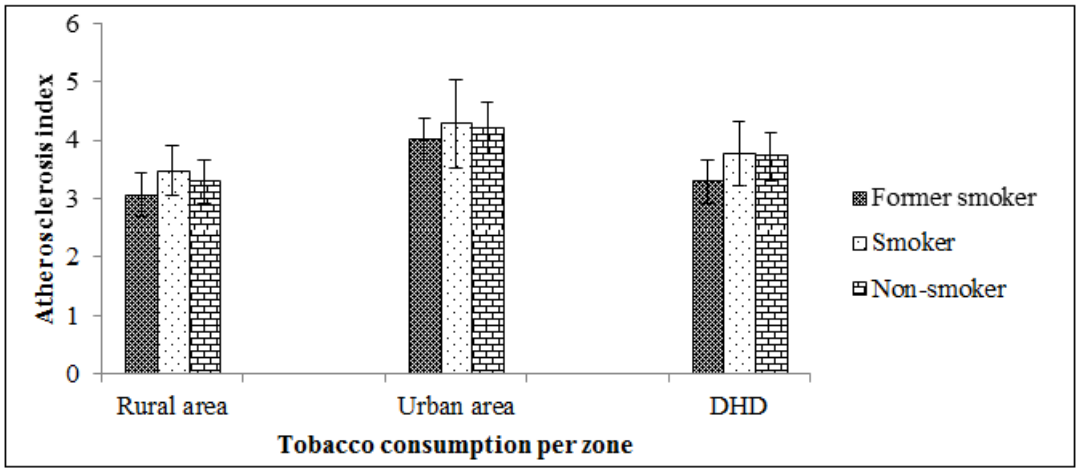

Fig-3: Variation of atherosclerosis index according to tobacco consumption
DHD = Dschang Health District

DISCUSSION

Regarding physical activity, we find that married people practice more physical activity (84.21% in rural area and 90.91% in urban area) compared to singles, divorced and widowers although the difference is not significant. This could be explained by the wife's household care that would lead to the body's changes by suggesting that he start working to delay obesity and other associated CMR. Indeed, there is a negative association between television time and the presence of cardiovascular risk factors due to the decrease of physical activity [22]. It is also observed in rural area that the population practices both moderate physical activity (82.31%) and low physical activity (96.60%); this rural population is also more active than that of urban area with 73.83% and 86.92% respectively for moderate and low physical activity although the difference is not significant. This observation is mainly due to the mode of movement in the two areas (motorized vehicles, elevators in urban area and walking, farming in rural area). Moreover, regardless of the area, the 30-40 age group is significantly less active than the 41-50 and 51-60 age groups. However, 41-50 age group has a better lipid profile although the values remain above normal (TC ≤ 200 mg/dl, TG <150 mg/dl, LDL-c ≤ 160 mg/dl). We notice TC rate (287.49 ±129.58 mg/dl in rural area and 291.82 ±103.73 mg/dl in urban area), TG values (280.39 ±175.89 mg/dl in rural area and 233.13 ±144.30 mg/dl in urban area) and LDL-c devices (195.79 ±126.17 mg/dl in rural area and 203.75 ±93.37 mg/dl in urban area). In addition, the practice of low physical activity has the best glycaemic profile (1.16 ±0.09 g/l). In fact, the low and prolonged physical activity makes it possible to reduce the blood lipid levels as well as the glycaemia because this prolonged activity makes it possible to better increase the body temperature to gradually dissipate fats and sugar [23] indicating that moderate physical activity can lower blood levels of TG since urbanisation is associated with a drastic decline in physical activity as well as Mabchour *et al.*, who obtained comparable results showing that socio-economic status, smoking and sedentary lifestyle are associated with CMR [1].

In addition, between 30-40 age group youths access a job and marriage that completely change their lifestyle, which imply weight gain as a sign used to evaluate the income and care administrated by the spouse leading to the decline in physical activity observed. The intensity of physical activity can also influence transaminases level. Note that for instance physical activity, the ALT rate has the highest value (17.91 ±2.59 U/L) whereas for AST, it is the moderate physical activity (19.94 ±2.03 U/L) which has the highest value but not significantly different from that of the intense physical activity (19.65 ±1.39 U/L). These results are comparable to those obtained by Kabamba *et al.*, who observed an increase of transaminases level in people with acute malaria following cells destruction [24]. This would indicate that the muscular efforts could increase the level of transaminases by destruction of muscle cells. In rural area (20.55%) there are more smokers than in urban area (16.82%). Respondents report that the cool and rainy climate of DHD and much more in rural area would be the favourable factor for smoking. These rates are close to the 16.6% of Cameroonian adult smokers estimated by the World Health Organization [5]. However, these smokers expose a high rate of non-smokers (90%) to tobacco smoke especially in public places. Smokers in the rural area have a higher TG (349 ±49.23 mg/dl) than in urban area (259.33 ±46.98 mg/dl), and similarly for TC (280.82 ±28.43 mg/dl in rural area and 272.18 ±21.92 mg/dl in urban area). Tobacco users have a higher atherosclerosis index in urban area (4.28 ±0.76) compared to rural area (3.47 ±0.43). We might think that despite the high number of tobacco users in rural area, they remain more active. This would help to partially evacuate the harmful effects of tobacco. The atherosclerosis index ranks the 30-40 age group (4.07 ±0.59) as the most at risk compared to those aged 51-60 (3.58 ±0.43) and 41-50 years (3.52 ±0.42). Benissan *et*

al., found that tobacco is significantly correlated with hypertension, which is the main cardiovascular disease in Africa with an average prevalence of 25% in the adult population [25]. In the DHD smokers have the highest AST levels (22.17 ±3.6 U/L) and ALT (18.53 ±3.23 U/L). Indeed, Kuaté *et al*., find that the significant increase of transaminases leads to hepatic and muscular dysfunctioning that can lead to cardiovascular disease [26]. Amedeo *et al*., have also shown that tobacco toxins pass through the alveolar-capillary membrane to promote vascular spasms, atherosclerosis and even thromboses [27].

CONCLUSIONS

This study of two groups of subjects living in two different environments showed that educational level, occupation and even marital status influenced physical activity profile, tobacco consumption and the occurrence of cardiometabolic diseases in the Dschang Health District. Moderate physical activity is the best way to stay in motion, due to the benefits it provides. The tobacco-free lifestyle would be very advisable to protect everyone from the hardening of the arteries and thus against the cardiometabolic diseases. However, this study shows that the 51-60 age group is the most active, predicts high levels of lipids, hypertension, obesity and high atherosclerosis index rate in the other age group.

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to field officers and also to the participants who freely gave their consent to take part in all phases of this study.

STATEMENT OF COMPETING INTERESTS

The authors have no competing interests.

REFERENCES

1. Mabchour, A. E., Delisle, H., Vilgrain, C., Larco, P. & Sodjinou, R. (2016). Obésité abdominale et autres biomarqueurs de risque cardiométabolique : influence du niveau socioéconomique et du mode de vie dans deux populations noires apparentées, Cotonou (Bénin) et Port-au-Prince (Haïti). Pan African Medical Journal, 24, 306.
2. WHO. (2017). Leading cause of death, illness and impoverishment Retrieved March 28, 2017, from http://www.who.int/mediacentre/factsheets/fs339/en/.
3. Gill, J. M. R., & Malkova, D. (2006). Physical activity, fitness and cardiovascular disease risk in adults: interactions with insulin resistance and obesity. Clinical Science, 110(4), 409-425. PMID: 16526946, DOI: 10.1042/CS20050207.
4. Haskell, W. L., Lee, I-M., Pate, R. R., Powell, K. E., Blair, S. N., Franklin, B. A., & Bauman, A. (2007). Physical activity and public health: Updated recommendation for adults from the American College of Sports Medicine and the American Heart association. Circulation, 116(9), 1081-1093.
5. WHO. (2014). Lutte contre les maladies cardiovasculaires: priorités stratégiques. Retrieved august 21, 2016, from www.who.int/cardiovascular_diseases/priorities/fr/.
6. WHO. (2015). Report on the Global Tobacco Epidemic. Retrieved March 28, 2017, from http://www.who.int/tobacco/surveillance/policy/country_profile/cmr.pdf?ua=1.
7. WHO. (2016). World health statistics 2016: Monitoring health for the SDGs. Retrieved June 07, 2017, from http://www.sante.public.lu/fr/publications/s/statistiques-sanitaires-mondiales-2016-en/index.html.
8. Lemogoum, D., & Bortel V. L. (2006). Ethnic differences in arterial stiffness and wave reflections after cigarette smoking. Journal of Hypertension, 24(4), 683-689. DOI:10.1097/01.hjh.0000217850.87960.16.
9. Jha P., Ramasundarahettige C., & Landsman V. (2013). 21st-century hazards of smoking and benefits of cessation in the United States. The New England Journal of Medicine, 68, 341-350.
10. Lavoie, M. E. (2012). Inflammation, stress oxydant, profil métabolique: influence des apports alimentaires et de la dépense énergétique (Doctoral dissertation). Available from Theses database of Montreal University, Canada. (UMI N° 0570).
11. El Rhazi, K. (2010). Transition nutritionnelle, facteurs associés et émergence des maladies chroniques au Maroc: étude transversale en population générale adulte (Doctoral dissertation). Available from Theses database of University of Bordeaux 2, France.
12. Sossa, C., Delisle, H., Agueh, A., Makoutodé, M., & Fayomi B. (2012). Four-year trends in cardiometabolic risk factors according to baseline abdominal obesity status in West African adults: The Benin Study. Journal of Obesity, 10p.
13. Abegunde, D. O., Mathers, C. D., Adam, T., Ortegon, M., & Strong K. (2007). The burden and costs of chronic diseases in low-income and middle-income countries, Lancet, 370 (9603), 1929-1938.
14. Kirigia, J. M., Sambo, H. B., Sambo, L. G. & Barry, S. P. (2009). Economic burden of diabetes mellitus in the WHO African region. BMC International Health and Human Rights, 9, 6.
15. Aboussaleh, Y., Farsi, M., El Hioui, M. & Ahami, A. (2009) Transition nutritionnelle au Maroc: Coexistence de l'anémie et de l'obésité chez les femmes au Nord-Ouest marocain. Antropo, 19, 67-74.
16. Lemogoum, D. (2013, September). La Fondation Camerounaise du Cœur en partenariat avec l'entreprise AES-SONEL et le soutien du Ministère des Sports et de la Santé Publique, 6è célébration de cette semaine du cœur sous le thème « protégeons

le cœur de la femme et de l'enfant». Afrique. Aurore Plus, N° 1353, P.9, dans: Société: Santé.
17. Sossa, C. (2012). Evolution du risque cardiométabolique sur une période de quatre ans : Étude chez des adultes béninois en Afrique de l'Ouest (Doctoral dissertation). Available from Theses database of Montreal University, Canada. (UMI N° 0570).
18. Global Physical Activity Questionnaire. (2003). Analysis Guide. World Health Organization. Retrieved May 07, 2013, from http://www.who.int/chp/steps/GPAQ/en/index.html .
19. International Physical Activity Questionnaire. (2007). Programme (Promotion de l'Alimentation et de l'Activité Physique version 2 française).
20. Global Adult Tobacco Survey. (2011). Tobacco Free Initiative. Surveillance and monitoring. Retrieved May 07, 2013, from http://www.who.int/tobacco/surveillance/survey/gats/en/.
21. Yunqin, C., Xiaojin, Z., Baishen, P., Xuejuan, J., Haili, Y., Bin, C., Yunzeng, Z., Junbo, G., & Haozhu, C. (2010). A modified formula for calculating low-density lipoprotein cholesterol values. Lipids in Health and Disease, 9, 52.
22. Ewané, E. M., Mandengué, S. H., Priso, B. E., Tamba, M. S., Ahmadou, & Fouda, B. A. (2012). Dépistage des maladies cardiovasculaires chez les étudiants de l'Université de Douala et influence des activités physiques sportives. Pan African Medical Journal, 11, 77.
23. Shaw, K., Gennat, H., O'Rourke, P., & Del Mar, C. (2006). Exercise for overweight or obesity. Cochrane Database of Systematic Reviews, (4), Art No. CD003817.
24. Kabamba, T. A., Bakari, S. A., Longanga, O. A., & Lukumwena, K. Z. (2014). Baisse du HDL-cholestérol indicateur du stress oxydatif dans le diabète de type 2. Pan African Medical Journal, 19, 140.
25. Benissan, A. T., Degbé, M., Akpalo, E., Aklikokokou, K., & Gbeassor, M. (2015). Prévalence des facteurs de risque cardiovasculaire chez les Ogo du Togo. Science de la vie, de la terre et agronomie, Revue CAMES, 03, 02.
26. Kuaté, D., Kengne, N. A. P., Biapa, N. C. P., Azantsa, K. B. G., & Muda, W. A. M. (2015). Tetrapleura tetraptera spice attenuates high-carbohydrate, high-fat diet-induced obese and type 2 diabetic rats with metabolic syndrome features. Lipids in Health and Disease. BioMed Central, 14, 15. DOI 10.1186/s12944-015-0051-0.
27. Amedeo, M., Saverio, B. F., Wanda, K. C., Spagnoli, F., Francesconi, M., Vicinanza, R., Delle, C. R., & Biondi, M. (2013). Smoking behaviour and mental health disorders-mutual influences and implications for therapy. International Journal of Environmental Research and Public Health, 10, 4790-4811.