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Impact of the Diet Profile and Alcohol Consumption on Cardiometabolic Risks in Dschang Health District-Cameroon

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Authors' contributions

This work was carried out in collaboration between all authors. Authors FNZ, FMT and MBSD designed the study. Under the supervision of authors FNZ and DL, MBSD developed the protocol and train investigators. The collection and data analysis were done by author MBSD with the collaboration of authors DSBD and FCNN. The first draft of the paper was written by author MBSD. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The study was conducted between March 2015 and June 2017 to determine the prevalence of cardiometabolic risks in adult men from Dschang Health District in Cameroon.
Methodology: After obtaining the ethical clearance, a simplified questionnaire was used for 254 volunteer participants aged from 30 to 60 years, selected in 10 areas of Dschang Health District. Some clinical parameters and fasting blood glucose were measured. The collected data were submitted to EPI-Info™ version 7.1.5.0. Software. The results were expressed as frequency and mean ±SD at the 5% significance level.

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Results: In Dschang Health District There are 38.98% obese, 39.76%, and 28.74% hypertensive patients with systolic hypertension and diastolic hypertension respectively. 87.07% and 40.19% of alcoholism respectively in rural and urban areas. Diabetes has a prevalence of 17.72%, and 74.02% of cases of hypertriglyceridemia are observed. We can conclude that the prevalence of cardiometabolic risk factors is high and is above the national average. This is a consequence of the high consumption of alcohol and salt beyond the World Health Organization standard (>5g/day), abundant use of unrefined palm oil for cooking but especially a low fruit and vegetable consumption (>400g/day) despite availability in the study area.

Conclusions: This study of two groups of subjects living in two different environments showed that educational level, occupation and even marital status influenced diet profile, alcohol consumption and the occurrence of cardiometabolic diseases in the Dschang Health District. Good eating habits and a healthy lifestyle prevent cardiometabolic disorders. Salt, alcohol and unrefined palm oil are to be consumed in moderation and on the other hand, consuming fruits and vegetables at all ages keep the heart and arteries healthy.

Keywords: Prevalence; diet; alcoholism; obesity; diabetes; hypertension; salt; palm oil.

ABBREVIATIONS

AI : Atherosclerosis Index
ALT : Alanine aminotransferase
AST : Aspartate aminotransferase
BG : Blood Glucose
BMI : Body Mass Index
CMD : Cardiometabolic Disease
CMR : Cardiometabolic Risk
Cr : Creatinine
DBP : Diastolic Blood Pressure
DHD : Dschang Health District
HDL-c : High Density Lipoprotein cholesterol
NCD : Non Communicable Disease
SBP : Systolic Blood Pressure
TC : Total Cholesterol
TG : Triglyceride
UA : Uric Acid
WC : Waist Circumference

1. INTRODUCTION

Cardiometabolic risks (CMR) represent all risk factors for cardiovascular diseases and type 2 diabetes (T2D) [1]. The increase of the prevalence of cardiometabolic diseases (CMD) in developing countries is due to a rise in the incidence of CMR factors, with a constellation of problems such as obesity, high blood pressure, hyperglycemia and dyslipidemia. In short, an emergence of no communicable diseases (NCD) [2-4]. A tendency to group several of these metabolic abnormalities in the same individual has been observed, giving rise to the concept of metabolic syndrome [5].

Urbanization is increasing rapidly in developing countries mainly due to rural exodus. The urban lifestyle compared to the rural style is closely associated with the increase of the prevalence of some NCD such as hypertension, diabetes, obesity, and dyslipidemia [6]. Sobngwi et al. thought that the number of people in the urban area, estimated at 32 million in 1950, will increase to 857 million in 2025 [7]. This is a phenomenon to be mastered and planned to avoid the constant increase of CMR, mainly due to urbanization, and the unhealthy lifestyle. CMD Subsequent unhealthy lifestyle is the number one health expenditure item and the leading cause of death with 17.5 million deaths annually in the world at the start of the 21st century [8,9]. 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 unhealthy feeding. If nothing is done by 2030, nearly 23.6 million people will die of a CMD, and it will remain the leading killer of all causes of death in the world [10]. The increase in the global prevalence of CMD affects both developed and developing countries [11].

In Africa, the impact of cardiometabolic diseases on human and economic development is essential in developing countries [3]. This high economic and social cost of CMD in these countries [12] is a barrier to their growth [13] because they are progressing faster in these developing countries [14]. Cameroon is a low-income country ranked 153rd out of 186 on the Human Development Index [15]. It is at the age of 30 years average, that young people access employment in Cameroon, synonymous with regular financial accessibility, which very often leads to the rapid acquisition of unhealthy lifestyles linked to changes in food profiles. This new societal environment imposes a nutritional

transition, a change of diet and movement with consequences on body composition [2].

Cameroon is hardly stroke by the CMD that affects more than 4 million of the population, according to the statistics of the Cameroon Heart Foundation [16]. Hence, the increase in strokes (24% of deaths per year), myocardial infarction (18% of deaths per year), diabetes (10% of deaths per year) and high blood pressure affecting 35% of the adult population [17]. The statistics related to CMD are becoming a fear increasingly and need particular attention to improve the situation of Cameroonians. Cameroon does not have modern health infrastructures for fast and efficient management of the morbidity related to CMD. Thus, these data confirm the predominance of CMR factors in urban areas, while projections indicate that the increase in the world population will be mainly in urban developing countries [18], henceforth the need to take preventive measures, especially in the urban areas [3]. This study, therefore, aims at producing epidemiological and biochemical data likely to contribute to the prevention of CMD.

2. MATERIALS AND METHODS

2.1 Field of Study and Eligibility Criteria

Our study was conducted in the Dschang Health District (DHD), after obtaining the ethical clearance. After enlightened information, free consent was expressed by the signature of 254 subjects distributed in ten health areas. Male, randomly recruited between the ages of 30 and 60 years, which were apparently in good health and having lived for at least six months in the study environment allowed us to collect data. Women were excluded from our study because of the various hormonal changes related in particular to their physiological state. They will be the subject of a future study.

2.2 Sampling Technique

The sampling was random, stratified and proportionated; based on a survey using both the questionnaire and the blood samples for the analyses. Our participants were stratified in each health area according to age (30-40, 41-50 and 51-60 years). After the working sessions with the Head of the Random Health Area, an extensive awareness and information campaign in all villages and neighbourhoods, the population was invited to the main Health Centre for free and voluntary detection of CMD. All the villages and neighbourhoods of a Health Area were eligible for our survey.

2.3 Data Collection

Six interviewers used a pre-tested questionnaire on twenty-one people in the urban area. The survey was inspired by those of Moskalewicz and Sieroslawski [19] for alcoholic status and Larsson et al. [20], Hu et al. and Dehghan et al. for questions on food by adapting them to our context [21,22]. 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, blood pressure, waist circumference (WC), body mass index (BMI) and took 5 ml of blood from the elbow in sterile tubes for CMR evaluation.

2.4 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 -20ºC until the determination of transaminases, creatinine, uric acid, and lipids. Contaminated material was sterilised in an autoclave labelled Sonaclav at 121ºC for 20 minutes and at a pressure of 1.2 bar before being poured into a pit to avoid any risk of contamination.

2.5 Statistical Analysis

The data collected were submitted to the EPI-Info™ software version 7.1.5.0. Analysis of the variance was used, and when there were significant differences, the Chi-Square test permitted us to compare the frequencies and the Fischer Exact Test to compare the means. The results were expressed in frequency and mean ±SD at 5% significance level.

2.6 Ethical Consideration

Ethical clearance was obtained from Cameroon Bioethics Initiative (Reference number: CBI/335/ERCC/CAMBIN and Protocol number: 1061). Permission to conduct the study was obtained from the top management of the Dschang Health District Office. Informed consent was also obtained from participants before collection of the samples.

2.7 Limitations of the Study

This study had several limitations, first the lack of control over food security and socio-demographic conditions, then the time and the purposes of our study did not allow us to enlarge the sample size, and finally, volunteers who submitted themselves

to the questionnaires are those who care about the issues studied and this can create biases.

3. RESULTS

3.1 Characteristics of the Study Population

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

3.2 Food Hygiene of the Study Population per Age and Living Environment

Table 2 indicated that the more we are aged and the more we consume salt, but this consumptionwas mostly remarkable among individuals aged from 51-60 in the rural area (63.64% at *P*=.25). Also, Cameroonians ate more at home (5-7 times a week), although out of home feeding remained a practice with a non-significant difference between age groups both in the rural and urban areas.

3.3 Food Consumption per Age in Study Area

Table 3 presented the age-feeding profile in the study area. In the rural area, the 51-60 age group consumed more (5-7 times per week) fruits and vegetables (81.82% at *P*=.13) whereas in the urban area it was the young people aged 30-40 who consumed more (71.43% at *P*=.81). Consumption of dairy products was significantly lower in the urban area in the 30-40 age group (25% at *P*=.01) and the same in the rural area (15.08% at *P*=.85). It also appeared that young people aged from 30-40 consumed more dairy products in the urban area (80%). The high consumption of beef was observed in 85.71% of 30-40 age group in the rural area with a very significant difference compared to other age groups (*P*=.001). Fatty foods and unrefined palm oil were low appreciated (≤ one time per week) by the 51-60 age group (32.83% *P*=.02) in the urban area compared to other age groups.

3.4 Influence of Environment and Salt Intake on Blood Pressure

Fig. 1 indicated that those who consumed too much salt had a higher systolic and diastolic blood pressure (SBP and DBP) than other consumer groups. However, there was no significant difference (*P*>.05) between zones.

3.5 Variation of Lipid Parameters in Relation with Palm Oil Consumption

It could be seen from Fig. 2 that total cholesterol (TC) and triglycerides (TG) were significantly (*P*<.05) influenced by high quantity of palm oil consumption.

3.6 Influence of Palm Oil Consumption and Living Environment on BMI and AI

The body mass index increased with the amount of palm oil consumption and fat products in the

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	< .001*	10	10	80	.465*
	Primary	7.69	23.08	69.23	< .001**	14.29	17.14	68.57	< .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	7.14	.297**	85.71	0	14.29	< .001*
	Married	18.68	27.47	53.85		10.08	19.38	70.54	.297**
	Divorced	100	0	0		0	100	0	
	Widower	0	0	0		0	0	100	
Occupation	Bureaucrat	42.37	20.34	37.29	.01*	0	0	100	< .001*
	Manufacturing	13.89	33.33	52.78	< .001**	19.27	19.27	61.47	.297**
	Strength activity	16.67	8.33	75		19.05	23.81	57.14	
Information stroke/heart attacks	Yes	30.39	24.51	45.10	.267*	17.24	17.93	64.83	.584*
	No	20	0	80	.115**	0	0	100	.115**

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

Table 2. Food hygiene profile of the urban and rural population

Characteristics		Rural area (n = 147)			Urban area (n = 107)		
		Age group					
		30-40 (%)	41-50 (%)	51-60 (%)	30-40 (%)	41-50 (%)	51-60 (%)
Number of meals/day	1 time	0	33.33	66.67	33.33	16.67	50
	2 times	15.79	17.11	67.11	23.53	23.53	52.94
	3 times	11.76	19.61	68.63	41.38	27.59	31.03
	≥ 3 times	50	7.14	42.86	50	0	50
	P-value	*.03*			*.41*		
Regular meal times	Never	23.60	16.85	59.55	27.27	30.30	42.42
	Always	4.35	21.74	73.91	20.83	16.67	62.50
	Sometimes	8.57	17.14	74.29	36	22	42
	P-value	*.12*			*.38*		
Salt consumption	Little salt	0	25	75	25	75	0
	good salt	18.94	15.91	65.15	30.93	20.62	48.45
	Too much salt	0	36.36	63.64	16.67	33.33	50
	P-value	*.25*			*.11*		
Number of days of meals taken out / week	≤ 1 time	4	17	79	27.71	22.89	49.40
	2 - 4 times	8.33	20.83	37.5	41.67	0	58.33
	5 - 7 times	54.29	17.14	28.57	30.77	46.15	23.08
	P-value	*.05*			*.07*		
Water consumption / week	≤ 1 time	22.22	16.67	61.11	20	20	60
	2 - 4 times	25.92	16.67	57.41	33.33	8.33	58.33
	5 - 7 times	13.39	19.64	66.96	29.35	25	45.65
	P-value	*.50*			*.05*		

n = Population size/area; % = Percentage by characteristic

Table 3. Feeding profile by age and living environment

Characteristics		Rural area (n = 147)			Urban area (n = 107)		
		Age group					
		30-40 (%)	41-50 (%)	51-60 (%)	30-40 (%)	41-50 (%)	51-60 (%)
Fruit and vegetable consumption / week	≤ 1 time	18.18	16.36	65.45	28.17	25.35	46.48
	2 - 4 times	9.80	32.07	58.12	24.36	32.90	42.74
	5 - 7 times	0	18.18	81.82	71.43	14.29	14.29
	P-value	*.13*			*.81*		
Dairy products consumption / week	≤ 1 time	15.08	18.25	66.67	25	26.14	48.86
	2 - 4 times	36.11	8.33	55.56	45.56	13.33	41.11
	5 - 7 times	25	16.67	58.33	80	0	20
	P-value	*.85*			*.01*		
Meat consumption / week	≤ 1 time	12.88	18.18	68.94	27.08	25	47.92
	2 - 4 times	16.67	11.11	72.22	42.78	21.67	35.56
	5 - 7 times	85.71	14.29	0	100	0	0
	P-value	*.00*			*.72*		
Palm oil consumption / week	≤ 1 time	17.24	18.39	64.37	41.79	25.37	32.83
	2 - 4 times	12.5	12.5	75	9.44	19.07	71.48
	5 - 7 times	16.22	18.92	64.86	11.11	22.22	66.67
	P-value	*.62*			*.02*		
Sweet products consumption / week	≤ 1 time	14.28	15.38	70.33	27.45	29.41	43.14
	2 - 4 times	8.74	20.44	70.81	29.8	11.16	59.04
	5 - 7 times	47.37	10.53	42.11	42.86	35.71	21.43
	P-value	*.03*			*.63*		

n = Population size/area; % = Percentage by characteristic

rural (26.32 ±1.77) and the urban (28.37 ±2.25) areas. No significant difference was observed according to the atherosclerosis index (AI) in all areas although it was higher in the urban area (4.6 ±0.46).

3.7 Influence of Carbohydrate and Protein Sources Consumption on Certain Biochemical Parameters

We noted in Fig. 4 that blood glucose (BG) levels increased with the consumption of sweet products regardless of the area. However, this rate was higher in the urban area (1.64 ±0.19 g/l) compared to the rural area (1.44 ±0.46 g/l) although the difference was not significant. Uric acid (UA) rate was very high in DHD (1.94 ±0.57 mg/dl) mainly in the group consuming meat products 5 to 7 times a week.

3.8 Variation of Alcoholic Profile of the Study Population

We observed through table 4 that 66.40% of rural drinkers were in the 51-60 age group with a non-significant difference (P=.73) compared to other age groups. In the urban area, 47.42% (P=.34) of individuals in the 51-60 age group consumed alcohol. It also appeared that in the rural area 7.69% of people drank more than three beers per day while there were 18.75% in the urban area. The consumption of alcohol was pronounced in public places.

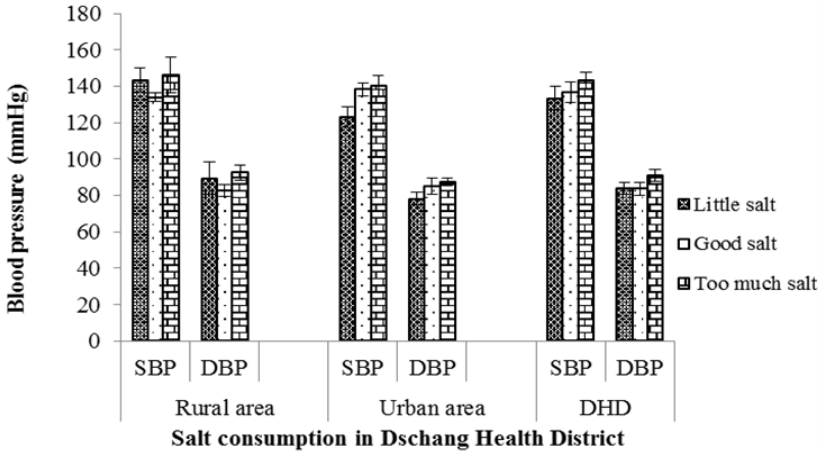

Fig. 1. Variation of blood pressure by salt intake

SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, DHD = Dschang Health District

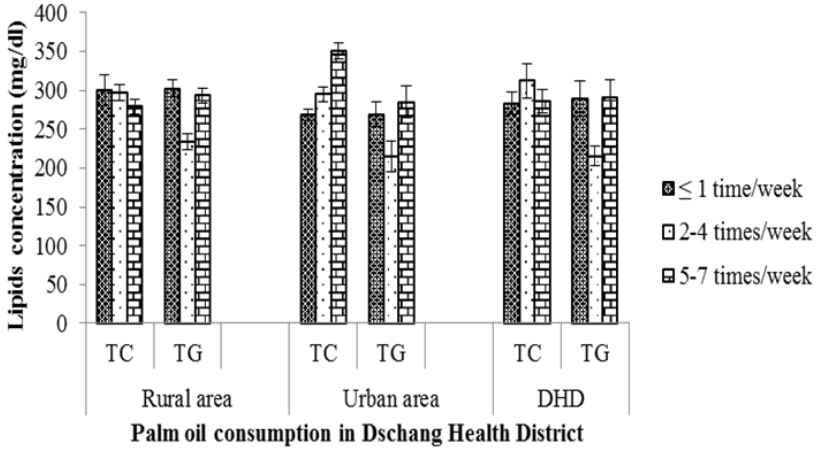

Fig. 2. Lipid variation due to palm oil consumption

TG = Triglyceride, TC = Total cholesterol, DHD = Dschang Health District

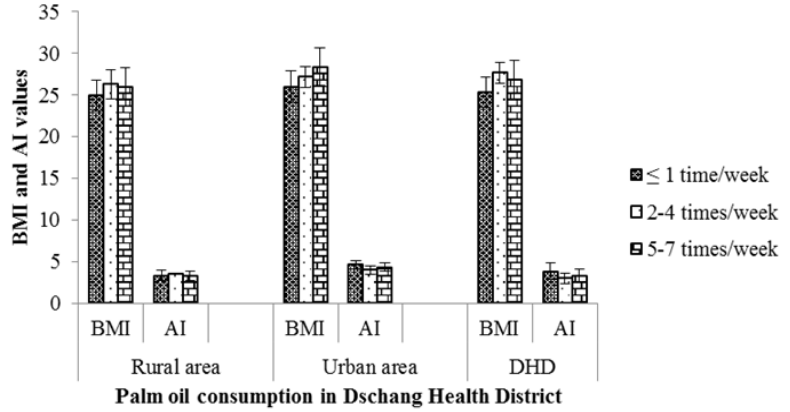

Fig. 3. Variation of BMI and AI in relation with palm oil consumption

BMI = Body Mass Index, AI = Atherosclerosis Index, DHD = Dschang Health District

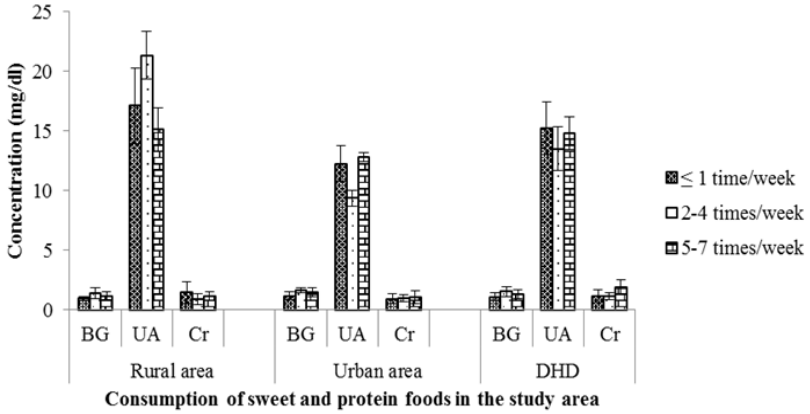

Fig. 4. Variation of BG, UA and Cr according to food consumption

BG = Blood glucose, UA = Uric acid, Cr = Creatinine, DHD = Dschang Health district

Table 4. Alcohol consumption profile of urban and rural population

Characteristics		Rural area (n = 147)			Urban area (n = 107)		
		Age group					
		30-40 (%)	41-50 (%)	51-60 (%)	30-40 (%)	41-50 (%)	51-60 (%)
Alcohol status	Former drinker	0	25	75	0	0	100
	Drinker	17.19	16.41	66.40	27.83	24.74	47.42
	Non drinker	20	26.67	53.33	62.50	12.50	25
	P-value	*.73*			*.34*		
Quantity / day	1 to 2 beers	12.28	22.81	64.91	31.37	27.45	41.18
	1 to 2 glasses	16.07	14.29	69.64	21.88	21.88	56.25
	3 bottles and more	30.77	7.69	61.54	25	18.75	56.25
	Less than a glass	40	0	60	0	0	0
	P-value	*.33*			*/*		
Place of consumption	At home	10.34	20.69	68.97	26.09	26.09	47.83
	At work	66.67	33.33	0	0	33.33	66.67
	Public places	17.17	15.15	67.68	28.77	23.29	47.95
	P-value	*.09*			*.87*		
Time of year when consumption is intense	Do not know	13.51	13.51	72.97	23.33	33.33	43.33
	May-October	100	0	0	33.33	0	66.67
	November-April	16.30	18.48	65.22	28.79	21.21	50
	P-value	*.03*			*.61*		

n = Population size/area % = Percentage by characteristic

3.9 Variation of Lipid Parameters According to Alcohol Consumption in the DHD

Fig. 5 illustrated the variation of lipid parameters in relation with alcohol consumption. It appeared that among drinkers, TC is significantly higher in the urban area (398.34 ±21.48 mg/dl) compared to the rural area (314.17 ±32.26 mg/dl) (P<.05). It was also observed that high-density lipoprotein cholesterol (HDL-c) was low and below the norm (<0.55 mg/dl) in all groups in the urban area (13.13 ±4.32 mg/dl for former drinkers, 21.55 ±4.44 mg/dl for drinkers and 24.41 ±10.11 mg/dl for non-drinkers). It should be noted that among former drinkers, the TG level was significantly higher in the rural area (177.42 ±16.97 mg/dl) compared to the urban area (117.16 ±16.09 mg/dl).

3.10 Alcoholic Status Influence on the Atherosclerosis Index in DHD

In the urban area, atherosclerosis index was significantly elevated among drinkers (5.1 ±0.22) compared to rural drinkers (3.38 ±0.4) as presented on Fig. 6.

3.11 Alcoholic Status Influence on Transaminase Levels in DHD

Fig. 7. showed that in the DHD, alanine amino transferase (ALT) was higher among drinkers(15.67 ±1.63 U/L) compared to former drinkers (14.45 ±1.39 U/L) and non-drinkers (14.37 ±1.84 U/L) (P>.05). Former drinkers (23.43 ±2.01 U/L) had aspartate amino transferase (AST) levels significantly higher compared to non-drinkers (18 ±2.07 U/L).

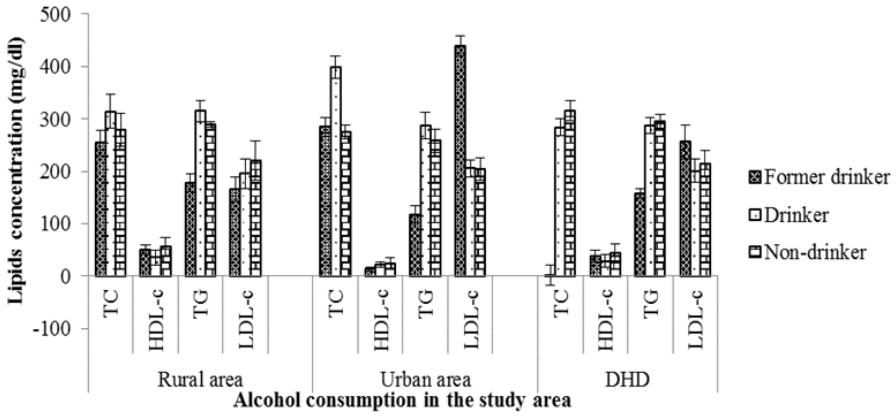

Fig. 5. Lipid levels variation in relation with alcohol status

TC = Total Cholesterol, TG = Triglyceride, DHD = Dschang Health District, HDL-c = High Density Lipoprotein, LDL-c = Low Density Lipoprotein

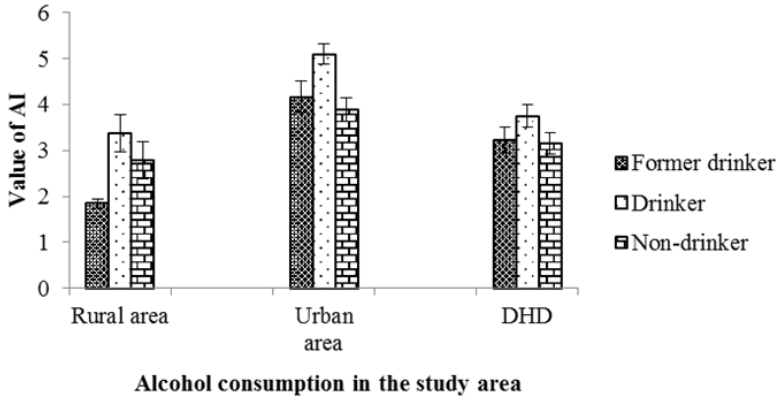

Fig. 6. Variation of AI according to alcohol status

AI = Atherosclerosis Index, DHD = Dschang Health District

3.12 Influence of Alcoholic Status on Blood Glucose in DHD

We observed in Fig. 8 that the BG level of former drinkers was higher (1.43 ±0.16 g/l) compared to the drinkers (1.27 ±0.1 g/l) and non-drinkers (1.17 ±0.09 g/l) without significant difference (*P*>.05).

3.13 Influence of Alcoholic Status on Creatinine in DHD

Fig. 9 showed that non-drinkers in DHD had a higher creatinine level (1.32 ±0.12 mg/dl) (*P*>.05) than former drinkers (0.84 ±0.15 mg/dl) and drinkers (1.12 ±0.15 mg/dl).

3.14 Influence of Alcoholic Status on Uric Acid Levels in DHD

It was noted in Fig. 10 that throughout the DHD, the levels were above the normal value (3.6 to 8.2 mg/dl). Former drinkers had higher rates with no significant difference (*P*>.05) in the study area (17.43 ±2.57 mg/dl) compared to drinkers and non-drinkers respectively (14.71 ±2.16 mg/dl and 16.8 ±2.57 mg/dl).

3.15 Influence of Demographic Characteristics on the Alcoholic Profile

We noted through Table 5 the influence of demographic characteristics on the alcohol profile in the urban and the rural areas of DHD. We saw that widowers and divorced people in the rural or the urban areas were 100% alcohol drinkers, while 87.40% in the rural area and 91.21% in the urban area were registered among married couples. Singles, 78.57% in the rural area and 85.71% in the urban area were drinkers although the differences were not significant between groups (*P*>.05). Education level and occupation did not influence the alcohol profile in DHD. Moreover, no significant

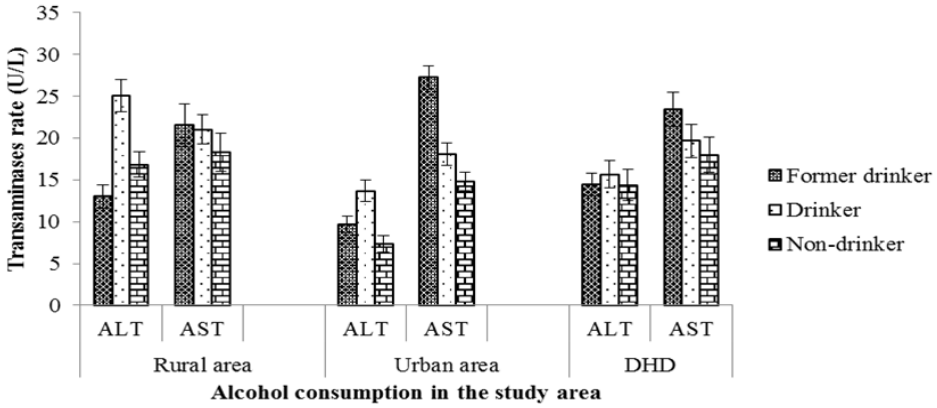

Fig. 7. Variation of transaminases rate related to alcohol status
ALT = Alanine aminotransferase, AST = Aspartate aminotransferase, DHD = Dschang Health District

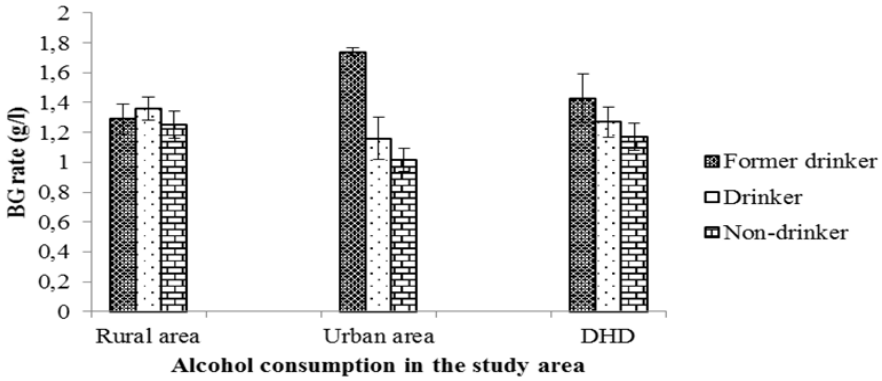

Fig. 8. Variation of blood glucose level related to alcohol status
BG = Blood Glucose, DHD = Dschang Health District

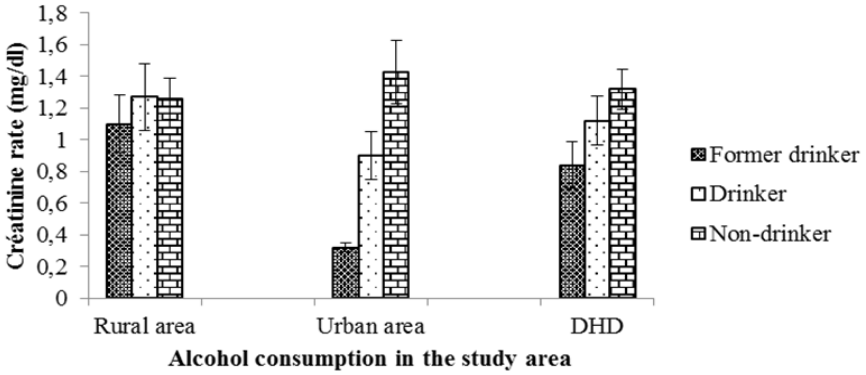

Fig. 9. Variation of creatinine level according to alcohol status
DHD = Dschang Health District

difference was observed between the different age groups concerning alcohol consumption profile.

4. DISCUSSION

In this study of two groups of subjects living in two different environments, the aim was to demonstrate that it exists a close relationship between diet and lifestyle on the occurrence of cardiometabolic diseases in the rural and the urban areas of DHD. It can be seen that the level of education, occupation and even marital status have an influence on food consumption and alcoholism. These results are comparable to those obtained by Sobngwi et al. who showed an association between lifestyle explosion, body mass index, blood pressure, fasting blood glucose, and the occurrence of CMD [7]. Similarly, Mabchour et al. demonstrated that socioeconomic level and alcohol consumption are associated with CMR [2].

The consumption of fruit and vegetables in the study area regardless of age remains low (<400g/day) and below the recommendations of the World Health Organization while these foods are well available in this locality [23]. This may be due not only to ignorance with little knowledge of populations about the ability of dietary fiber and antioxidants from fruits and vegetables to protect against CMD [24]. The consumption of palm oil, and other high fat diets in this population is accentuated (5-7 times/week) among the 51-60 age group (64.86% in the rural area and 66.67% in the urban area), while the young 30-40 years old are numerous to eat more than 3 times/day (50%) and out of home (54.29% in the rural area

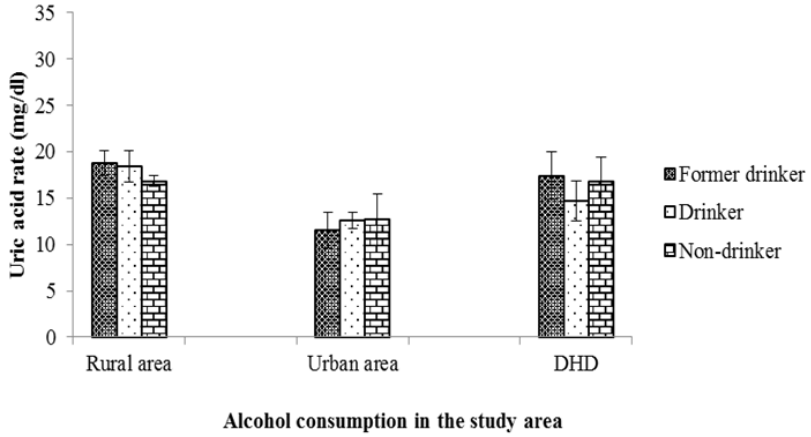

Fig. 10. Uric acid level variation in relation with alcohol consumption
DHD = Dschang Health District

Table 5. Variation of alcohol consumption profile related to demographic characteristics of urban and rural population

Characteristics		Rural area (n= 147)			Urban area (n = 107)		
		Former drinkers (n = 4) (%)	Drinkers (n = 128) (%)	Non-drinkers (n = 15) (%)	Former drinkers (n = 6) (%)	Drinkers (n = 78) (%)	Non-Drinkers (n = 23) (%)
Marital status	Single	0	78.57	21.43	0	85.71	14.28
	Divorced	0	100	0	0	100	0
	Married	3.15	87.40	9.45	2.20	91.21	6.59
	Widower	0	100	0	0	0	0
	P-value	*.94*			*.23*		
Education level	Non educated	0	60	40	0	100	0
	Primary	2.86	82.86	14.28	0	92.31	7.69
	Secondary	3.51	94.74	1.75	2.22	97.78	0
	University	0	100	0	2.13	82.98	14.89
	P-value	*.01*			*.11*		
Occupation	Strength activity	0	90.48	9.52	0	91.67	8.33
	Bureaucrat	5.88	88.23	5.88	3.39	84.74	11.86
	Manufacturing	2.75	86.24	11	0	100	0
	P-value	*.66*			*.29*		

% = Percentage by characteristic, n = Size/area

and 30.77% in the urban area) even if the difference is not significant. We might think that street food, which is ready for consumption, is unhealthy and uncontrolled because it is very rich in processed fat and/or sugars, which can promote the development of obesity and associated chronic diseases. Sossa et al. confirmed that these foods and beverages are prepared and sold by street vendors [3]. Steyn and Labadarios have also shown that these foods are consumed by all social classes while they directly influence CMR by the unhygienic and salty quality of the meals served there [25]. This situation is all the more serious as we observe in this study that 23.8% of people in the rural area and 14.01% in the urban area drink water at most 4 days a week, which with the consumption of very salty food in the 51-60 age group (63.64% in the rural area and 50% in the urban area) will predispose this population to hypertension (143.35 ±4.42 / 90.82 ±3.33 mmHg); because water and sodium are essential nutrients that allow the maintenance of the osmotic pressure and the regulation of the water balance. Cohen and Alderman, Strazzullo et al. found that high salt intake was associated with cardiovascular diseases increased risk [26,27].

The levels of TC (312.15 ±21.39 mg/dl) and TG (290.3 ±23.16 mg/dl) are elevated in DHD and this could be explained by a hypercaloric diet very rich in saturated fatty acids. Fats consumption induced a higher AI in the urban area (4.6 ±0.46) although the difference was not significant. We might think that the abundant consumption of unrefined palm oil for cooking is the main source of dietary fat in most DHD households. This contributes to increase levels of TC and TG because it is an oil composed of approximately 51% saturated fatty acids known to increase blood cholesterol when it is consumed abundantly [28]. It is therefore advisable to moderate its use, without however seeking to exclude it because the occasional consumption of unrefined palm oil (red oil) in small doses is not problematic.

In general, the level of transaminases in DHD increases with age irrespective of the level of food and alcohol consumption. The 30-40 age group has the best profile (17.13 ±1.23 U/L for the ALT and 17.8 ±1.27 U/L for the AST) while the 51-60 age group has the highest values (20.84 ±1.13 U/L for AST and 19.2 ±1.4 U/L for ALT) although these values remain in the norm. This would be a consequence of the high alcohol consumption in the 51-60 age group (66.40% in the rural area and 47.42% in the urban area) as well as the high consumption of dairy products (55.56% in the rural area and 41.11% in the urban area). We might think that the liver, the muscles and even the heart undergo a deterioration with age, hence this high level of transaminases in the blood of the over 50 years; which corroborates the work of Moss and Henderson [29]. In the rural area, the uric acid level (21.35 ±1.98 mg/dl) is significantly higher than in the urban area (12.82 ±0.35 mg/dl). This

result could be explained by the fact that rural area is characterized by an accentuated consumption of bush meat, which is caught and consumed almost the same day due to the lack of conservation means. The consequence of that feeding habit is the rate increase of uric acid in the blood, standing as a precursor of gout that causes CMD [30]. In urban area, beef, pork and mutton are more eaten. It is noted that in Dschang Health District high consumers of meat products have a high creatinine level (1.94 ±0.57 mg/dl), but this rate is higher in the rural area compared to the urban area.

The blood glucose level is higher in the urban area (1.64 ±0.19 g/l) compared to the rural area (1.44 ±0.46 g/l) and both are above normal (1.26 g/l). In addition, sweet products are more commonly found and consumed in the urban areas where there is more hyperglycemia (13.08%) and diabetes (25.23%). These results are similar to those obtained by Sobngwi et al. [7]. This would indicate that in Cameroon, exposure to urban lifestyle is a potential risk factor for types 2 diabetes and World Health Organization also indicated that this prevalence is high in the urban area [31]. It is also observed that this blood sugar level increases with age and therefore the highest value is found among the 51-60 age group (1.33 ±0.1 g/l). However, these results are contrary to those obtained by Vega-Lopes et al. who reported that types 2 diabetes represents 90% of the world's diabetes cases and is for 40 to 50 years old [32].

5. CONCLUSION

We can conclude that Dschang Health District populations consumed a lot of salt mainly in the 51-60 age group. The 30-40 age group was more oriented towards meals out of home. In general, the consumption of fruits and vegetables was not the most shared thing in the Dschang Health District. This study also highlighted a high consumption of meat products, sugar products intake, palm oil and fatty foods among the population; especially in the period from November to March which coincides with the celebration of rites and traditional ceremonies. The prevalence of cardiometabolic diseases was high in Dschang Health District and lifestyle seems to be a risk factor to consider. To improve the health and knowledge of our populations on the cardiometabolic diseases risk parameters and to contribute to the fight against cardiometabolic diseases related to unhealthy behaviors and lifestyle, future researches could be conducted in Cameroon to extend this study in women, build a database by taking in consideration, the nutritional education inside population.

CONSENT

All authors declare that written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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