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RESEARCH ARTICLE

INFLUENCE OF BLOOD GROUPS, SLEEP QUALITY AND PHYSICAL ACTIVITY LEVELS ON THE CARDIOVASCULAR PROFILE OF TEACHERS OF THE UNIVERSITY OF DOUALA (CAMEROON)

Dr. Ahmadou[1*]; Foba Tchouttang Simora Perez[2]; Dr. Bika Lélé Élysée Claude[3]; Pr. Mekoulou Ndongo Jerson [4]; Pr. Assomo Ndemba Péguy Brice[5]; Pr. Mandengue Samuel Honoré[6] and Pr. Ayina Ayina Clarisse[7]

[1]Senior lecturer, Physiology and Medicine of Physical Activities and Sports Unit, Department of Biology Animal Organisms, Faculty of Sciences, University of Douala, Cameroon;[2]PH.D. Student, Physiology and Medicine of Physical Activities and Sports Unit, Department of Biology Animal Organisms, Faculty of Sciences, University of Douala, Cameroon;[3]Senior lecturer, Physiology and Medicine of Physical Activities and Sports Unit, Department of Biology Animal Organisms, Faculty of Sciences, University of Douala, Cameroon;[4]Associate Professor, Physiology and Medicine of Physical Activities and Sports Unit, Department of Biology Animal Organisms, Faculty of Sciences, University of Douala, Cameroon;[5]Associate Professor, Department of Physiology, Faculty of Medicine and Biomedical Sciences, The University of Yaoundé 1, Cameroon;[6]Professor & General coordinator of Physiology and Medicine of Physical Activities and Sports Unit, Department of Biology Animal Organisms, Faculty of Sciences, University of Douala, Cameroon;[7]Associate Professor, Physiology and Medicine of Physical Activities and Sports Unit, Department of Biology Animal Organisms, Faculty of Sciences, University of Douala, Cameroon

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****Corresponding author:***
Dr. Ahmadou

ABSTRACT

Introduction: Cardiovascular diseases are influenced by emerging risk factors like sleep quality and blood groups. However, regular physical activity (PA) may have positive impacts on cardiovascular health and sleep. The aim of this research was to study the influence of blood groups, sleep quality and physical activity levels on the cardiovascular profile of teachers of the University of Douala. **Material and methods:** The present study was a cross-sectional, descriptive and analytical study. A structured questionnaire was developed taking into account socio-demographic and professional characteristics and family history. PA level was assessed using the *international physical activity questionnaire* and sleep quality using the *Pittsburgh Sleep Quality Index*. Anthropometric (mass, waist and hips circumference, height and body composition), cardiovascular (blood pressure, heart rate and blood sugar level) parameters were measured and blood types determined. **Results:** A total of 200 teachers (38 women and 162 men) participated in the study. Their mean age was 40 ± 8 years. More than half (76%) were overweight/obese ,52% were abdominally obese and 35% had a high waist circumference/hip circumference. Less than half (46%) of the teachers had a poor quality sleep meanwhile 29% had a sleep duration less than 6 h. Overweight/general obesity and hypertension was significantly (p=0.029 et p=0.008 respectively) present in those with a poor quality sleep. The most represented blood group to the least was as follow; O>A>B>AB (44.5% 32.5% 18.0% 5.0% respectively). Those with blood group AB presented a higher frequency of cardiometabolic factors. Less than half (33.5%) of the teachers had a low physical activity level. **Conclusion:** To sum up, poor quality sleep had a negative impact on the cardiovascular profile of teachers. Blood group AB was most at risk. The high level of physical activity was the one with the most positive effect on cardiometabolic risk factors.

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INTRODUCTION

The increasingly competitive and innovative nature of research worldwide in recent years has led to a sharp rise in the performance expectations placed on teachers (1). Consequently, the working environment and the number of hours worked by teachers today expose them repeatedly to stressors, which can have significant and even negative consequences for their health (2). One of the most worrying trends is the rise in non-communicable diseases, which result from a combination of genetic, physiological, environmental and behavioural factors. In addition to these traditional risk factors, there are other so-called emerging factors, such as blood group and sleep quality, which can influence cardiovascular parameters. Consequently, cardiovascular risk and metabolic parameters appear to be associated with blood group (3). Furthermore, a study conducted in the United States has shown an association between blood group AB and the risk

of stroke in non-diabetic individuals compared with diabetic individuals. In addition, factor VIII has also been linked to the risk of stroke in people with blood group AB, independent of conventional risk factors (4). Furthermore, poor sleep quality has also been identified as a risk factor (5). Inadequate sleep is thought to be linked to an increased risk of high blood pressure and mortality from cardiovascular disease. The drowsiness and fatigue that result can lead to reduced productivity but, above all, to a decline in quality of life (6). Moreover, a study conducted in Cameroon on occupational burnout revealed a high prevalence of burnout syndrome in the academic sector. However, regular physical activity is thought to be effective in preventing weight gain (7) by improving cardiometabolic health, regardless of body weight status (8). Given all these factors that contribute to and exacerbate cardiovascular diseases, which are on the rise in Cameroon, and the population's vulnerability to these conditions. It was therefore a matter for us, given the major role played by teachers in a nation's education system, to assess the effect of blood group, sleep quality and level of physical activity on the cardiovascular parameters of teachers at the University of Douala in Cameroon.

MATERIAL AND METHODS

Context and type of study: The study was conducted in an academic setting in the Littoral Region of Cameroon, specifically in three departments (Wouri, Moungo and Nkam). Wouri is one of the four departments in the Littoral Region, with Douala as its administrative capital. Still regarded as Cameroon's economic capital, Douala is a cosmopolitan city home to several private higher education institutions and the University of Douala, where these lecturers teach. Unlike the Wouri region, the Nkam and Moungo regionswhose administrative centers are Yabassi and Nkongsamba respectivelyeach host a public institution. This study was conducted as a cross-sectional survey across 11 institutions between September 2023 and February 2024. These included the Faculty of Arts and Humanities, the Faculty of Economics and Applied Management, the Faculty of Law and Political Science, the Faculty of Medicine and Pharmaceutical Sciences, the Faculty of Science, the National Higher School of Technical Education, the National Higher School of Polytechnics, the Higher School of Economics, the University Institute of Technology in the city of Douala, the Institute of Fisheries Sciences in Yabassi and the Institute of Fine Arts in Nkongsamba.

Participants and sampling: The survey involved teaching assistants, lecturers, senior lecturers and professors with at least one year's professional experience at the selected institutions. Participants who had voluntarily agreed to take part in the study were interviewed individually in their offices and laboratories and asked to provide information on cardiovascular conditions and their risk factors. They had also completed the short version of the IPAQ (International Physical Activity Questionnaire) (9), which assesses the level of physical activity, and the Pittsburgh Sleep Quality Index (10), which assesses sleep quality. Teachers who returned incomplete or incorrectly completed questionnaires were excluded from the study. Initially, 252 teachers from the various selected institutions were contacted; of these, 24 (9.52%) refused to participate in the study, 19 (7.53%) were absent at the appointed time, and 9 (3.57%) questionnaires were excluded due to incomplete data. Our sampling was consecutive and non-exhaustive. In total, two hundred (200) participants were selected for the study and constituted our final sample. The study was approved by the University of Douala and complied with the ethical guidelines of the 1975 Declaration of Helsinki.

Data collection: Data were collected using a structured questionnaire comprising three sections. The first section contained information on sociodemographic and personal characteristics, as well as details about the institution. The second section assessed the participant's self-reported levels of low-intensity (walking), moderate and streanuous physical activity, and time spent sitting during the week preceding the study. The third section focused on the sleep quality index, providing an overall score ranging from 0 to 21; an overall score of 5 indicates poorer sleep quality, and the higher the score, the poorer the quality.

Collection of parameters and diagnostic criteria: The study involved identifying each participant using an individual record form and collecting information on personal and family medical history, as well as substance use and dietary habits. The height of the subjects, standing barefoot, was measured using a graduated measuring rod, whilst weight and body composition were determined using a Terraillon impedance meter (BEG67317, BR, France).Body mass index (BMI) was calculated using the formula BMI = weight (kg) / (height (m)) ² and was used to define overweight as a BMI of ≥ 25 and < 30 kg/m², and obesity as a BMI of > 30 kg/m² (11). Waist circumference and hip circumference (WC/HC) were measured using a tape measure; and the waist-to-hip ratio was calculated. Physiological parameters (blood pressure and heart rate) were measured at rest after a minimum of 15 minutes, on the left and right arms of the seated subject, using an OMRON M3 Plus electronic cuff blood pressure monitor (Health Care Co., Ltd, Kyoto, Japan) approved by the WHO.A blood pressure of ≥ 140/90 mmHg (12) was considered to be high blood pressure (BP). Capillary blood glucose was measured from a drop of blood taken from the index finger using an ACCU-CHEK AVIVA electronic glucometer (Roche Group Laboratory Equipment 207 W, USA), and subjects with a blood glucose level ≥ 1.26 g/L (13) were considered hyperglycaemic. Blood groups and Rhesus factor were determined using the Beth Vincent globular method on an opal plate, employing monoclonal test sera: Anti-A, Anti-B and Anti-AB for blood groups, and Anti-D for the Rhesus factor. Once the measurements had been taken, participants were asked to complete the IPAQ questionnaire (9) in order to assess their level of PA by calculating their score in METs (Metabolic Equivalent of Task) minutes per week, as well as their sleep quality index. The PA questionnaire categorises activities into low, moderate and vigorous levels. Sedentary behaviour was measured by the amount of time spent sitting each day. Sleep quality was assessed over a one-month period using the Pittsburgh Sleep Quality Index questionnaire (10). The questionnaire consists of 19 questions, grouped into 7 components that provide an overall score. The component scores reflect subjective sleep quality, sleep latency (i.e. the time taken to fall asleep), sleep duration, usual sleep efficiency, sleep disturbances, use of medication, and daytime fatigue. Each question is scored on a scale of 0 to 3. The overall PSQI score is then calculated by adding up the seven components, resulting in a total score ranging from 0 to 21; a total score of 5 indicates poorer sleep quality, and the higher the score, the poorer the quality.

Statistical analysis: Data analysis was performed using EpiInfo version 7.2.5. Quantitative and qualitative data were expressed as frequencies and percentages. Associations between dependent and independent variables were assessed using the chi-square test. Means were compared using the unpaired t-test for comparisons between two groups and ANOVA for comparisons involving more than two groups. Fisher's post-hoc test was used for comparisons involving more than two groups. The significance threshold was set at $p < 0.05$.

RESULTS

General characteristics of the study population: Of the 200 participants, the majority were male (81%). More than half (68%) were aged over 35. The most common group were lecturers (44%), followed by teaching assistants (40%). Hypertension (28%) and diabetes (24%) were the most common family histories.

Table I: Breakdown of participants by socio-occupational characteristics and family history

Settings	Variables	N	(%)
Gender	Women	38	19
	Men	162	81
Age group	≤35	64	32
	>35	136	68
Rank	Assistant	80	40
	Teachingload	88	44
	Senior lecturer	19	9.5
	Professor	13	6.5
Family history	Obesity	25	12.5
	Diabetes	48	24
	High blood pressure	56	28
	Myocardial Infarction	4	2
	Stroke	15	7.5

N : Staff, % : Percentage,

Height, weight, waist circumference and waist-to-hip ratio were higher in men, who also had significantly higher muscle mass and bone mass than women ($p<0.0001$). Meanwhile, women had higher BMI and body fat mass. The anthropometric characteristics and body composition of teachers by gender are summarised in Table II

Anthropometric parameters, body composition and age groups: With regard to age group, muscle mass ($p<0.0001$) and bone mass ($p=0.0187$) were higher among teachers under the age of 35, whereas body weight, BMI, body fat mass, waist circumference and waist-to-hip ratio were significantly higher among those over the age of 35. Anthropometric parameters and body composition by age group are summarised in Table III below:

Sleep quality and cardiovascular risk factors: More than half (54%) of the participants reported good sleep quality. Overweight/obesity, abdominal obesity, high triglycerides/cholesterol, hypertension and diabetes were significantly more common among those with poor sleep quality. However, the difference was significant for overweight/obesity ($p=0.029$) and for hypertension ($p=0.008$).

Physical activity and sleep quality: Nearly half (40.5%) of the sample had a moderate level of physical activity and 26.0% a high level, whilst 33.5% had a low level of physical activity. The results suggest that sleep quality appears to improve as the level of physical activity increases, although the difference was not statistically significant ($p=0.073$).

Blood group and cardiovascular profile: Blood group O (44.5%) was the most common, followed by A (32.5%), B (18%) and AB (5%). The most common blood group and Rh factor was O+ (44%), and the least common was A- (0.5%). No significant association was found between blood groups and the cardiovascular profile of our participants (Table IV). The cardiovascular risk factors for different blood groups are summarised in Table IV below:

DISCUSSION

Cardiovascular parameters: The overall aim of this study was to assess the influence of blood group, sleep quality and physical activity levels on the cardiovascular profile of teachers at the University of Douala. The findings indicate that the majority of participants had a history of hypertension, diabetes and obesity, making them a particularly high-risk group (14). Furthermore, three-quarters of our sample were overweight or obese, with a generally higher BMI and body fat mass among participants aged over 35.

These results are similar to those obtained by Lizana et al. in 2020, who also found a higher prevalence of overweight and obesity among teachers in this category (15). Furthermore, the risk of being overweight or obese was three times higher (OR: 3.97, 95% CI: 2.23–7.05) among teachers in this category. These results could be explained by the high proportion of teachers in this age group in our study (68%). They could also be attributed to age-related muscle changes, which lead to atrophy of muscle fibres—particularly type II fibres—and the replacement of muscle mass with adipose tissue, especially from this age group onwards (16).

Sleep quality: SBP, DBP, blood glucose levels, BMI and body fat percentage were higher among those with poor sleep quality, although these differences were statistically significant only for DBP ($P=0.002$). The heavy workload, lack of sleep and subsequent stress experienced by our participants could result in a melatonin deficiency, which may in turn elevate these parameters. Indeed, impaired sleep quality is thought to cause harmful changes in the body via the sympathetic nervous system and certain hormones (17). Meanwhile, high blood pressure may be explained by water and salt retention resulting from chronic exposure to stress hormones during insomnia. Furthermore, the presence of obesity/overweight and a high BMI is thought to be due to insomnia, which acts by inhibiting the action of leptin and increasing that of ghrelin, a hormone that stimulates appetite, leading to overweight and obesity (18).

Level of Physical activity: Less than half of the population engaged in moderate levels of physical activity (40.5%). Although engaging in vigorous physical activity was associated with lower levels of overweight/obesity, abdominal obesity, high WC/HC, and blood pressure (systolic and diastolic). Standing during lectures and in the laboratory could also explain this level of activity. Furthermore, these results are fully consistent with those of Hamer et al. (2014) and Júdice et al. (2015), who found that engaging in moderate physical activity had beneficial effects on all cardiometabolic

Table II. Age, anthropometric parameters and body composition by gender

Parameters	Total	Women	Men	P-value
Age (years)	40 ± 8	37 ± 8	41 ± 8	0.0137
Height (m)	1.7 ± 0.07	1.6 ± 0.06	1.7 ± 0.06	<0.0001
Mass (kg)	83.8 ± 12.7	78.5 ± 11.4	85.1 ± 12.7	0.0039
BMI (kg/m^2)	27.9 ±3.8	28.6 ± 19.1	27.7 ± 3.7	0.1837
Waist circumference (cm)	95.3 ± 57.5	88.3 ± 12.3	97.3 ± 63.5	0.4046
Hip circumference (cm)	105 ± 9.7	108 ± 11.2	104 ± 9.2	0.0327
WC/ HC	0.9 ± 0.5	0.8 ± 0.07	0.9 ± 0.6	0.2779
%Body Fat	22 ± 7.9	28.8 ± 8.4	20.5 ± 6.8	<0.0001
% Muscle Mass	36.6 ± 66	30.4 ± 7.2	38.1 ± 5.4	<0.0001
%Water body	61.4 ± 36.8	25 ± 6.6	63.6 ± 64.5	0.0802
Bone mass (kg)	3.3 ± 0.4	3.1 ± 0.3	3.4 ± 0,4	<0.0001

%: Percentage; WC: Waist Circumference; HC**:** Hip Circumference

Table III. Anthropometric parameters and body composition by age group

Parameters	Total	≤35 years	>35 years	P-value
Age (years)	40 ± 8	31 ± 3	44 ± 6	<0.0001
Height (m)	1.7 ± 0.07	1.7 ± 0.07	1.7 ± 0.07	0.767
Mass (kg)	83.8 ± 12.7	77.1 ± 11	87.05 ± 12.2	<0.0001
BMI(Kg/m^2)	27.9 ± 3.8	25.7 ± 3.8	28.9 ± 3.7	<0.0001
WC (cm)	95.3 ± 57.5	83.9 ± 12.5	100.7 ± 68.6	0.0548
HC (cm)	105.5 ± 9.7	100 ± 9.8	108.1 ± 8.5	<0.0001
WC/ HC	0.9 ± 0.5	0.8 ± 0.07	0.9 ± 0.6	0.2490
%Body Fat	22.08 ± 7.9	17.8 ± 7	24.06 ± 7.5	<0.0001
%Muscle Mass	36.6 ± 66	40.3 ± 6.1	34.9 ± 6	<0.0001
%Water body	61.4 ± 36.8	68.8 ± 64.2	58.01 ± 6.07	0.0525
Bone mass (kg)	3.3 ± 0.4	3.4 ± 0.3	3.3 ± 0.4	0.0187

%: Percentage; BMI: Body Mass Index; WC: Waist Circumference; HC: Hip Circumference

Table IV. Risk factors associated with blood type

	A	AB	B	O	P-value
BMI (kg/m²)	27.2 ± 3.7	28.4 ± 5.2	28.4 ± 4.1	28.1 ± 3.7	0.361
WC (cm)	89.4 ± 12.2	93.9 ± 11.6	91.2 ± 17.0	91.8 ± 11.1	0.315
WC/HC	0.85 ± 0.07	0.88 ± 0.05	0.86 ± 0.07	0.86 ± 0.07	0.291
%MG	20.9 ± 7.7	24.3 ± 11.9	22.2 ± 6.3	22.7 ± 8.1	0.419
BGL (g/l)	0.99 ± 0.11	0.96 ± 0.17	1.02 ± 0.27	0.97 ± 0.13	0.399
SBP (mm Hg)	131 ± 17	121 ± 14	131 ± 18	128 ± 12	0.128
DBP (mm Hg)	82 ± 13	74 ± 12	83 ± 12	80 ± 10	0.100

%:Percentage;BMI: Body Mass Index;WC:Waist Circumference;HC**:**Hip Circumference;BGL:BloodGlucose Level; SBP:systolic blood pressure; DBP: diastolic blood pressure

parameters compared to a low level of activity (19,20). Indeed, regular physical activity increases energy expenditure through the utilisation of fatty acids, thereby reducing their storage and that of body fat (21).

Blood group and Rhesus Factor: In this study, the distribution of ABO and Rhesus blood group phenotypes revealed that blood group O was the most common in the population, followed by groups A, B and AB, with a predominance of Rhesus positive over Rhesus negative. This order is similar to that found in studies conducted by Ndoula et al. (2014) in Cameroon and Tesfaye et al. (2015) in Ethiopia (22,23). However, no association was found between blood group AB and cardiometabolic parameters. However, values for body mass index, waist circumference, high WC/HC fat mass, abdominal obesity and diabetes were higher among individuals with blood group AB. Indeed, according to a study conducted in the United States, blood group AB is associated with a higher risk of stroke in non-diabetic individuals compared to diabetic individuals. Furthermore, factor VIII is also associated with the risk of stroke in people with blood group AB, independent of conventional risk factors (4).

CONCLUSION

The quality of sleep and the level of physical activity play a key role in maintaining and improving cardiovascular health, whilst blood type may have a minor influence.

Conflict of Interests: The authors have no competing interestsо declare that are relevant to the content of this article.

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