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Prevalence and Factors Associated with Overweight and Obesity among Public Secondary School Teachers in Parakou, Benin, in 2021

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Abstract

Introduction: Overweight and obesity represent a public health problem in Africa due to the epidemiological transition. The objectives of this work were to determine the prevalence of overweight and obesity and to identify associated factors among public secondary school teachers in Parakou, Benin in 2021. **Methods:** We conducted a descriptive and analytical cross-sectional study. Teachers working in public secondary schools in Parakou during the 2020 - 2021 academic year, present at work and who gave their written informed consent, were included. A two-stage random sampling was carried out. Data were collected during an individual interview using a questionnaire followed by the measurement of anthropometric parameters and blood pressure. Overweight and obesity were defined by a body mass index ≥ 25 kg/m². Multivariable logistic regression was performed to identify associated factors. **Results:** A sample of 325 teachers, including 88.6% of men, was recruited with an average age of 36.2 ± 6.8 years. The prevalence of overweight and obesity was 43.7% (95% CI [38.1% - 44.8%]). It increased significantly with income ($p < 0.001$). Teachers suffering from diabetes (OR = 2.96 95% CI [1.23 - 7.14]; $p = 0.016$) were at higher risk compared to others as well as teachers with abdominal obesity (OR = 5.82 95% CI [3.09 - 10.95]; $p < 0.001$) compared to others. Conversely, the risk was lower among teachers working in two schools compared to a single school (OR = 0.52 95% CI [0.29 - 0.94]; $p = 0.030$). **Conclusion:** The results show a high prevalence of overweight and obesity. Actions are necessary to prevent overweight and obesity among secondary school teachers in Parakou, in Benin.

Keywords

Prevalence, Obesity, Teachers, Benin

1. Introduction

Overweight and obesity were defined by the World Health Organization as "an abnormal or excessive accumulation of body fat that can harm health" [1]. They represent the fourth leading risk factor for death worldwide and cause more than 1.3 million deaths each year [2]. According to World Health Organization estimates in 2016, 39% of adults aged 18 and over were overweight and 13% were obese [1].

Obesity is one of the main preventable risk factors for non-communicable diseases such as cardiovascular disease, diabetes, cancer, chronic respiratory diseases and osteoarthritis. There is an increase in the magnitude of obesity with a prevalence that almost tripled between 1975 and 2020.

Overweight and obesity are mainly due to an imbalance between energy inputs and expenditures. Thus, they are favored by sedentary lifestyle or lack of physical activity and unbalanced diet rich in sugars and fat. Developing countries, particularly those in sub-Saharan Africa (SSA), face a double nutritional burden. As they continue to face the burden of malnutrition, they are experiencing an increasing burden of overweight and obesity.

In Africa, a report of the Regional Office of the World Health Organization in 2022, noted a prevalence of 38.8% among women and 22.8% among men. In Benin, the prevalence of overweight and obesity was estimated at 30% and 9.4%, respectively, among adults aged 18 to 69 years old in 2015 [2].

Several factors associated with overweight and obesity have been found in the literature. Genetic factors are implicated in some forms of obesity [3]. Advanced age and female gender were also identified by several African studies [4] [5] [6]. On the environmental level, the education level, the socio-economic level, the area of residence, and the social acceptance of obesity were found [7] [8] [9]. On the behavioral level, studies have found an association of overweight and obesity with the consumption of fast-food meals and physical inactivity [7] [8]. In terms of the organization of health systems, the lack of health education can contribute to the increase of overweight and obesity.

Teachers are among the priority intervention targets for reducing overweight and obesity in schools. Interventions among secondary teachers responsible for the education of adolescents and young people can contribute not only to individual control of overweight and obesity but also to raising awareness among students and their parents. However, there is little data on overweight and obesity among secondary teachers in sub-Saharan Africa, particularly in Benin. Two studies conducted in India in 2016 and Austria in 2022 reported a prevalence of 72% and 34.4%, respectively [10] [11]. It is important to fill this data gap in Be-

nin for the planning of appropriate prevention actions.

The objective of this study was to estimate the prevalence of overweight and obesity among secondary school teachers in the city of Parakou, Benin, in 2021 and to identify the associated factors.

2. Methods

2.1. Study Design, Population, and Recruitment

It was a descriptive and analytical cross-sectional study. The study population was made up of all teachers working in public secondary schools in the city of Parakou in north Benin during the academic year 2020 - 2021. The inclusion criteria were the presence at work and the written informed consent.

A sample size of 326 teachers was calculated taking into account a theoretical prevalence of 26%, a risk of error of 5%, a chosen precision of 5% and a proportion of non-response of 10%. A two-stage random survey was conducted. The sample frame was made up of the 10 secondary public schools of Parakou with a first and second degree. A random selection of 50% of these schools was made. Then, teachers of the 5 schools retained, was randomly selected. The number of teachers selected per school was proportional to the size of teachers.

2.2. Variables, Data Collection and Analysis

The main dependent variable was "overweight and obesity", defined by a body mass index ≥ 25 kg/m². Overweight corresponded to a body mass index between 25 kg/m² and 30 kg/m², and obesity to a body mass index ≥ 30 kg/m². The body mass index was calculated by dividing the weight value (in kg) by the square of the height value (in meters).

The independent variables were socio-demographic (age, sex, monthly income, residence, marital status), professional (seniority, status in education, level of education, number of hours of weekly instruction, number of schools), behavioral (insufficient consumption of fruits and vegetables defined as eating less than 5 servings per day, physical inactivity defined as less than 150 minutes per week of moderate physical activity or equivalent, consumption of alcohol last 30 days, smoking), medical history (high blood pressure, diabetes). High blood pressure was defined as systolic blood pressure (PAS) ≥ 140 mm Hg and/or diastolic blood pressure (PAD) ≥ 90 mm Hg during the survey. Abdominal obesity was defined according to the criteria of the International Diabetes Federation as a waist circumference ≥ 94 cm in men and ≥ 80 cm in women [12].

Data collection took place from May 2021 to June 2021. The collection techniques were a face-to-face individual interview and a direct observation consisting of measurements of anthropometric parameters and blood pressure. The weight was measured with a mechanical scale from SECA brand and the height with a fleece from SECA brand. Blood pressure was measured with an OMRON brand electronic monitor with multiple cuffs according to the standards of the International Hypertension Society (ISH). Three consecutive blood pressures

were taken in the sitting position after a rest of at least 5 minutes and within 1 minute between each measurement. The average of the last two measurements was considered as the blood pressure value. The data were recorded on a collection tool developed from the World Health Organization (WHO) STEPS tool and included a questionnaire [13]. The electronic version was used on smartphones thanks to the Kobo Collect application.

The data collection team consisted of 5 students completing their Bachelor's degree in Public Health. It was supervised by a doctor. Prior to the start of data collection, a pre-test of the collection tool was conducted in one secondary school that was not selected for the survey. The pre-test allowed us to adjust the collection tool before the survey.

The data was analyzed in the EPI info software version 7.2. Proportions were calculated for the description of qualitative variables and means (with standard deviation) for quantitative variables with 95% confidence intervals.

A multivariate logistic regression was performed using a backward process. Independent variables were introduced in the initial model at the p-value threshold of 0.2. The association measure was the odd ratio (OR). The association was considered statistically significant for a p-value of less than 0.05.

This study was conducted in compliance with ethical rules and legal provisions. All teachers signed a free and informed consent form after reading the information note about the study. All data was collected and analyzed anonymously. Investigators were trained and committed to collecting data in confidence. The study protocol received the favorable opinion of the pedagogical committee of the National School of Training of Senior Technicians in Public Health and Epidemiological Surveillance. Administrative authorizations have been obtained.

3. Results

A total of 325 teachers were included. The average age was 36.2 ± 6.8 years. There was a male predominance (88.6%) with a sex ratio of 7.8. The socio-demographic and socio-professional characteristics of teachers are presented in **Table 1**. Most were married (79.7%) and about half (54.5%) had a monthly income between 250 and 500 USD. On a professional level, teachers who had a seniority of less than 10 years (49.2%) and who worked in a single school (53.8%) were more represented.

The behavioral and clinical characteristics of teachers are presented in **Table 2**. There were teachers with histories of high blood pressure (14.5%), diabetes (10.8%) and total high cholesterol (6.2%). The prevalence of alcohol consumption was estimated at 67.4% (IC 95% [62.1 - 72.3]) and that of tobacco consumption at 7.1% (95% CI [4.8 - 10.4]). The prevalence of insufficient consumption of fruits and vegetables was 2.1% (95% CI [1.1 - 4.4]) and that of physical inactivity was 22.5% (95% CI [18.3 - 27.3]). The prevalence of high blood pressure and abdominal obesity were 16.6% [95% CI [12.9 - 21.1] and 24.0% [95%CI [19.7 - 28.9] respectively.

Table 1. Socio-demographic and socio-professional characteristics of teachers, (secondary schools, Parakou 2021).

	Count	%
Age (years)		
20 - 29	50	15.4
30 - 39	170	52.3
≥40	105	32.3
Sex		
Male	288	88.6
Female	37	11.4
Marital status		
Single/Divorced/Widowed	66	20.3
Married/in couple	259	79.7
Monthly income (USD)		
<250	81	24.9
250 - 500	177	54.5
≥500	67	20.6
Seniority (years)		
<10	160	49.2
10 - 20	135	41.6
≥20	30	9.2
Number of teaching school		
1	175	53.8
2	127	39.1
3	23	7.1
Field of teaching		
Scientists and physical activity	159	48.9
Literary	166	51.1
Hours of teaching/week		
<10	8	2.5
10 - 20	86	26.4
≥20	231	71.1

Table 2. Medical history, lifestyle information, and clinical parameters of teachers (secondary schools, Parakou 2021).

	Count (N = 325)	%	95% CI
History of high blood pressure	47	14.5	11.1 - 18.7
History of diabetes	35	10.8	7.9 - 14.6
History of high total cholesterol	20	6.2	4.0 - 9.3
Alcohol consumption last 30 days	219	67.4	62.1 - 72.3
Tobacco consumption	23	7.1	4.8 - 10.4
Insufficient consumption of fruit and vegetables	7	2.1	1.1 - 4.4
Physical inactivity	73	22.5	18.3 - 27.3
High blood pressure (during survey)	54	16.6	12.9 - 21.1
Abdominal obsesity	78	24.0	19.7 - 28.9

The mean BMI was 24.6 ± 3.2 Kg/m². The difference between men (24.5 ± 3.1 kg/m²) and women (25.2 ± 3.6 kg/m²)was not statistically significant (p = 0.181). The distribution of teachers by BMI class is illustrated by Figure 1. Among the 325 teachers, 124 (38.2%) had a BMI between 25 and 30 Kg/m² and 18 (5.5%) had a BMI ≥ 30kg/m². The prevalence of overweight and obesity was estimated at 43.7% (95% CI [38.1 - 48.8%]).

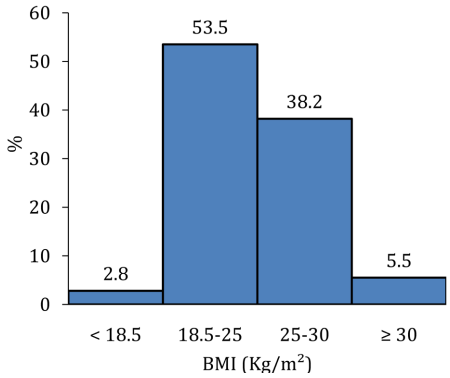

Figure 1. Distribution of Body mass index among 325 teachers(secondary schools, Parakou 2021).

Table 3. Factors associated with overweight and obesity among teachers, univariable analysis (secondary schools, Parakou 2021).

			Overweight and Obesity		
	Yes	No	cOR*	95% CI	p
Age group (years)					0.039
20 - 29	15	35	1		
30 - 39	73	97	1.71	0.87 - 3.37	0.119
≥40	54	51	2.47	1.21 - 5.05	0.013
Sex					
Male	125	163	1		
Female	17	20	1.11	0.57 - 2.24	0.737
Marital status					
Single/Divorced/Widowed	24	42	1		
Married	118	141	1.47	0.83 - 2.56	0.179
Income (USD)					<0.001
< 250	22	59	1		
250 - 500	72	105	1.80	1.01 - 3.19	0.036
≥500	48	19	6.77	3.29 - 13.94	<0.001
Seniority (years)					<0.001
<10	56	104	1		
10 - 20	65	70	1.73	1.10 - 2.83	0.022
20 - 30	21	9	4.33	1.86 - 10.08	<0.001
Number of teaching school					<0.001
1	91	84	1		
2	38	89	0.40	0.25 - 0.65	<0.001
3	13	10	1.23	0.51 - 2.95	0.646
Field of teaching					
Scientific/physical activity	67	92	1		

Continued

Literary	75	91	1.13	0.73 - 1.76	0.581
History of high blood pressure					
No	112	166	1		
Yes	30	17	2.53	1.57 - 4.10	0.003
History of diabetes					
No	116	174	1		
Yes	26	9	4.39	1.99 - 9.71	<0.001
History of high total cholesterol					
No	132	173	1		
Yes	10	10	1.33	0.54 - 3.18	0.539
Alcohol consumption last 30 days					
No	40	66	1		
Yes	102	117	1.41	0.88 - 2.27	0.154
Tobacco consumption					
No	125	177	1		
Yes	17	6	4.01	1.56 - 10.59	0.004
Insufficient consumption of fruits and vegetables					
No	2	5	1		
Yes	140	178	1.96	0.38 - 10.29	0.414
Physical inactivity					
No	28	45	1		
Yes	114	138	1.33	0.78 - 2.26	0.296
Abdominal obesity					
No	82	165	1		
Yes	60	18	6.83	3.78 - 12.32	<0.001
High blood pressure					
No	108	163	1		
Yes	34	20	2.61	1.42 - 3.77	0.002

Table 4. Factors associated with overweight, multivariate analysis, final model (secondary schools teachers Parakou, 2021) OR: Odd Ratio; CI: Confidence Interval; vs: versus.

	Overweight and Obesity		
	Adjusted OR	95% CI	p
Income (250 - 500 USD/vs < 250)	2.58	1.33 - 4.99	0.005
Income (≥ 500 USD/vs < 250)	5.29	2.39 - 11.70	<0.001
Number of teaching school (2/ vs 1)	0.52	0.29 - 0.94	0.030
History of diabetes	2.96	1.23 - 7.14	0.016
Abdominal obesity	5.82	3.09 - 10.95	<0.001

*cOR: Crude Odd Ratio; CI: Confidence Interval.

In univariable analysis, the age group, the monthly income, the seniority, the number of schools, the field of teaching, the histories of high blood pressure and diabetes, the tobacco consumption, the abdominal obesity and the high blood pressure, were associated with overweight and obesity (Table 3). In multivariable

analysis, the monthly income, the number of schools, the history of diabetes and the presence of abdominal obesity remained associated with overweight and obesity (**Table 4**). The risk of being overweight or obese increased with income. Teachers with an income between 250 and 500 USD (OR = 2.58, IC 95% [1.33 - 4.99], p = 0.005) and those with an income ≥ 500 USD (OR = 5.29, IC 95% [2.39 - 11.70], p = 0.005) had a higher risk of overweight and obesity compared to teachers who had a lower income < 250 USD. Teachers working in two schools had a lower risk of being overweight or obese (OR = 0.52, IC 95% [0.29 - 0.94]; p = 0.030) compared to those working in a single school. In addition, teachers with diabetes (OR = 2.96, IC 95% [1.23 - 7.14], p = 0.016) had a higher risk of being overweight or obese compared to others as well as teachers with overweight abdominal obesity (OR = 5.82, IC 95% [3.09 - 10.95], p < 0.001) compared to others.

4. Discussion

This study reveals a high prevalence of overweight and obesity of 43.7% among targeted teachers. This prevalence increased significantly with income. It also varied according to the number of teaching colleges, diabetes status, and the presence of abdominal obesity.

The prevalence of overweight (38.2%) was higher than that observed nationally in 2015 at 29.9%. However, a lower prevalence of obesity (5.5%) was noted compared to the results of the national survey (9.4%). The difference may be due to higher levels of health literacy among teachers than among the general population. The information could have been focused more on the health consequences of obesity than those of overweight. A study of secondary school teachers' knowledge and practices regarding overweight prevention could provide more information to support our hypothesis. The prevalence of overweight was also higher than that reported among health workers in Parakou, in Benin in 2016 (24.1%) [4] and among traders in the Dantokpa market in Cotonou in 2019 [5].

The prevalence of overweight and obesity is lower than that observed among secondary school teachers in 2016 in India (72%) while it is higher than that found in 2022 in Austria (34.4%) [10] [11]. Other studies among teachers of different teaching degree reported prevalence of 53.0% in Hungary in 2022, 57.1% in Brazil in 2019, 64.5% in Saudi Arabia in 2023, and 84.7% in South Africa in 2016 [14] [15] [16] [17]. These studies highlighted the variability of the prevalence of overweight and obesity among teachers from different regions. These differences may be related to study methods and periods or to some socio-cultural, economic and health-environmental factors.

The prevalence of overweight and obesity increased with the income level, contrary to findings in other studies in which an inverse association was observed [18] [19]. A sedentary lifestyle and a diet high in sugar and fat can explain obesity in wealthy people.

A link between obesity and diabetes status was also found in this study. Traditionally, obesity is a risk factor for diabetes. There is therefore a frequent associ-

ation between diabetes and obesity. Obesity should precede the onset of diabetes. However, the cross-sectional design of the study does not allow to establish a temporality between obesity and diabetes status and to take it into account in the discussion.

The prevalence of overweight and obesity was higher among teachers working in a single school probably because they may be more sedentary than those working in two schools. In depth, studies could allow us to identify relevant explanatory factors.

An association between abdominal obesity and overweight/obesity was found in this study and is consistent with literature data. Indeed, abdominal obesity is another indicator of obesity. It is identified as a more specific cardio-metabolic risk factor according to several studies.

Age progression, female sex, physical inactivity and insufficient consumption of fruits and vegetables recognized as factors associated with overweight were not found in this study probably due to lack of power related to the small size of the sample. A larger size could highlight more associated factors.

This study addresses the lack of information on the prevalence of overweight and obesity among secondary school teachers in Parakou. The data will allow the planning and implementation of appropriate preventive measures against overweight among teachers. The collection of behavioral data can lead to information biases because they are based on statements. Moreover, the factors associated with obesity found in this study cannot be considered as etiological factors, taking into account the study design. We can't establish a causal link between these factors and obesity. We can't also generalize the results to all secondary school teachers in Parakou as we didn't select private schools' teachers.

5. Conclusion

This study reveals a high prevalence of overweight and obesity among public secondary teachers in Parakou in 2021. This prevalence varied according to income, diabetes status, the number of teaching school and the presence of abdominal obesity. Awareness among teachers, especially those working in a single college and those with higher incomes, is needed. It would also be interesting to encourage teachers to set up in secondary schools, sports sessions for themselves for the prevention of obesity. Specific research with analytical design would be useful.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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