

# Epidemiological Aspects of Obesity, Overweight and Cardiovascular Risk Factors at Associes in Semi-Urban Areas (Case of Sébikotane)

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## Abstract

**Introduction:** Obesity and overweight are a public health problem. The general objective was to determine the epidemiological aspects of obesity, overweight and associated risk factors in a semi-urban environment. **Patients and Methods:** This was a cross-sectional, descriptive study conducted on November 28 and 29, 2023 in Sébikotane. It focused on volunteers for screening for chronic non-communicable diseases. Epidemiological and clinical data were evaluated. **Results:** One hundred and twenty-nine cases of obesity were recorded (28%). Two hundred and eighty-two cases were overweight or obese (61.3%). The mean age was 49.55 years, with a standard deviation of 12.41 years. The age group [40 - 49 years] was the most representative, with 85 cases (30.1%), and the majority were female, with 264 cases (93.6%). Primary education was the most common, with 75 cases (46.3%). Grade 1 obesity concerned ninety-seven cases (75.2%), and diabetes was present in thirty cases (23%). Hypertension was present in ninety-five cases (33.7%). Obesity was more marked in the age group [40 - 49 years] with 45 cases (36%). **Conclusion:** Obesity and overweight are a major cause of morbidity and mortality. The development and implementation of a prevention and management program is essential.

## Keywords

Obesity, Overweight, Risk Factors, Sébikotane, Senegal

## 1. Introduction

Obesity and overweight are major public health problems and causes of death worldwide, especially in low- and middle-income countries [1]. According to the World Health Organization (WHO), an estimated 1900 million adults worldwide are overweight, and 650 million are obese [2]. Obesity and overweight are associated with a higher risk of diabetes, hypertension and other chronic diseases [3], and their association with other cardiovascular risk factors leads to increased morbidity and mortality [4] [5]. In Africa, obesity and overweight are on the increase.

In Senegal, the STEPS survey in 2015 showed a prevalence of 6.4% with 2.5% in men and 10.0% in women [6].

In 2013 in Saint Louis, Pessinaba *et al.* found a prevalence of obesity (23%) [7]. In a study carried out in Guéoul in 2018 on the prevalence of cardiovascular risk factors in semi-rural areas, the prevalence of obesity was found to be 13% [8]. Eleven years later, we thought it would be interesting to study obesity and overweight in a semi-urban area very close to the city of Dakar.

The aim of this study was to investigate the epidemiological aspect of obesity, overweight and associated risk factors in a semi-urban area (Sébikotane).

## 2. Patients and Methods

### 2.1. Study Framework

The Commune of Sébikotane is located 45 km east of Dakar and 15 km from Rufisque (chief town of the department). It is subdivided into sixteen districts, and is a semi-urban area located in the Rufisque department of the Dakar region, bordering the Thiès region. The screening was held in the cultural center, and included a reception area, four offices for consultations, capillary blood glucose sampling and the taking of vitals (blood pressure, pulse, blood glucose, height, waist circumference, weight), and urine analysis.

### 2.2. Type of Study

This was a prospective descriptive and analytical cross-sectional study. Our volunteers were recruited over a two-day period (October 29 and 30, 2023).

### 2.3. Study Population

The study population consisted of all volunteers screened in Sébikotane.

### 2.4. Inclusion Criteria

Our work included all volunteers who had their weight and height recorded to obtain their BMI during the recruitment period.

### 2.5. Non-Inclusion Criteria

Patients with no BMI (no weight or height or both) and consenting patients were excluded.

## 2.6. Data Collection Procedure

A form was drawn up to serve as a basis for data collection. It covered the patient's marital status, lifestyle, family and personal history, and anthropometric data.

Patient data are recorded in the patient card.

## 2.7. Study Variables

- Socio-professional data  
These included age, gender, marital status, profession, ethnicity and origin.
- History and associated risk factors  
These included personal history (hypertension, asthma, dyslipidemia, diabetes), family history (diabetes, dyslipidemia).
- § La Measuring height and weight was made easier by direct reading using a height gauge and a bathroom scale.
- § La Quételet's Body Mass Index (BMI) was calculated using the following formula: weight in kilograms to height in centimetres squared.
- § La BMI classification used was that of the WHO [9]. TT was measured at mid-distance between the anterior superior iliac spine and the lower edge of the last ribs on a bare abdomen at the end of normal expiration.
- § La abdominal obesity has been defined as a TT value greater than 94 cm in men and 80 cm in women [10].

Any volunteer with diabetes and/or taking anti-diabetic medication or with capillary blood glucose  $>2$  g/l and signs of diabetes was considered diabetic.

AH was defined and classified according to the 2007 European Society of Hypertension (ESH) recommendations [11]. BP was measured after at least ten minutes' rest in both arms, using a manual mercury sphygmomanometer with the appropriate cuff and inflatable bag sizes in accordance with WHO recommendations [12]. PAS and PAD corresponded to the first and fifth Korotkoff sounds. Three measurements at five-minute intervals were averaged. High blood pressure was defined as PAS greater than or equal to 140 mm Hg and/or DBP greater than or equal to 90 mm Hg.

**Ethical considerations:** Data confidentiality was respected. Authorization from the Sébikotane authorities was requested beforehand.

## 3. Results

### 3.1. Population

Four hundred and sixty volunteers were enrolled during the study period. The mean age was 47.53 years, with extremes of 14 and 84 years. The [40 - 49] age group was the most representative, with one hundred and twenty-six cases, *i.e.* 27.4%. BMI was normal in one hundred and fifty-nine volunteers (34.6%). However, one hundred and fifty-three (33.3%) were overweight and one hundred and twenty-nine (28.0%) obese. Nineteen volunteers (4.1%) were thin. The average weight of the population was 70.97 kg, with extremes ranging from 33 to 120 kg.

The average height of the population was 1.63271 m. The minimum height

was 1.380 m. The maximum height was 1.8603 m. The mean waist circumference of this population was 87.2 cm, with extremes ranging from 44 cm to 126 cm. One hundred and twenty-five volunteers (27.2%) had blood glucose levels above 1.21.

## 3.2. Overweight and Obese Population

### 3.2.1. Epidemiological Data

During the study period, one hundred and twenty-nine cases were obese, *i.e.* 28% of the general population. Two hundred and eighty-two cases were overweight or obese (61.3%).

The mean age was 49.55 years, with a standard deviation of 12.41 years. The age group [40 - 49] was the most representative with 85 cases (30.1%), followed by the age group [50 - 59] with 78 cases (27.7%). Fourteen volunteers were under 30 (5%) (**Table 1**). Obesity was more marked in the age group [40 - 49 years] with 45 cases (36%). It was 13% in the [20 - 29] age group, and 17% were overweight (**Table 2**). Two hundred and sixty-four cases (93.6%) were predominantly female. Obesity and overweight were more prevalent among women, with 128 (31%) and 136 (33%) respectively. Shopkeepers were the most represented with 43.9%, followed by housewives (30%). Primary education was the most represented with seventy-five cases, a percentage of 46.3%, followed by junior high school with forty-one cases, a percentage of 25.3%. The most common levels of education among obese people were zero, Arabic and high school, with 30%, 30% and 35% of cases respectively. Uneducated volunteers were most represented among the overweight: 36% (**Table 3**). Married people were in the majority with two hundred and twenty-three cases, *i.e.* 79.1%. Singles accounted for 10 cases (3.5%).

**Table 1.** Distribution by age group.

Age range	Workforce	Percentage (%)
<20	0	0
20 - 29	14	5
30 - 39	42	14.9
40 - 49	85	30.1
50 - 59	78	27.7
60 - 69	49	17.4
70 - 79	12	4.3
>80	2	0.7
Total	282	100

**Table 2.** Breakdown by age group.

Age range	Obesity	Overweight
<20	0 (0%)	0 (0%)
20 - 29	6 (13%)	8 (17%)

**Continued**

30 - 39	23 (34%)	19 (28%)
40 - 49	45 (36%)	40 (32%)
50 - 59	33 (30%)	45 (41%)
60 - 69	16 (20%)	33 (41%)
70 - 79	6 (39%)	6 (35%)
>80	0 (0%)	2 (50%)
Total	129	153

**Table 3.** Distribution of overweight and obese patients by level of education.

Study level	Obesity	Overweight
0 (no schooling)	55 (30%)	65 (36%)
Arabic	13 (30%)	16 (36%)
Primary	36 (28%)	39 (30%)
College	18 (26%)	23 (33%)
Lycée	6 (35%)	3 (18%)
University	1 (6%)	7 (41%)
Total	129	153

**3.2.2. Clinical Data**

Asthma was noted in twenty cases (7.1%). Familial diabetes was noted in 119 cases (42.2%), familial arterial hypertension in one hundred and forty-five cases (51.4%), and menopause in one hundred and twenty-eight cases (48.5%). Menopause was present in one hundred and twenty-eight cases (48.5%). Fetal macrosomia was present in sixty-five cases (24.6%), and abdominal obesity in one hundred and thirty-six cases (29.6%). Grade 1 obesity concerned ninety-seven cases (75.2%), twenty-seven were grade 2 (20.9%) and five grade 3 (3.9%). Diabetes was present in thirty cases (23%). Hypertension was present in ninety-five cases (33.7%). There was only one case of smoking among obese and overweight subjects. A sedentary lifestyle was observed in fifty-four cases (19.1%). Abdominal obesity was present in two hundred and fifty-four cases or (90.1%) (Table 4). Diabetics were (32%) obese and (40%) overweight. Among hypertensives, 52 (28.4%) were obese and 43 (23.5%) were overweight. The number of cardiovascular risk factors was greater than or equal to 3 in 40 cases (14.2%). The maximum number of cardiovascular risk factors was 7, representing 1 case (0.3%) (Table 5). The mean weight of the obese and overweight population was 79.60 kg, with a standard deviation of 11.44. The mean height of the obese population was 1.63m with a standard deviation of 0.07. The mean waist circumference of the overweight and obese population was 93.72 cm with a standard deviation of 11.41 (Table 6).

**Table 4.** Summary of cardiovascular risk factors.

Cardiovascular risk factors	Workforce	Percentage (%)
Diabetes	65	23
HTA	95	33.7
Abdominal obesity	254	90.1
Tobacco	1	0.4
Obesity	129	45.7
Sedentatitits	54	19.1
Asthma	20	7.1

**Table 5.** Distribution of obesity and overweight by number of cardiovascular risks.

Number of FRCV	Obesity and overweight	Overweight	Obesity
0	85 (30.2%)	40	45
1	34 (12%)	30	4
2	43 (15.2%)	13	30
3	40 (14.2%)	23	17
4	24 (8.5%)	15	8
5	3 (1%)	3	1
6	52 (18.4%)	29	23
7	1 (0.3%)	0	1
Total	282 (100%)	153	129

**Table 6.** Summary distribution of overweight and obese volunteers by level of education.

Obesity and overweight	Obesity and overweight				P
	Yes		No		
	Average	Standard deviation	Average	Standard deviation	
AGE	49.55	12.41	44.35	16.31	0.000
Diabetes duration	7.93	6.84	6.25	4.45	0.443
No. of children	4.41	2.84	3.66	3.05	0.008
TAS	12.98	2.36	12.23	2.04	0.001
TAD	8.28	1.45	7.78	1.21	0.000
Waist circumference	93.72	11.41	78.46	9.65	0.000
Fasting blood glucose	1.19	0.38	1.16	0.45	0.410
Weight (kg)	79.60	11.44	57.29	8.21	0.000
Size (m)	1.63	0.07	1.64	0.08	0.020
BMI	30.10	4.01	21.20	2.45	0.000
Pulse	79.54	11.04	81.29	10.93	0.253
Nb FDRCV	2.38	0.98	2.33	0.89	0.555

## 4. Discussion

The main limitation of the present study lies in the number of people and places studied in Sébikotane, and may therefore not be representative of the urban population as a whole. During the present study, obesity and overweight affected 28% and 33.2% of volunteers respectively. This prevalence of obesity and overweight in the present study is higher than those reported among studies carried out in Africa. Thus, in Guinea Bissau, the overall prevalence of obesity was 12.8% [13], in Burkina Faso in 2013 (24.5% overweight and 12.5% obese), and in Malawi (23.2% overweight and 12.0% obese) [14] [15]. An earlier study in Dakar showed 19.2% overweight and 9.7% obese [16] [17]. We note a clear increase in this prevalence. Moreover, obesity and overweight affected **61.3% of the** Sébikotane population. We believe that this disparity may be due to differences in eating habits or lack of physical activity. **Obesity** and overweight are more prevalent among women, with 128 (31%) and 136 (33%) respectively. This finding is the same as in other countries. In Guinea Bissau, the overall prevalence of obesity was almost four times higher in women than in men (20.6% versus 5.5%) [13]. In Ibadan, Nigeria, 42% of women and 14% of men were obese [17]. In South Africa, a study of obesity showed similar findings, but with a much higher prevalence of 53.4% and 18.7% in women and men respectively [18]. In Senegal, obesity or overweight is considered a sign of prosperity, good health or beauty in women, or of good social integration [19]. For some, female predominance has been linked to marital status, multiple pregnancies and hormonal changes, particularly after the menopause, and to socio-cultural practices, perceptions and norms [20]. In our study, menopause was present in 48.5% of cases. In the STEPS survey in 2015, obesity was 6.4% with 2.5% in men and 10.0% in women [6]. In Okafor's study in Nigeria, obesity, overweight and underweight were found in 17%, 31% and 5% of participants respectively [21]. In our study, 4.1% of volunteers were underweight. Similarly, in Uchenna, only 4% of the study population was underweight [22]. In a study carried out in north-eastern Nigeria, the prevalence of underweight was 29.1% [23]. The mean age was 49.55 years, with a standard deviation of 12.41 years. The age group [40 - 49 years] was the most representative with 85 cases (30.1%), followed by the age group [50 - 59 years] with 78 cases (27.7%). For Okafor, obesity is also noted, with peaks in the [35 - 44] and [45 - 54] age groups [21]. Obesity and overweight are on the rise among young people. In our study, 5% of obese volunteers were under 30. The figure was 13% in the [20 - 29] age group, and 17% were overweight. This finding is similar to that of some authors, who found that 4.3% of young people were obese [21].

In a study in South Africa, 14.8% (21.1% and 7.8% boys) were overweight and 2.8% obese among young people [24]. Primary education was the most common, accounting for 46.3% of cases. Uneducated volunteers were the most represented among the overweight (36%). Education about the harmful effects of overweight and obesity is needed in this population to reduce morbidity and mortality. In

his study in Guinea, Turé *et al.* found no apparent difference in the prevalence of overweight and obesity among individuals with different levels of education [13]. Shopkeepers were the most represented with 43.9%. The higher prevalence of obesity among people with higher income levels is described in studies [25]. It is described that individuals with higher income levels in Africa tend to turn to diets rich in fats, oils and sugar, as well as animal products rich in saturated fats (diets commonly referred to as “Western diets”), and are much less active [26]. Abdominal obesity was present in 136 cases (29.6%). Elsewhere, abdominal obesity was 71.5% and 23.4% respectively, in women and men [18]. The proportion of morbid obesity was lower (3.9%). Obesity is associated with vascular, respiratory and arthritic complications. Obesity is a risk factor for premature death in people under 65, and for many cardiovascular and non-cardiovascular disorders, including several types of cancer [18]. A high Body Mass Index (BMI) is associated with a higher risk of diabetes, hypertension and other chronic diseases [3]. These two conditions have the same determinants (poor diet), and potentiate their deleterious actions on the body (particularly on the heart, brain, kidneys...). All these factors increase the risk of death. In our study, diabetes was present in 23% of volunteers. Sow *et al.* [27] in their study found overweight in 30.3% and obese in 22.5%. In Ka *et al.*'s study, the rates of obesity and overweight were 5.9% and 2.4% respectively [28]. In Mbaye *et al.*'s series, the prevalence of obesity and overweight was 23.0% [29]. In our study, arterial hypertension was present in ninety-five cases (33.7%). Among hypertensives, 28.4% were obese and 23.5% were overweight. In the study by Charfeddine *et al.*, the prevalence of hypertension among obese adults was 36% [30]. Yayehd *et al.* in Togo found 22.1% obese, with a significant female predominance [31]. In Libreville, obesity was reported in 27.4% [32]. Only one case of smoking is present among obese and overweight people. The association between alcohol consumption, smoking and obesity is not consistent [20]. Abdominal obesity was present in almost all of the study population (90.1%). In fact, central obesity has been recognized as an independent risk factor for cardio-metabolic disease and a better predictor of cardiovascular risk than overall obesity [33]. This risk also exists in the combination of normal weight and central obesity [34]. The number of cardiovascular risk factors was greater than or equal to 3 in 14.2%. This figure shows that almost half the population is exposed to cardiovascular disease.

### Conflicts of Interest

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

### References

- [1] Fanzo, J., Hawkes, C., Udomkesmalee, E., Afshin, A., Allemand, L., Assery, O., Baker, P., Battersby, J., Bhutta, Z. and Chen, K. (2018) World Nutrition Report 2018: Shedding Light on Boosting Action for Nutrition. Development Initiatives Poverty



Research Limited, Bristol.

- [2] World Health Organization (2020) Overweight and Obesity. WHO Press, Geneva.
- [3] Berrington de Gonzalez, A., Hartge, P., Cerhan, J.R., Flint, A.J., Hannan, L., MacInnis, R.J., Moore, S.C., Tobias, G.S., Anton-Culver, H., Freeman, L.B., *et al.* (2010) Body Mass Index and Mortality among 1.46 Million White Adults. *New England Journal of Medicine*, **363**, 2211-2219. <https://doi.org/10.1056/NEJMoa1000367>
- [4] Afshin, A., Forouzanfar, M.H., Reitsma, M.B., Sur, P., Estep, K., Lee, A., Marczak, L., Mokdad, A.H., Moradi-Lakeh, M., Naghavi, M., *et al.* (2017) Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *New England Journal of Medicine*, **377**, 13-27. <https://doi.org/10.1056/NEJMoa1614362>
- [5] Bovet, P., Chioloro, A. and Gédéon, J. (2017) Health Effects of Overweight and Obesity in 195 Countries. *New England Journal of Medicine*, **377**, 1495-1497. <https://doi.org/10.1056/NEJMc1710026>
- [6] Senegal STEPS Survey (2015) Enquete Nationale sur les Facteurs de Risque des Maladies Non Transmissibles Steps. Rapport préliminaire: Les indicateurs clés. [https://www.ansd.sn/sites/default/files/2022-11/DV-STEPS-1-06-2016%20-%20MF-fin\\_ANSD%20vf\\_0.pdf](https://www.ansd.sn/sites/default/files/2022-11/DV-STEPS-1-06-2016%20-%20MF-fin_ANSD%20vf_0.pdf)
- [7] Pessinaba, S., Mbaye, A., Yabéta, G.A.D., Harouna, H., Sib, A.E., Kane, A.D., Bodian, B.M., Ndiaye, M.B., Mbaye-Ndour, M., Niang, K., Diagne-Sow, D., Diack, B., Kane, M., Diao, M., Mathieu, J.-B.S. and Kane, A. (2013) Prevalence Survey of Cardiovascular Risk Factors in the General Population in Saint-Louis (Senegal). *Annales de Cardiologie et d'Angéiologie*, **62**, 253-258. <https://www.sciencedirect.com/journal/Annales-de-cardiologie-et-dangeiologie> <https://doi.org/10.1016/j.ancard.2013.02.005>
- [8] Mbaye, A., Babaka, K., Ngaïde, A.A., Gazalb, M., Faye, M., Niang, K., Dodo, A., Sarr, S.A., Dioum, M., Bodian, M., Ndiaye, M.B., Kane, A., Ndour-Mbaye, M., Diao, M., Diack, B., Kane, M., Diagne-Sow, D., Thiaw, I. and Kane, A. (2018) Prevalence of Cardiovascular Risk Factors in Semi-Rural Settings in Senegal. *Annales de Cardiologie et d'Angéiologie*, **67**, 264-269. <https://doi.org/10.1016/j.ancard.2018.04.005>
- [9] WHO (2000) Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation. *World Health Organization Technical Report Series*, **894**, 1-253.
- [10] Alberti, K.G.M.M., Zimmet, P. and Shaw, J. (2005) The Metabolic Syndrome—A New Worldwide Definition. *The Lancet*, **366**, 1059-1062. [https://doi.org/10.1016/S0140-6736\(05\)67402-8](https://doi.org/10.1016/S0140-6736(05)67402-8)
- [11] Mancia, G., De Backer, G., Dominiczak, A., Cifkova, R., Fagard, R., Germano, G., *et al.* (2007) Guidelines for the Management of Arterial Hypertension: The Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *Journal of Hypertension*, **25**, 1105-1187. <https://doi.org/10.1097/HJH.0b013e3281fc975a>
- [12] Guidelines Subcommittee (1999) 1999 World Health Organization-Internal Society of Hypertension Guidelines for the Management of Hypertension. *Journal of Hypertension*, **17**, 151-183. <https://doi.org/10.1097/00004872-199917020-00001>
- [13] Turé, R., Damascène, A., Djico, M. and Lunet, N. (2021) Prevalence of Underweight, Overweight and Obesity among Adults in the Urban Area of Bissau, West Africa. *Nutriments*, **13**, Article 4199. <https://doi.org/10.3390/nu13124199>
- [14] Kaboré, S., Millogo, T., Soubeiga, J.K., Lanou, H., Bicaba, B. and Kouanda, S. (2020) Prevalence and Risk Factors for Overweight and Obesity: A Nationwide Cross-Sectional Study in Burkina Faso. *BMJ Open*, **10**, e032953. <https://doi.org/10.1136/bmjopen-2019-032953>

- [15] Msyamboza, K.P., Kathyola, D. and Dzowela, T. (2013) Anthropometric Measurements and Prevalence of Underweight, Overweight and Obesity in Adult Malawians: National Population-Based NCD STEPS Survey. *Pan African Medical Journal*, **15**, Article 108. <https://doi.org/10.11604/pamj.2013.15.108.2622>
- [16] Macia, E., Cohen, E., Guèye, L., Boetsch, G. and Duboz, P. (2017) Prevalence of Obesity and Perceptions of Body Size in Urban and Rural Senegal: New Insights into the Epidemiological Transition in West Africa. *Cardiovascular Journal of Africa*, **28**, 324-330. <https://doi.org/10.5830/CVJA-2017-034>
- [17] Olatunbosun, S.T., Kaufman, J.S. and Bella, A.F. (2011) Prevalence of Obesity and Overweight in Urban Adult Nigerians. *Obesity Reviews*, **12**, 233-241. <https://doi.org/10.1111/j.1467-789X.2010.00801.x>
- [18] Malhotra, R., Hoyo, C., Østbye, T., Hughes, G., Schwartz, D. and Tsolekile, L. (2008) Determinants of Obesity in an Urban Township in South Africa. *South African Journal of Clinical Nutrition*, **21**, 315-320. <https://doi.org/10.1080/16070658.2008.11734173>
- [19] Holdsworth, M., Gartner, A., Landais, E., Maire, B. and Delpuech, F. (2004) Perceptions of Healthy and Desirable Body Size among Urban Senegalese Women. *International Journal of Obesity*, **28**, 1561-1568. <https://doi.org/10.1038/sj.ijo.0802739>
- [20] Adeboye, B., Bermano, G. and Rolland, C. (2012) Obesity and Its Impact on Health in Africa: A Systematic Review. *Cardiovascular Journal of Africa*, **23**, 512-521. <https://doi.org/10.5830/CVJA-2012-040>
- [21] Okafor, C.I., Gezawa, I.D., Sabir, A.A., Raimi, T.H. and Enang, O. (2014) Obesity, Overweight, and Underweight among Urban Nigerians. *Nigerian Journal of Clinical Practice*, **17**, 743-749. <https://doi.org/10.4103/1119-3077.144389>
- [22] Ijoma, U.N., Chime, P., Onyekonwu, C., Ezeala-Adikaibe, B.A., Orjioko, C., Anyim, O.B., Onodugo, O.D., Aneke, E., Nwatu, C.B., Young, E., Mbadiwe, N., Ekenze, O.S., Okoye, J.U., Abonyi, M., Ulasi, I.I., Mbah, A. and Onodugo, P.N. (2019) Factors Associated with Overweight and Obesity in an Urban Area of South East Nigeria. *Food and Nutrition Sciences*, **10**, 735-749. <https://doi.org/10.4236/fns.2019.107054>
- [23] Aliyu, S.U., Chiroma, A.C., Jajere, A.M. and Gujba, F.U. (2015) Prevalence of Physical Inactivity, Hypertension, Obesity and Smoking: A Case for NCD Prevention among Adults in Maiduguri, Nigeria. *American Journal of Medical Sciences and Medicine*, **3**, 39-47.
- [24] Otitoola, O. and Oldewage-Theron, W. (2021) Prevalence of Overweight and Obesity among Selected Schoolchildren and Adolescents in Cofimvaba, South Africa. *South African Journal of Clinical Nutrition*, **34**, 97-102. <https://doi.org/10.1080/16070658.2020.1733305>
- [25] Hanlon, P., Byers, M., Walker, B.R. and Macdonald, H.M. (2010) Environmental and Nutritional Factors Related to Disease. In: Walker, B.R., Colledge, N.R. and Ralston, S.H., Eds., *Davidson's Principle and the Practice of Medicine*, 21st Edition, Churchill Livingstone Elsevier, London, 116-121.
- [26] Bovet, P., Ross, A.G., Gervasoni, J.-P., Mkamba, M., Mtasiwa, D.M., Lengeler, C., Whiting, D. and Paccaud, F. (2002) Distribution of Blood Pressure, Body Mass Index and Smoking Habits in the Urban Population of Dar es Salaam, Tanzania and Associations with Socioeconomic Status. *International Journal of Epidemiology*, **31**, 240-247. <https://doi.org/10.1093/ije/31.1.240>
- [27] Sow, D., Diedhiou, D., Diallo, I.M., et al. (2018) Study of Cardiovascular Risk Factors in Type 2 Diabetic Patients at the Marc Sankalé Center in Dakar. *Revue Africaine de Médecine Interne*, **5**, 43-49.

- [28] Ka, O., Sow, D., Yade, B., Léye, M.M.M., Ngom, N.F., Ndiaye, A.A., Diop, C.T., Dia, M.E. and Kane, M.O. (2021) Profile of Diabetics Hospitalized in the Internal Medicine Department of the Ndamatou Hospital in Touba, Senegal. *Mali Public Health*, **11**, 19-25.
- [29] Mbaye, M.-N., Niang, K., Sarr, A., et al. (2011) Aspects épidémiologiques du diabète au Sénégal: Résultats d'une enquête sur les facteurs de risque cardiovasculaire dans la ville de Saint-Louis. *Médecine des Maladies Métaboliques*, **5**, 659-664.  
[https://doi.org/10.1016/S1957-2557\(11\)70343-1](https://doi.org/10.1016/S1957-2557(11)70343-1)
- [30] Charfeddine, S., et al. (2022) [Associated Factors and Subclinical Myocardial Dysfunction in Obese Patients with Masked Hypertension]. *Annales de Cardiologie et d'Angéiologie*, **71**, 6-10.
- [31] Yayehd, K., Damorou, F., Akakpo, R., Tchéro, T., N'Da, N.W., Pessinaba, S., Belle, L. and Johnson, A. (2013) Prevalence of Arterial Hypertension and Description of Its Risk Factors in Lomé (Togo): Results of a Screening Conducted in the General Population in May 2011. *Annales de Cardiologie et d'Angéiologie*, **62**, 43-50.  
<https://doi.org/10.1016/j.ancard.2012.09.006>
- [32] Akagha Konde, C.P., Ndoume Obiang, F., Ayo Bivigou, E., Ndjibah Alakoua, L.C., Moussavou, F. and Madoungou Nziengui, J.B. (2022) High Blood Pressure among Hospital Staff in Libreville: A Preliminary Study of 135 Cases. *Obameer Health Sciences and Disease*, **23**, 78-80.
- [33] Mohamed, S.F., Haregu, T.N., Khayeka-Wandabwa, C., Muthuri, S.K. and Kyobutungi, C. (2019) Magnitude and Predictors of Normal-Weight Central Obesity—The AWI-Gen Study Findings. *Global Health Action*, **12**, Article 1685809.  
<https://doi.org/10.1080/16549716.2019.1685809>
- [34] Cameron, A.J. and Zimmet, P.Z. (2008) Expanding Evidence for the Multiple Dangers of Epidemic Abdominal Obesity. *Circulation*, **117**, 1624-1626.  
<https://doi.org/10.1161/CIRCULATIONAHA.108.775080>