International Journal of Physiology, Health and Physical Education

ISSN Print: 2664-7265
ISSN Online: 2664-7273
Impact Factor: RJIF 8
IJPHPE 2025; 7(2): 102-108
www.physiologyjournals.com
Received: 14-07-2025
Accepted: 17-08-2025

Bâ Fatoumata
Physiology Laboratory, Health Sciences Training and Research Unit, Gaston Berger University, Saint-Louis, Senegal.

Cissé Bademba
Laboratory of Physiology, Senegal.

Sène Mbaye
Laboratory of Physiology, Pharmaceutical Unit, Cheikh Anta Diop University, Dakar, Senegal.

Sar Fatou Bintou
Laboratory of Physiology, Health Sciences Training and Research Unit, Iba Der Thiam University, Thiès, Senegal.

Corresponding Author:
Bâ Fatoumata
Physiology Laboratory, Health Sciences Training and Research Unit, Gaston Berger University, Saint-Louis, Senegal.

Assessment of physical activity levels, recovery and eating habits among schoolchildren in the Saint-Louis region of Senegal

Bâ Fatoumata, Cissé Bademba, Sène Mbaye and Sar Fatou Bintou

DOI: https://doi.org/10.33545/26647265.2025.v7.i2b.130

Abstract
Introduction: Regular physical activity has a positive impact on health, regardless of age. It reduces the risk of chronic diseases and helps combat obesity.
Objective: To contribute to a better understanding of the level of physical activity and eating habits of adolescents attending school in the municipality of Saint-Louis.
Methodology: A descriptive and analytical cross-sectional study was conducted among 117 secondary school pupils aged between 11 and 18 over a period of one month. A physical activity assessment questionnaire (PAQ-A or PAQ-C) was used, supplemented by information on eating habits, lifestyle and socio-demographic data. Anthropometric parameters were measured, and the Ruffier test was used to determine the level of recovery.
Data analysis was performed using SPSS version 20.0. The Chi-square test and Fischer's test were used to compare the proportions of qualitative variables ; Student's t-test was used for quantitative variables. The significance threshold was set at $p < 0.05$.
Results: A male predominance was noted, with 54.7% boys and 45.3% girls. BMI was normal for 75% of pupils, low in 13.46% and high in 11.53% of cases. Physical activity levels were moderate in 72.6% of subjects and low in 26.5%. The level of recovery remained low for nearly the majority of students. A significant link was found between the level of physical activity and gender. Fruit and vegetable consumption was noted in more than 75% of subjects.
Conclusion: This preliminary study shows moderate to low levels of physical activity and poor recovery among adolescents. Hence the need for objective measurement tools for physical activity that are more suited to the Senegalese context.

Keywords: Physical activity, PAQ-A, PAQ-C, adolescents, Ruffier test, Saint-Louis

Introduction
Over the past few decades, the prevalence of overweight and obesity has steadily increased among children and adolescents aged 5 to 19, rising from just 4% in 1975 to just over 18% in 2016 [1]. According to the 2021 UNICEF report [2], more than 7 out of 10 overweight children worldwide live in Africa.
In Africa, it is currently estimated that 20 to 50% of urban populations are classified as overweight or obese and that by 2025, three quarters of the world's obese population will be found in developing countries, according to estimates [3]. In Algeria, a study conducted among adolescents aged 10 to 19 in schools showed a prevalence of obesity and overweight of 2.42% and 6.6% among boys and 0.54% and 2.16% among girls ; in Tunisia, 18.9% of adolescents are overweight and 4% are obese [4, 5]. Among Ethiopian adolescents aged 10 to 19, the prevalence of overweight and obesity was reported to be 12.9% and 2.7% respectively [6]. In Senegal, a study conducted among adolescents aged 11-17 in public and private schools in Dakar indicated a prevalence of obesity of 9.3%, including 2.88% of boys and 6.46% of girls [7]. In Côte d'Ivoire, the prevalence of overweight and obesity was 5% and 4% respectively in schools ; in the Democratic Republic of Congo, the prevalence of overweight was 8% and that of obesity was 1%, and in Togo, 2.86% (overweight) and 1.72% (obesity) [3, 8, 9]. With the nutritional transition, profound changes have been noted in eating habits, with diets often consisting of processed foods rich in sugar, salt, saturated fats and calories, and poor in micronutrients. Similarly, increasing urbanisation and the use of new

technologies have led to a decrease in daily physical activities. This phenomenon affects all countries, it develops in both urban and rural areas, and increasingly affects young people [10, 11].

Adopted by the World Health Assembly in 2004 and reaffirmed in 2011 in a political declaration on non-communicable diseases, the WHO Global Strategy on Diet, Physical Activity and Health outlines the measures needed to encourage people to eat healthily and engage in regular physical activity. Entitled 'A more active population for a healthier world', the Global Action Plan on Physical Activity 2018-2030 sets out effective and feasible government measures to increase physical activity worldwide [12].

The WHO recommends at least 60 minutes of moderate to vigorous physical activity per day for children and adolescents aged 5 to 17 [13]. A global study [14] found that more than 80% of school-aged adolescents do not meet the global recommendation for physical activity.

In Senegal, there are few studies measuring the level of physical activity among schoolchildren and adolescents. In 1998, Bénéfice *et al*. [15] revealed in their study that children spent nearly half their time in sedentary activities and that girls spent less time in moderate to intense activities than boys. In 2004, a study conducted in Niakhar, in the Fatick region, found that adolescent girls engaged in low-intensity physical activity [16]. In Thiam's study, the level of physical activity measured by accelerometer was considered low in almost all children aged 8 to 11 [17].

This study therefore aims to estimate the level of physical activity among school-aged adolescents and to assess the impact of this physical activity on their health. The overall objective is to contribute to a better understanding of the level of physical activity and eating habits of school-aged adolescents in the municipality of Saint-Louis.

The specific objectives are:

- To estimate the level of physical activity among adolescents attending school in the municipality of Saint-Louis ;
- To determine the eating habits of adolescents attending school ;
- To collect anthropometric data on these adolescents ;
- To assess their level of physical recovery.

Materials and Methods

A descriptive and analytical cross-sectional study was conducted over one month at Bango-Ngallèle public middle school. The study included regularly enrolled students with no known disabilities or medical conditions (diabetes, asthma, high blood pressure), after their parents had signed a consent form. The anonymity and confidentiality of the data were guaranteed.

The study was approved by the authorities responsible for education and training in the municipality of Saint-Louis, in particular the Education Authority and the Education and Training Inspectorate.

The study was conducted using a questionnaire comprising two parts:

• The first part focused on physical activity: the Physical Activity Questionnaire (PAQ-C or PAQ-A) depending on the participant's age;

• The second part focused on eating habits.

Other items were added, including the journey between home and school, daily hours of sleep, use of new technologies (television, computer, game consoles, telephone), socio-demographic data (name, age, gender) and anthropometric parameters.

This questionnaire was pre-tested with around twenty pupils from another institution, Bango High School, which enabled us to adjust one question, specifically the one relating to types of physical activity.

The questionnaire is self-administered, but to avoid incorrect completion, the interviewers (two trained medical students) asked the questions themselves and filled in the answers. Recruitment took place during physical education and sports classes.

Then, we assessed:

- **Body composition using a Tanita DC-360S impedance meter:** The subject is lightly clothed, and the soles of their feet, which have been thoroughly cleaned, are in contact with the impedance meter, which is placed on a flat surface. The data obtained includes weight, body mass index (BMI), percentage of body fat and muscle mass ;
- **Height using a Seca wall-mounted micro-taller measured at 220 cm:** Height is measured in physical education and sports clothing, barefoot. Standing upright with arms at their sides, torso and head straight, the pupil leans against the wall with feet together and heels against the wall.
- Blood pressure was measured using an Omron blood pressure monitor with a cuff adapted to the circumference of the subject's arm: blood pressure was taken after 5 to 10 minutes of rest, in a seated position, on the left arm and, in exceptional cases, on both arms.
- Resting heart rate and heart rate after squats were measured using a Polar heart rate monitor.

Data collection was carried out using Google Forms software and analysed using SPSS version 20.0 software. The Chi-square test and Fischer's test were used to compare the proportions of qualitative variables ; Student's t-test was used for quantitative variables. The significance threshold was set at $p < 0.05$.

For the BMI variable, we used the WHO curves: BMI (kg/m²) by age (years) for both boys and girls, which allows us to define three categories:

- **Underweight:** < 3rd percentile ;
- **Normal weight:** between the 3rd and 97th percentile ;
- **Overweight (including obesity):** ≥ 97th percentile or ≥ IOTF threshold - 25**; obesity: ≥ IOTF threshold - 30**.

For the blood pressure variable, we also used the WHO blood pressure curves. Thus, blood pressure is:

- normal if it is below the 97.5th percentile ;
- borderline or moderate between the 97.5th percentile and this level plus 10 mmHg
- Above this level, we have high blood pressure:
- confirmed between the 97.5th percentile + 10 mmHg and < + 30 mmHg
- immediately threatening: 97.5th percentile + 30 mmHg

Results

Descriptive analysis

Sociodemographic characteristics

A total of 117 pupils were surveyed, of whom 54.7% were boys and 45.3% were girls. The average age was 14.27 ± 1.57 years, with extremes of 11 and 18 years. The majority of pupils in our cohort had a normal BMI.

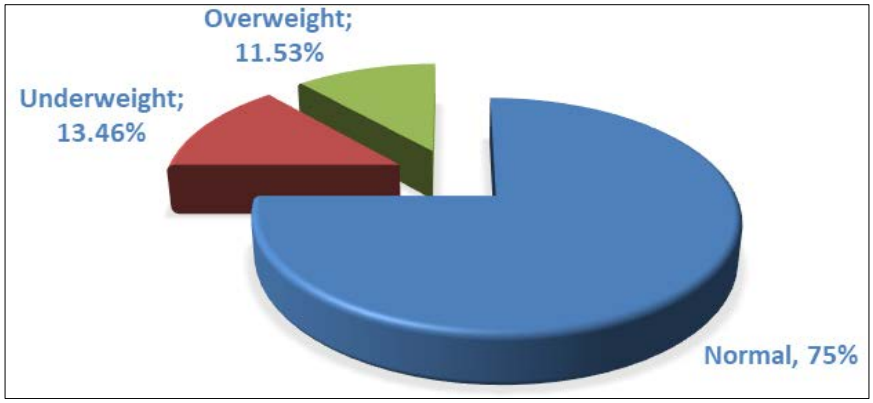

Fig 1: Distribution according to BMI (n = 52)

The normal fat mass ranges were provided by the impedance meter. Figure 2 shows the distribution of subjects according to fat mass.

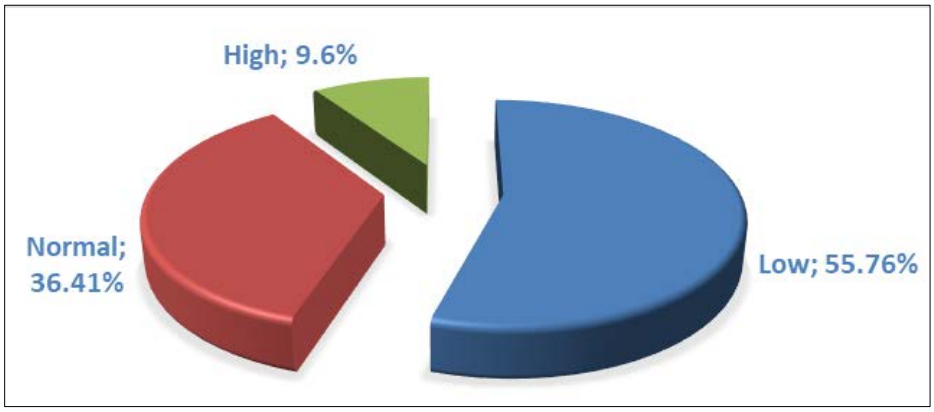

Fig 2: Distribution according to percentage of body fat

Normal blood pressure was measured in 46 out of a total of 51 subjects. Only 4 had high diastolic blood pressure and 1 had systolic-diastolic hypertension.

Level of physical activity

The distribution according to level of physical activity is shown in Figure 3.

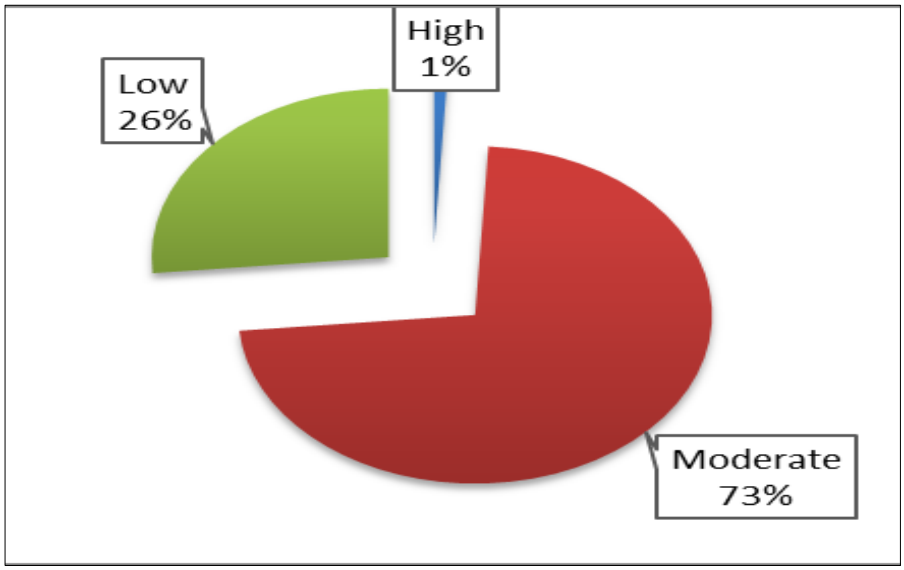

Fig 3: Distribution according to level of physical activity (n = 117)

Recovery level

The distribution of subjects according to the Ruffier index is shown below.

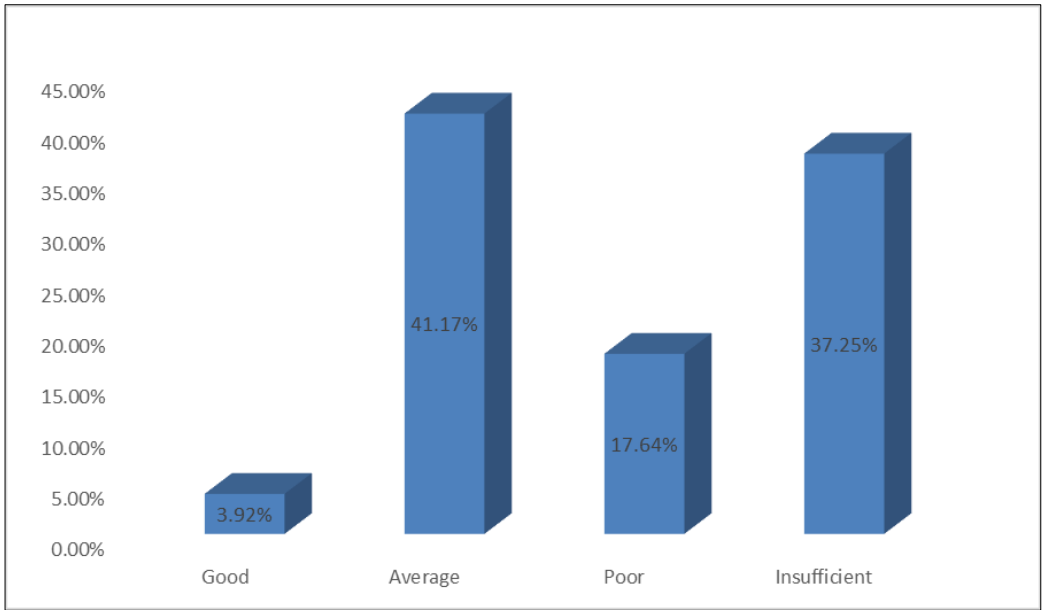

Fig 4: Distribution according to recovery level (N = 51)

Eating habits

Table 1 shows the distribution of subjects according to eating habits.

Table 1: Distribution of subjects according to eating habits (N=117)

Eating habits	Relative frequency (%)
Buying sweets	
Yes	10.3
No	72.6
Sometimes	17.1
Drinking sugary drinks	
Yes	41.9
No	17.1
Sometimes	40.2
Eating fast food	
Yes	3.4
No	70.9
Sometimes	24.8
Eating fruit	
Yes	19.65
No	24.78
Sometimes	55.57
Eating vegetables	
Yes	42.73
No	19.65
Sometimes	37.62

Lifestyle

The results are in table 2.

Table 2: Distribution of subjects according to lifestyle.

Lifestyle	Relative frequency (%)
Eating in front of the television/computer	
Yes	45.29
No	54.71
Commuting between home and school	
I walk	67.52
Bus, car, motorbike	16.23
Both	16.24
Watching television, playing computer games, video games or on the phone	
Every day	50.42
Most days	15.38
Only at weekends	34.18

Hours of sleep

Figure 5 shows the distribution of subjects according to the number of hours of sleep.

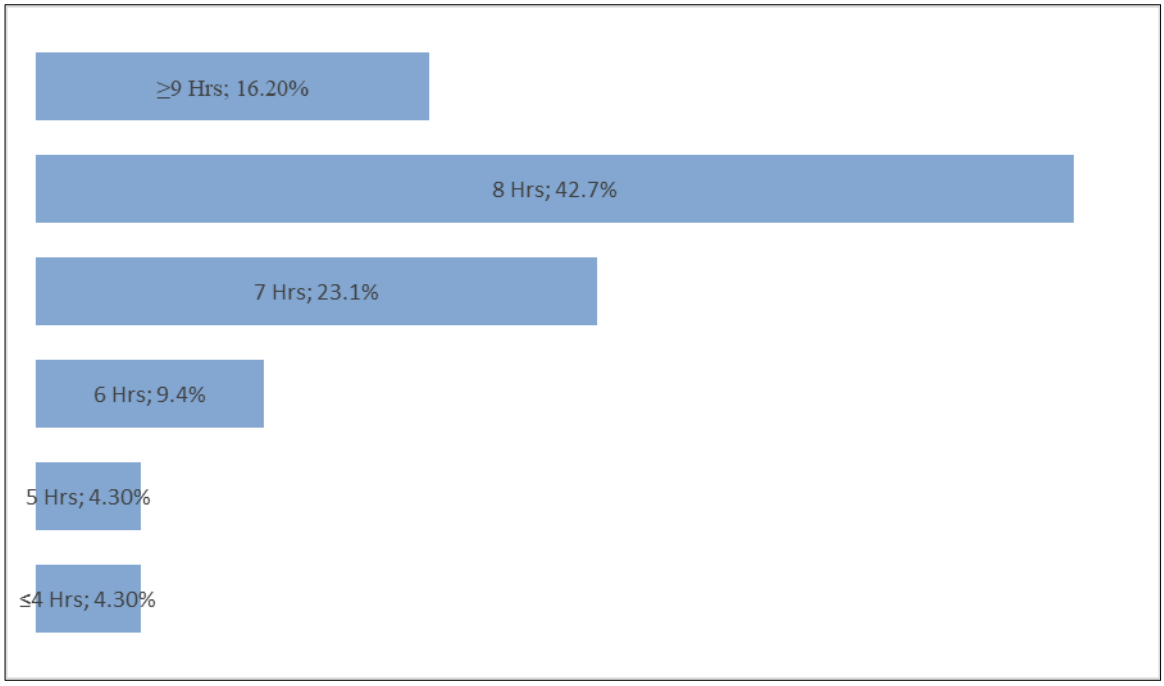

Fig 5: Distribution of subjects according to number of hours of sleep

Analytical study

High blood pressure was observed in girls only, with no statistically significant difference (p = 0.240). Overweight was more common in women, but with no significant difference (p = 0.3). No significant link was found between physical activity levels and sleep (p = 0.2) ; recovery levels and BMI (p = 0.7) ; or recovery levels and estimated physical activity levels (p = 0.7).

A significant link was found between physical activity level and gender (p = 0.01). In fact, there were more boys than girls in the 'moderate' and 'high' exercise categories.

Discussion

Our study found a male predominance with a sex ratio of 1.2. This seems to be simply due to a methodological bias, as participation was voluntary and recruitment was random during physical education and sports sessions.

The age of our subjects ranged from 11 to 18 years, which justified the use of two types of questionnaires: the PAQ-C for subjects aged 8 to 13 and the PAQ-A for the 14-18 age group. The level of physical activity measured by the PAQ-A or PAQ-C was moderate in 72% of subjects and low in 26.5%. Our results are similar to those of previous studies conducted in Senegal and elsewhere. In 2014, in a study assessing the level of physical activity in pupils aged between 8 and 11 years using accelerometers and the PAQ-C, Thiam [17] found a moderate level of physical activity in 65% of subjects measured by the PAQ-C. The accelerometer did not detect any intense levels of physical activity. Ndiaye also found low levels of physical activity among Senegalese adolescent girls in the rural area of Niakhar in 2004 [18]. In Mali, Katile M [19] found moderate physical activity rates of 83% measured by the PAQ-C in 2014. In a study conducted in Malaysia, 61.5% of 13-year-old adolescents had moderate levels of physical activity [20], as did children and adolescents aged 7 to 16 in Mozambique [21].

In our study, we found a significant link between physical activity levels and gender with a p-value of 0.01. However, in Thiam's study [17], physical activity levels were independent of gender, even though she noted that boys spent more time engaged in moderate to vigorous physical activity than girls. In a large cohort of Saudi children (n = 1,270) living in rural and urban areas, physical activity measured by questionnaire showed low levels of activity among the majority of girls, unlike boys [22].

The PAQ-A and PAQ-C provide an estimate of physical activity levels based on a recall of the previous seven days. They do not measure the intensity or duration of movements, meaning that the level of physical activity determined may be over- or underestimated. The Boon study conducted in New Zealand [23] and Lee's meta-analysis [24] showed that questionnaires tend to overestimate physical activity by 36 to 173% compared to accelerometers.

It is also important to note that some activities listed in the PAQ are not suitable for our African context, for example cross-country skiing, ice hockey, badminton, aerobics, ringette, hockey, skateboarding, baseball, softball, etc. We have tried to adapt as much as possible by including activities often practised by young people and teenagers in the Senegalese context, such as wrestling and martial arts. However, we believe that this questionnaire should be reviewed and validation studies should be carried out in the Senegalese context.

BMI values were normal for the majority of pupils (approximately three quarters), with 13.46% underweight and 11.53% overweight. We found no significant link between physical activity levels and BMI, or between recovery levels and BMI. None of our pupils were obese.

Among overweight pupils (n = 6), 4 had a moderate level of physical activity and 2 had a low level. Similarly, adaptation was average in two cases, insufficient in two cases, and poor and good in one case, respectively. Total sleep duration

varied between 7 and 9 hours, and only two of them had abnormal blood pressure readings.

A global meta-analysis of the nutritional status of school-age children shows a prevalence of thinness of 35% in Africa, although the threshold values used to define thinness were not identical from one country to another [25]. A study conducted in Burkina Faso, using the BMI-for-age indicator, found an underweight rate of 13.7%, comparable to ours [26].

We did not find any obese pupils, unlike the study by Faye *et al* [7]. The latter found prevalences of 13.77% and 2.06% in urban and rural areas respectively. It also mentioned a significantly higher proportion of underweight or normal weight pupils in urban areas than in rural areas. The absence of obese pupils is probably linked to the location of recruitment (public schools in the suburbs). Obesity is correlated with socio-economic status, and pupils in private schools very often come from wealthy families and are prone to obesity.

With regard to eating habits, the consumption of sugary drinks was common. We also found high consumption of fruit and vegetables, either regularly (every day) or fairly regularly (2 to 3 times a week), with 75.22% and 80.35% respectively. In addition, there was low consumption of fast food, cereals, etc. The low rate of overweight in our sample could certainly be linked to these eating habits.

The level of fitness, assessed using the Ruffier index, was insufficient in nearly half of the subjects. This seems to contradict the moderate level of physical activity found in most of them and suggests that a regular training programme should be implemented for these pupils in order to improve their physical abilities. The Senegalese curriculum includes only two hours of physical education and sports per week. As a result, it is not uncommon to encounter students who may go two or three weeks, or even longer, without having PE classes at school (taking into account days off and repeated strikes). Medical fitness examinations at schools should be comprehensive (including an electrocardiogram and assessment of maximum oxygen consumption, among other things) and carried out at the start of the school year to enable pupils to benefit from an appropriate training programme.

Our study has limitations. The small sample size and sampling technique do not allow the results to be extrapolated to the adolescent school population. Similarly, each of the two tools used, whether the PAQ or the Ruffier test, has its own limitations in terms of reliability.

Conclusion

At the end of this preliminary study, it appears that most pupils at Bango-Ngallèle secondary school have a moderate to low level of physical activity. Boys engage in physical activity significantly more than girls. The prevalence of overweight and obesity remains low in our cohort. However, cardiorespiratory fitness is unsatisfactory in most cases, as it shows insufficient adaptation to exertion in the majority of cases. The pupils' eating habits should be encouraged, especially with regard to the consumption of fruit and vegetables.

Looking ahead, further in-depth studies need to be conducted on a large scale, using a sample that is sufficiently representative of the school population in Saint-Louis, in order to confirm or refute the results. Similarly, the physical activity questionnaire (PAQ) should be adapted to the Senegalese context and validated against other instruments for objectively measuring physical activity and physical activity levels.

As physical activity has a positive impact on health, measures should be taken to facilitate its practice in schools and in the community. We therefore make the following recommendations:

- Raise awareness among young people of the beneficial effects of playing sport;
- Develop sports and leisure facilities to reduce the amount of time spent on sedentary activities;
- Diversify sporting activities as much as possible to enable young people to choose those that suit them best ;
- Involve the whole community;
- Strengthen medical fitness assessments in schools and offer adapted physical activities instead of exemptions from physical education and sports ; and
- Promote physical education and sports in schools more effectively.

Acknowlegments

We acknowledge all participants of the study, the academic authorities. There was no funding or financial support for this study.

Conflicts of interest : None.

References

1. Organisation Mondiale de la Santé (OMS). Obésité et surpoids. OMS; 2020.
2. UNICEF. L'état de la sécurité alimentaire et de la nutrition dans le monde. UNICEF; 2021.
3. Musung JM, *et al*. Prévalence du surpoids et de l'obésité chez l'adolescent en milieu scolaire à Lubumbashi, République Démocratique du Congo. The Pan African Medical Journal. 2019;32:49-57.
4. Fedala N, *et al*. Association entre l'indice de masse corporelle, l'activité physique et la sédentarité chez les adolescents algériens. International Journal of Innovation and Applied Studies. 2015;10(2):489-497.
5. Aounallah-Skhiri H, *et al*. Nutrition transition among adolescents of a south-Mediterranean country: dietary patterns, association with socio-economic factors, overweight and blood pressure. Nutrition Journal. 2011;10(1):38-45.
6. Teshome TPS, Debebe M. Prevalence and associated factors of overweight and obesity among high school adolescents in urban communities of Hawassa, Southern Ethiopia. Current Research in Nutrition and Food Science Journal. 2013;1(1):23-36.
7. Faye J, *et al*. Prévalence de l'obésité de l'enfant et de l'adolescent en milieu scolaire à Dakar. Bulletin de la Société de Pathologie Exotique. 2011;104(1):49-52.
8. Kramoh KE, *et al*. Prévalence de l'obésité en milieu scolaire en Côte d'Ivoire. Annales de Cardiologie et d'Angéiologie. 2012;61(3):145-151.
9. Djadou KE, *et al*. Prévalence de l'obésité en milieu scolaire urbain (Togo). Journal de Pédiatrie et de Puériculture. 2010;23(6):335-339.
10. Amat-Roze JM. 9ème Congrès international francophone « Transitions épidémiologiques en Afrique: quelles réponses des systèmes de santé ? » - Résumés des communications orales. Bulletin de la Société de Pathologie Exotique. 2013;106:291-333.

11. Popkin BM. The nutrition transition and obesity in the developing world. The Journal of Nutrition. 2001;131(3):871S-873S.
12. Organisation Mondiale de la Santé (OMS). Plan d'action mondial de l'OMS pour promouvoir l'activité physique 2018-2030. OMS; 2018.
13. World Health Organization (WHO). Global recommendations on physical activity for health. Geneva: WHO; 2010. p.1-60.
14. Organisation Mondiale de la Santé (OMS). Activité physique pour la santé: une population plus active pour un monde en meilleure santé: projet de plan d'action mondial pour promouvoir l'activité physique 2018-2030: rapport du Directeur général. OMS; 2018.
15. Benefice E. Physical fitness and body composition in relation to physical activity in prepubescent Senegalese children. American Journal of Human Biology. 1998;10:385-396.
16. Benefice E, Garnier D, Ndiaye G. Nutritional status, growth and sleep habits among Senegalese adolescent girls. European Journal of Clinical Nutrition. 2004;58:292-301.
17. Thiam M. Niveau d'activité physique mesuré par accéléromètre et par PAQ-C (Questionnaire de mesure de l'activité physique) chez des enfants sénégalais en milieu urbain: étude pilote. Master Nutrition *et al*imentation Humaine. Dakar; 2014.
18. Ndiaye G. Étude d'une méthode nouvelle de mesure de l'activité physique par accélérométrie chez des adolescentes rurales du centre du Sénégal. Thèse de doctorat de 3ème cycle de Nutrition *et al*imentation Humaine. Faculté des Sciences et Techniques, UCAD; 2004. p.1-109.
19. Katile M. Obésité, niveau d'activité physique et hypertension artérielle chez des enfants d'âge scolaire à Bamako (Mali). Master Nutrition *et al*imentation Humaine. UCAD, FST; 2014. p.1-44.
20. Dans P, Mohd NMT, Zalilah MS. Determination of factors associated with physical activity levels among adolescents attending school in Kuantan, Malaysia. Malaysian Journal of Nutrition. 2011;17:175-187.
21. Prista A, Nhantumbo L, Saranga S, *et al*. Physical activity assessed by accelerometry in rural African school-age children and adolescents. Pediatric Exercise Science. 2009;21:384-389.
22. Al-Nuaim AA, Al Nakeeb Y, Lyons M, *et al*. Prevalence of physical activity and sedentary behaviors relative to obesity among adolescents from Al-Ahsa, Saudi Arabia: rural versus urban variations. Journal of Nutrition and Metabolism. 2012;2012:417589.
23. Boon RM, Hamlin MJ, Steel GD, Ross JJ. Validation of the New Zealand Physical Activity Questionnaire (NZPAQ-LF) and the International Physical Activity Questionnaire (IPAQ-LF) with accelerometry. British Journal of Sports Medicine. 2014;44:741-746.
24. Lee PH, Macfarlane DJ, Lam TH, Stewart SM. Validity of the International Physical Activity Questionnaire Short Form (IPAQ-SF): a systematic review. International Journal of Behavioral Nutrition and Physical Activity. 2011;8:1-11.
25. Best C, Neufingerl N, Vangeel L, Vanden BT, Osendarp S. The nutritional status of school-aged children: why should we care? Food and Nutrition Bulletin. 2010;31(3):400-417.
26. Dabone C. Le double fardeau de la malnutrition à l'âge scolaire en milieu urbain: une étude au Burkina Faso. Thèse de doctorat de 3ème cycle de Nutrition Internationale. Faculté de Médecine, Université de Montréal; 2011. p.1-372.