

RESEARCH ARTICLE

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ESTIMATED LEVELS OF PHYSICAL ACTIVITY AND FOOD HABITS IN THE ADOLESCENT IN THE SCHOOL ENVIRONMENT OF THE CITY OF DALOA (COTE D'IVOIRE)

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ABSTRACT

This Adolescence is a pivotal period marked by many physical and psychological changes and a quest for significant autonomy. But the eating habits acquired during this period tend to persist over time and influence growth and long-term health. The purpose of this study was to improve the lifestyle of teenagers in the city of Daloa. To this end, she focused on developing a model for estimating body composition in a group of adolescents (176 girls and 175 boys) aged 11 to 17, enrolled in five secondary schools in the city of Daloa. They participated in the study by taking their anthropometric measurements to calculate BMI and waist-height ratio. A questionnaire was set up to obtain information on their physical activity and their food frequency. Underweight, overweight and abdominal obesity were determined according to WHO growth curves. The results showed that 23.86 % of girls and 47.71 % of boys are underweight. In addition, girls are more overweight (11.93 %) than boys (1.71 %). Similarly, they have more abdominal obesity (4.54 %) than boys (1.71 %). Boys are therefore more active than girls. In addition, most of these adolescents do not eat breakfast; de not consumes fruits and vegetables, milk and dairy products on a daily basis. More than half consume donuts, cakes, cookies, sweets and chocolate more than 3 times / week. Almost half of teenagers consume sugary drinks more than 3 times / week. In conclusion, it emerged from this study that adolescents in these 5 different secondary schools have a lifestyle at risk of developing chronic diseases through poor eating habits and lack of physical activity, especially among girls.

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INTRODUCTION

The health status of a large proportion of the population is currently of concern due to the high prevalence of obesity and chronic diseases (WHO, 2005). Adolescence is a pivotal period marked by many physical and psychological changes and a quest for significant autonomy. This is reflected in several spheres of life of adolescents, including their diet. Dietary habits acquired during this period tend to persist over time and influence long-term growth and health (Neumark *et al.*, 1999). Adopting a healthy and balanced diet is one of the most effective ways to prevent chronic disease and excessive weight gain (Waxman and Booth, 2003, WHO, 2004). Thus, promoting the adoption of healthy eating habits among the population is an essential target of health promotion interventions. Indeed, physical activity is, to this day, a recognized factor of prevention, even of care of a large number of pathologies (cardio-vascular, endocrine, but also in

rheumatology, oncology, geriatrics ... etc.). To be effective, physical activity must be done on a regular basis at a sufficient level of intensity. The sporting activity represents a major element but the other modes of activities, with significant energy expenditure, should not be neglected (workstation, displacements, leisure activities like gardening, household tasks ... etc.). In addition, insufficient physical activity contributes to obesity and the risk of complications from chronic diseases such as type II diabetes (US DHHS, 1996). Physical inactivity and unhealthy diet are considered to be major causes of major non communicable diseases, contributing significantly to the global burden of morbidity and mortality. Nearly 2 million deaths a year worldwide are attributable to inactivity (WHO, 2002). It is now well established that inadequate diet, coupled with a lack of physical activity, is a major determinant of major chronic diseases, such as cardiovascular disease (CVD) (Lichtenstein *et al.*, 2006), some cancers (Pan and Des Meules, 2009) and

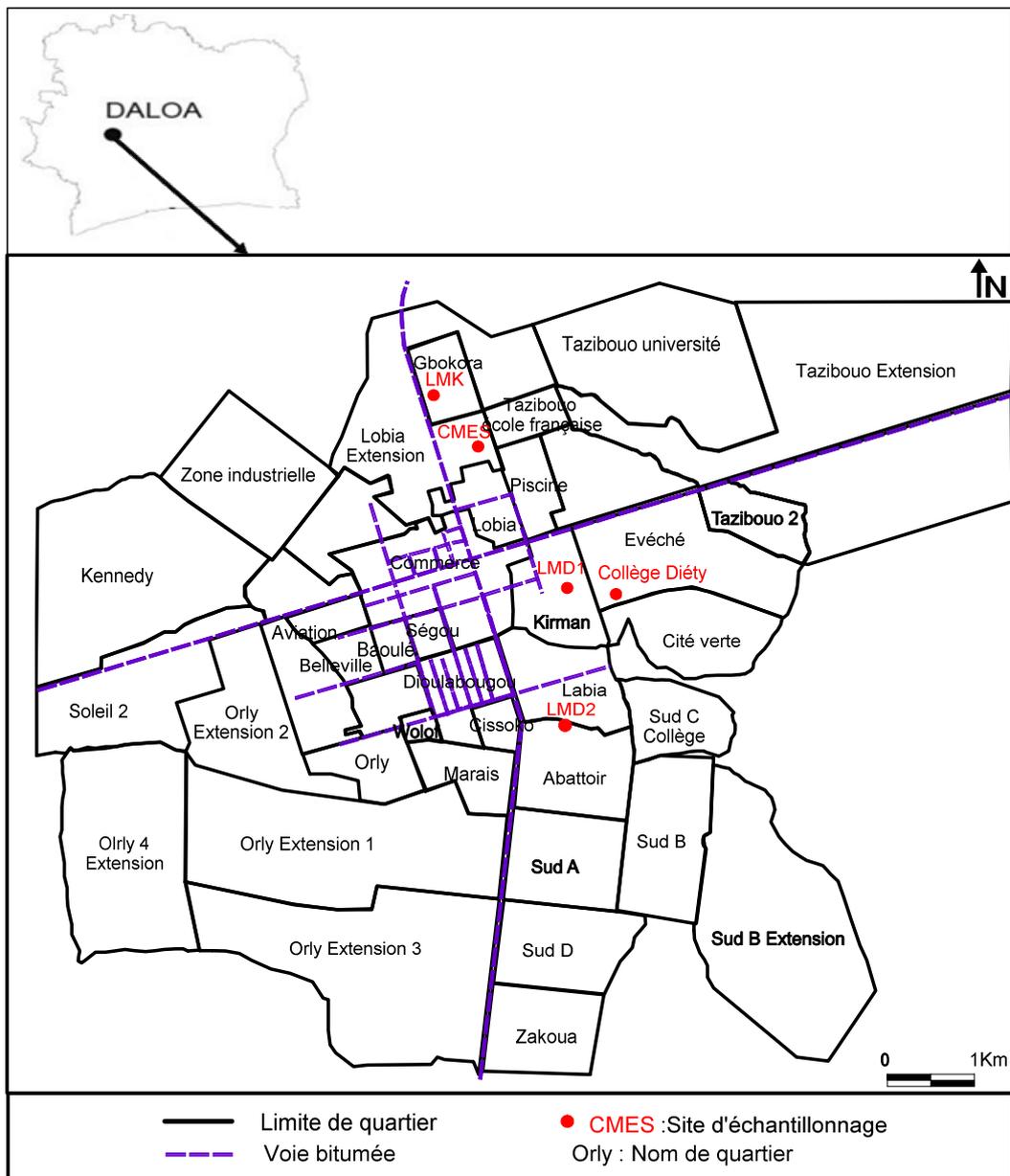


Figure 1. Location of the study site

type 2 diabetes (Parillo and Riccardi, 2004). Regular physical activity and healthy eating habits can maintain and improve the physical, mental and well-being of individuals (WHO, 2002). Children and adolescents who participate in higher levels of physical activity are less likely to develop risk factors for cardiovascular disease (Boreham and Riddoch, 2001; Strong *et al.*, 2005) and above likely to have positive results in regulating body weight (Gutin *et al.*, 2002, Lemura and Maziekas, 2002). Our society is increasingly confronted with certain health problems related to metabolic disorders. The most exposed subjects in society are adolescents; this part of the population is therefore very vulnerable. She is directly confronted with health problems. The juvenile population spends less and less energy and to worsen their case, consumes excess energy foods based on fat and sugar. The ingestion of these foods has the effect of making them subject to overweight and sometimes even obesity. It is clear that teenagers in the city of Daloa have little physical activity and a limited diet due to the lack of financial resources of several families.

To limit the risks of poor physical activity and poor nutrition, the teenager must lead a healthy lifestyle. A study of this particular age group therefore seems useful.

MATERIAL AND METHODS

Site of study: The study was carried out in the commune of Daloa, chief town of Upper Sassandra region, located between Latitude 6 and 7 North and Longitude 7 and 8 West in Côte d'Ivoire. Using questionnaire cards, we visited five settlements in the city of Daloa (Figure 3). This region covers an area of 15,200 km² with an estimated population of 1,430,960 inhabitants (Anonym 1, 2014).

Study population: This study involved 351 students, including 176 girls and 175 boys (Figure 2) aged 11 to 17, who were educated in Daloa in high schools and colleges. An authorization was issued by the Regional Directorate of National Education (RDNE) of Daloa to access the various

institutions included in the study. The data was collected with respect for confidentiality and anonymity.



Figure 2: Some students from the study population

Criteria for inclusion and exclusion: Adolescents with the following characteristics: living in the city of Daloa; be between 11 and 17 years old be healthy (in good moral condition); be educated in a secondary school (high school or college). On the other hand, adolescents who are pregnant or breastfeeding or who are physically or sickly disabled have been excluded.

Determination of anthropometric parameters of the study population: Anthropometric parameters of the study population included body weight, height, waist circumference, and waist-to-hip ratio (Figure 3). Body weight was measured to within 100 g using an electronic and portable scale (150 ± 0.1 kg) (Figure 3A). The size was measured to within 1 mm using a graduated wooden measuring board (200.0 ± 0.1 cm) (Figure 3B) (IAEA, 2010). The waist-to-hip ratio was calculated by dividing the waist circumference (cm) by the height (cm). The reference standard of waist-hip ratio of

Waist circumference was measured to within 0.1 cm using a tape measure. Waist circumference measurement was taken 0.50 was used to define abdominal obesity in boys and girls (McCarthy and Ashwell, 2006). midway between the last rib and the iliac crest and at the end of the normal exhalation (Figure 3C).

Lifestyle assessment of the study population

Assessment of activity and physical inactivity: Moderate intensity physical activity includes walking, recreational swimming, domestic activities, and recreational sports such as volleyball. Intensive physical activity includes activities such as jogging, running, cycling, self-defense, bodybuilding and intense sports such as football, basketball, handball, individual tennis, etc. In addition, a questionnaire including certain elements such as the time spent watching television, using the computer and the Internet, and sleep per day (night and day) was completed. The maximum time spent sedentary (watching television, using the computer) of the study population was evaluated (the standard is 3 hours minimum per day). The minimum time spent sleeping is 6 hours / day. The energy expenditure is calculated as follows:

$$\text{Energy Expenditure} = \text{Frequency} \times \text{Time (min or h)} \times \text{Intensity (MTE)}$$

Frequency: number of times of physical activity practice per week

Duration: time spent on physical activity

Intensity: Metabolism value of the task equivalence (MTE) for each type of physical activity.

Evaluation of eating habits: The questionnaire included additional elements to collect information on the dietary habits of the study population was conducted. Dietary habits have been classified into two categories:

- Healthy eating habits such as taking breakfast at home, eating fruits and vegetables, milk or dairy products;
- Bad eating habits such as the consumption of sugary drinks, donuts, cakes, cookies, sweets, chocolate, energy drinks and fast foods.
- Student responses were about the number of times a meal was consumed or a food consumed during a typical week.



Figure 3. Determination of anthropometrics parameters

Statistical analysis: The processed data were presented as mean ± standard deviation and in percentage before being subjected to one-way analysis of variance (ANOVA) (STATISTICA 7.1). ANOVA is performed on the averages of anthropometric parameters (age, weight, height, waist circumference, BMI, waist / height), physical activity and eating habits. Normality of distribution was tested by the Kolmogorov-Smirnov test. The chi-square and Fisher test were used to test the association between the dummies. The results of the quantitative variables were presented as an average and the comparative analysis was done by the Student's test. The results of the qualitative variables were presented in percentages and analyzed by the chi-square test. The significance level for all statistical analyzes was set at $p < 0.05$.

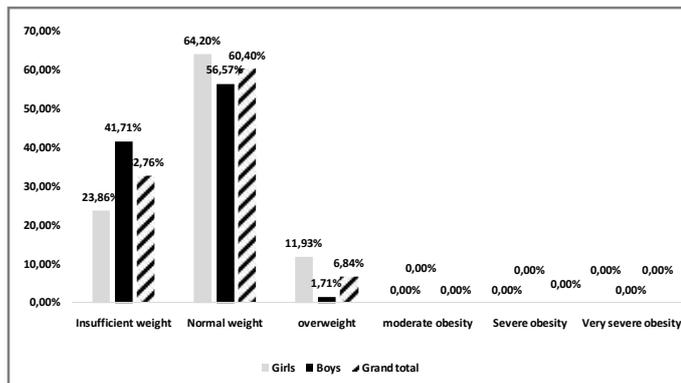
RESULTS

Anthropometric characteristics of the population studied by gender: The anthropometric characteristics studied are presented in Table 1. The average age (15.05 ± 1.67 years) of the girls studied was higher ($P < 0.05$) than that of the boys (14.95 ± 1.61 years). Their body weight (52.26 ± 9.70 kg) is higher ($P < 0.05$) than that of boys (50.21 ± 10.07 kg). However, boys have an average height (161 ± 90 cm) greater than that of girls (158.19 ± 6.32 cm). The BMI of girls is 20.79 ± 3.24 kg / m² compared to 18.97 ± 2.27 kg / m² of boys ($P < 0.05$). The waist circumference of the girls (65.02 ± 8.18 cm) is greater ($P < 0.05$) than that of the boys (64.82 ± 6.37 cm). The same is true for their waist-to-size ratio, 0.41 ± 0.05 against 0.40 ± 0.03 for boys ($p < 0.05$).

Table 1. Anthropometric characteristics of adolescents by Gender

	Boys (175)	Girls (176)	P
Age (years)	14.95±1.61	15.05±1.67	0.017
Body Weight (kg)	50.21±10.07	52.26±9.70	0.006
Size (cm)	161.90±10.29	158.19±6.32	0.003
Waist size(cm)	64.82±6.37	65.02±8.18	0.002
BMI (kg/m ²)	18.97±2.27	20.79±3.24	0.0009
Waistline/waist	0.40±0.03	0.41±0.05	0.00043

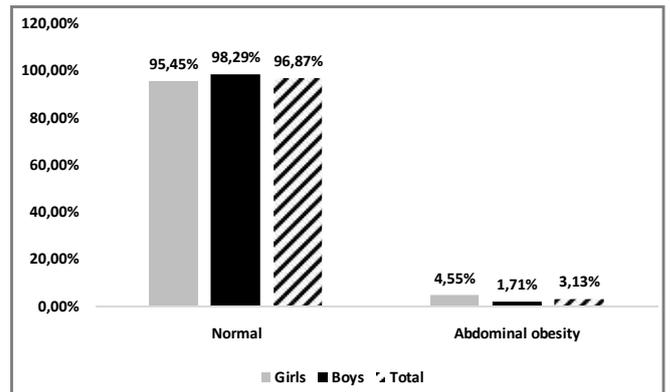
Evolution of the body mass index (BMI) of the study population: Figure 4 shows the evolution of BMI in the study population. At the girls' level, 23.86% are underweight and 64.20% are of normal weight. In contrast, 11, 93% of girls are overweight, but do not have obesity. In boys, 41.71% are overweight and 56.57% are of normal weight. 1.71% of boys are overweight and also do not have obesity.



Chi-square test to test the possibility of a link between gender and evolution of BMI in adolescents. The p-value obtained is 0.0009.

Figure 4. Evolution of BMI in adolescents

Prevalence of abdominal obesity: Figure 5 shows the prevalence of abdominal obesity in the study population. Girls have more abdominal obesity (4.54%) than boys (1.71 %).



Chi-square test verifies the possibility of gender-related linkage with abdominal obesity in adolescents. The p-value obtained is 0.0004.

Figure 5. Prevalence of abdominal obesity

Physical activity of the study population

Frequency of moderate physical activity: The incidence of moderate physical activity among boys, girls and the total population is shown in Figure 6. At the girls' level, 86.93% practice moderate physical activity at least 8 times / week and 13, 07% at most 8 times in the week. In boys, 83.43% engage in moderate physical activity at least 8 times / week and 16.57% at most 8 times / week.

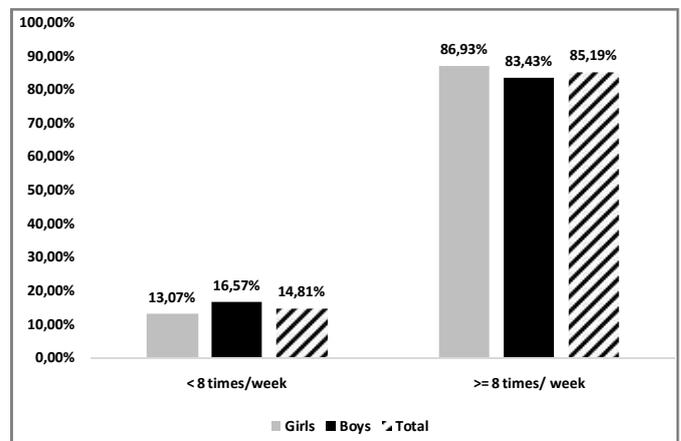


Figure 6. Frequency of moderate physical activity in adolescents

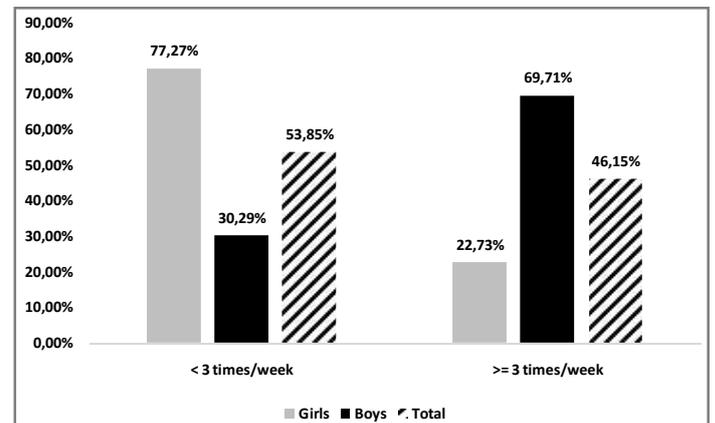


Figure 7. Frequency of intense activity among adolescents

Frequency of intense physical activity: The frequency of intense physical activity among boys, girls and the total population is shown in Figure 7. At the girls' level, 22.73% engage in intense physical activity at least 3 times / week and 77.27 % practice intense physical activity at most 3 times / week. At the level of boys, 69.71% engage in intense physical activity at least 3 times / week and 30.29% engage in intense physical activity at most 3 times / week.

Time spent on physical activity: The time spent on moderate and intense total physical activity for girls and boys is presented in Table 2. There is no significant difference in total physical activity ($P > 0.05$). In contrast, there is a significant difference in moderate and intense physical activity ($P < 0.05$). The girls in the study had moderate physical activity (6,082 h / week) higher than boys (4,745 h / week). The boys in this study had a high level of physical activity (2.671 hours / week) higher than girls (0.733 hours / week) (Table 2).

Table 2. Time spent on physical activity of adolescents by gender

	Boys (175)	Girls (176)	P
Total physical activity (h/wk)	7.415	6.815	0.0922
Moderate physical activity (h/wk*)	4.745	6.082	0.0001
Intense physical activity (h/wk*)	2.671	0.733	6.18E-16

* : hour/week

Duration devoted to total physical activity: The total physical activity duration for boys, girls, and total population is shown in Figure 8. At the girls' level, 48.30% practice at least 6 hours / week of total physical activity versus 51, 70% less than 6h / week. At the level of boys, 58.29% engage in total physical activity at least 6h / week while 41.71% devote less than 6h of time per week to total physical activity.

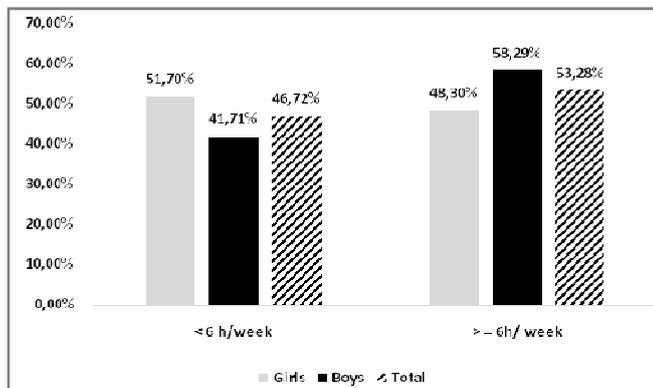


Figure 8. Duration devoted to total physical activity in adolescents

Duration devoted to moderate physical activity among adolescents: The duration of moderate physical activity for boys, girls, and the total population is shown in Figure 9. For girls, 81.82% engage in moderate physical activity at least 3h / week and 18.18% spend less than 3 hours / week on moderate physical activity. At the level of boys, 72.57% practice at least 3 hours in the week of moderate physical activity against 27.43% less than 3 hours / week.

Duration devoted to intense physical activity among adolescents: The duration of intense physical activity among boys, girls and the total population is shown in Figure 10. At the girls' level, 93.75% practice less than 3h / week of intense physical activity and 6.25 % spend at least 3h / week of intense

physical activity. At the level of boys, 68.57% practice less than 3 hours / week of intense physical activity and 31.43% devote at least 3 hours / week to intense physical activity.

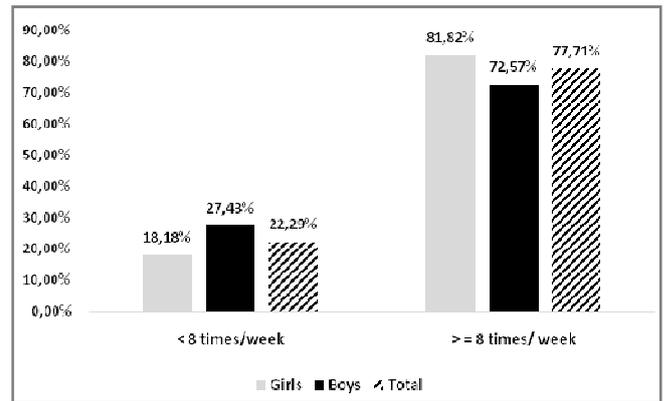


Figure 9. Duration devoted to moderate physical activity in adolescents

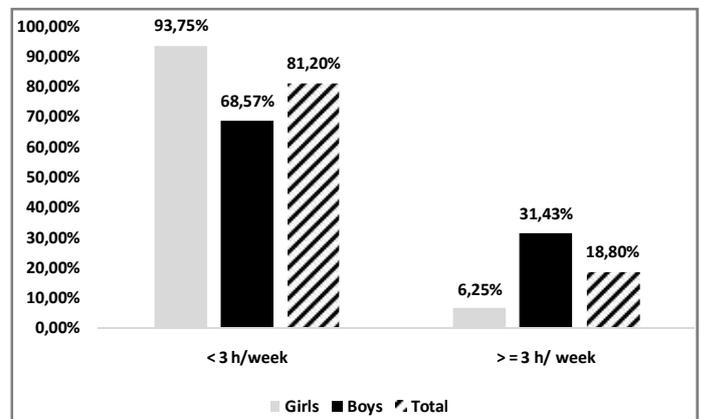
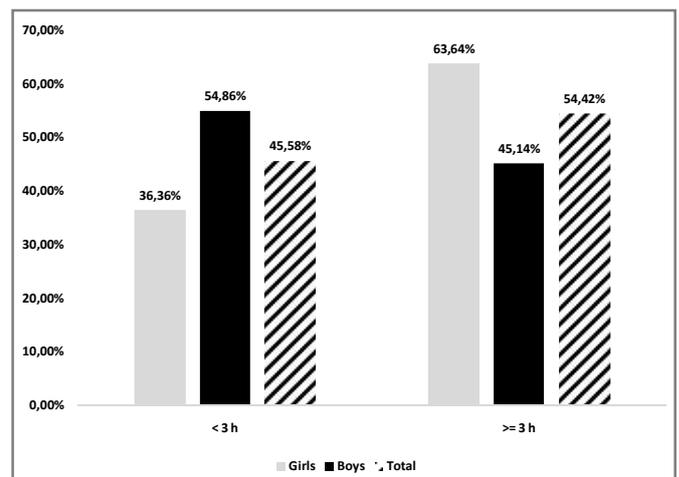


Figure 10. Duration devoted to intense physical activity among adolescents

Physical inactivity of the studied population



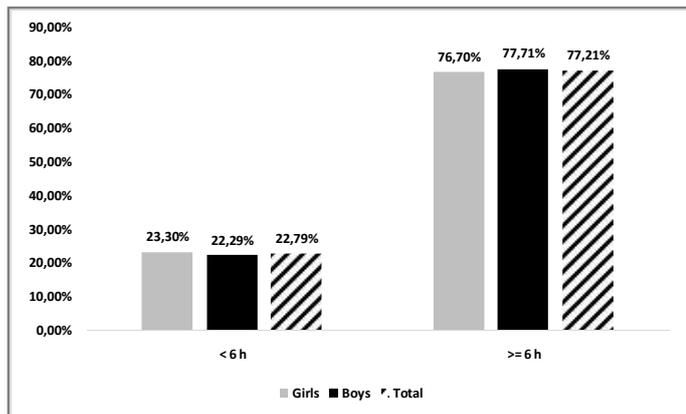
Chi-square test to verify the possibility of linking the genre and the time spent watching television among adolescents. The p-value obtained is 0.00018.

Figure 11. Time spent watching television among teens

Time spent watching television: The time devoted to watching television among girls, boys and the total population is shown in Figure 11. At the level of girls, 63.64% watch television at least 3h / day and 36.36% devote less than 3h / day watching TV.

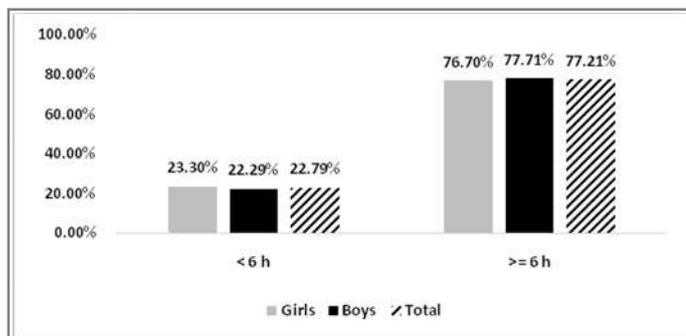
At the level of boys, 45.14% watch television at least 3h / day and 54.86% spend less than 3h / day of their time watching television.

Time spent using computers in teenagers: The time spent using the computer for girls, boys and the total population is shown in Figure 12. At the girls' level, 23.30% use the computer more than 3h / day while 76.70% devote no more than 3h / day to use the computer. At the level of boys, 26.86% use the computer more than 3h / day and 73.14% spend no more than 3h / day to use the computer.



Chi-square test to check the possibility of linking gender and the time spent using computers in teenagers. The p-value obtained is 0.065.

Sleep duration: Sleep duration for girls, boys, and total population is shown in Figure 13. At the girls' level, 76.70% have at least 6h / day sleep duration and 23.30% spend less than 6h / day to sleep. At the level of boys, 77.71% have sleep duration of at least 6h / day and 22.29% devote less than 6h / day to sleep.



Chi-square tests the possibility of gender and sleep duration binding in adolescents. The p-value obtained is 0.428

Figure 13 . Sleep duration in adolescents

Nutritional profile of the study population

Healthy eating habits: Healthy eating habits among girls and boys are presented in Figure 14. At the girls' level, 35.23% eat breakfast, 47.16% consume vegetables, 49.43% consume fruit and 43.18% consumes milk. At the level of boys, 34.23% eat breakfast, 45.14% consume vegetables, 50.86% consume fruit and 39.43% consume milk.

Bad eating habits: Poor eating habits for girls and boys are presented in Figure 15. At the girls' level, 67.61% consume sweetened beverages, 15.34% fast foods, 40.91% fries, 72.73% donuts, 65.34% candies, chocolate and 10.23% energy drinks. At the level of boys, 50.29% consume sugary drinks,

14.29% fast food, 33.14% fries, 67.43% donuts, 44% candy, chocolate and 10.23% drinks energy.

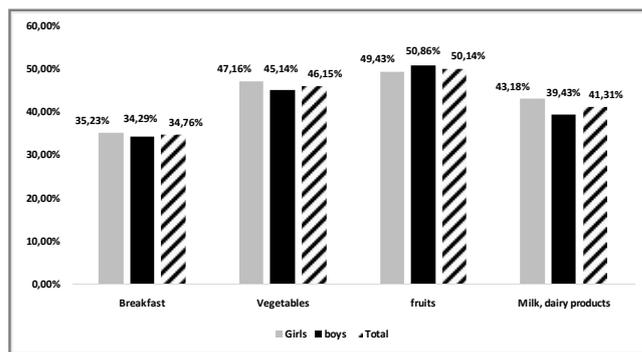


Figure 14. Healthy eating habits in adolescents

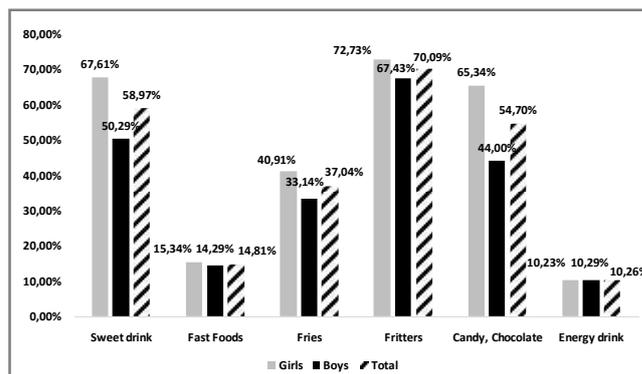


Figure 15. Bad eating habits in teenagers

DISCUSSION

Obesity and related diseases in children and adolescents in developing countries are growing (WHO, 2010). This study, which describes the estimation of activity levels and dietary habits among adolescents in the city of Daloa (Côte d'Ivoire), promotes active and healthy lifestyle that plays an important role in the fight against obesity. It reports 0% risk of obesity in these adolescents. These results corroborate those reported by Lokrou and Nioblé (2008) and Sbaibi and Aboussaleh (2011). They showed low (0.9%) risks of obesity respectively in the high school students of the district of Abidjan and the teenagers of the rural commune of Sidi El Kamel (Morocco). This low risk of obesity could be explained by regular physical activity (moderate or intense) of these adolescents. In addition, the distance of schools from their homes and the lack of financial means seem to subject them to significant energy expenditure (Sbaibi et al., 2013). In addition, agricultural work regularly practiced by some young people (rural communes) also subjects them to a significant loss of energy (Sbaibi and Aboussaleh, 2011). The prevalence of underweight (32.76%) is relatively low among these young people. However, it remains well above those of 10% and 17.6% reported respectively by Sbaibi and Aboussaleh, (2011) and Aboussaleh et al. (2007). These different results could be explained by genetic and hormonal factors. Effect, according to (Sbaibi and Aboussaleh, 2011) the short stature in some adolescents and the growth of some of their hormones could be responsible for the underweight. The prevalence of overweight, however, is low (6.84%). However, it is significantly higher compared to the 1.42% reported by Lokrou and Nioblé (2008). This observed excess weight would be linked to a lack of physical activity due to their young age (Sallis et al., 1993, Kimm et al.,

2002). This study also revealed a high prevalence of overweight and abdominal obesity in girls. According to WHO (2009), 5% of the mortality is attributable to overweight and obesity. Other authors have implicated the involvement of obesity in certain chronic diseases such as hypertension (Moran 1999, Cabrinety *et al.*, 2002). Likewise, their BMI is high. These strong values seem to be related to the high proportion of physical inactivity of girls. According to (Patrick *et al.*, 2004), insufficient intense physical activity could be a risk factor for high BMI in adolescents. Girls are at risk of developing cardiovascular disease because they spend less time on intense physical activity. Adolescents who participate in higher levels of physical activity are less likely to develop cardiovascular disease risk factors (Boreham and Riddoch, 2001, Strong *et al.*, 2005) and are more likely to have positive results in regulating body weight (Gutin *et al.*, 2002, Lemura and Maziekas, 2002). Children and adolescents also require regular physical activity for normal growth and development, and maintenance of good health and fitness (US DHHS 1997, Al-Hazzaa 1997, Biddle *et al.*). In this study, the time spent watching television or using the computer was considered a sedentary factor. The results showed that girls (63.64%) spend more time (more than 3h / day) watching television. The time spent in front of a screen (television, video, video games, computer ...) is currently considered as an indicator of a sedentary lifestyle (Dietz, 1996). Indeed, according to Ekelund *et al.* (2006), the time spent watching television is associated with the risk of metabolic diseases such as obesity (among girls) (Crespo *et al.*, 2001). This study also showed that adolescents (77.21%) have long sleep duration (≥ 6 h / day). Adequate sleep is therefore essential to human health and well-being (Marshall *et al.*, 2008). With regard to eating habits, this study found that adolescents did not take breakfast (34.76%). According to PNNS (2002), breakfast is essential for good health. Most of these adolescents do not consume milk and dairy products (58.69%). However, dairy products (milk, yogurts and cheeses) are a very important source of calcium, especially during growing childhoods (PNNS, 2002). They do not consume vegetables and fruits. However, the consumption of vegetables and fruits is recommended by the WHO (WHO) (2004) because they are rich in minerals and vitamins, and bring few calories thanks to their high content of water, and enter in the prevention obesity and diabetes (PNNS, 2002). Vegetables and fruits are part of healthy eating habits that contribute to improving the physical and mental health of individuals and their well-being (WHO, 2002). This study also showed that most teens consume donuts (70.09%), cakes, cookies, sweets and chocolate (54.70%), sugary drinks (58.97%) and energy drinks (Figure 15). This dietary habit of these teens does not seem to be appropriate for a healthy lifestyle. They must therefore limit the intake of any food and meals that can cause health complications and the development of obesity.

Conclusion

This study describes the estimation of physical activity levels and dietary habits among adolescents in the city of Daloa and also provides reliable tools for the assessment of lifestyle and the impact of interventions aimed at promote a healthy lifestyle and reduce the health risks of teens. It emerged from this study that:

- Girls are more at risk for overweight and abdominal obesity than boys. They are therefore at risk of

developing cardiovascular diseases because they spend little time on physical activity (they spend less energy);

- The eating habits of these teens do not seem to be appropriate for a healthy lifestyle.

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