**Niaba Koffi Pierre Valery**
Department of Biochemistry-Microbiology, Agrovalorisation Laboratory, Jean Lorougnon Guédé University of Daloa, BP 150 Daloa, Cote D'Ivoire

**ANVOH Koutoua Yves Blanhard**
UFR of Food Science and Technology Nangui Abrogoua University, 02 BP 801 Abidjan 02, Cote D'Ivoire

**Diomandé Masse**
Department of Biochemistry-Microbiology, Agrovalorisation Laboratory, Jean Lorougnon Guédé University of Daloa, BP 150 Daloa, Cote D'Ivoire

**KOUAME Samuel**
Department of Biochemistry-Microbiology, Agrovalorisation Laboratory, Jean Lorougnon Guédé University of Daloa, BP 150 Daloa, Cote D'Ivoire

**Beugre Grah Avit Maxwell**
Department of Biochemistry-Microbiology, Agrovalorisation Laboratory, Jean Lorougnon Guédé University of Daloa, BP 150 Daloa, Cote D'Ivoire

# Evaluation of some anthropometric parameters of students on the site of the Daloa University Campus

**Niaba Koffi Pierre Valery, ANVOH Koutoua Yves Blanhard, Diomandé Masse, KOUAME Samuel and Beugre Grah Avit Maxwell**

**Abstract**
The objective of this study is to assess the body mass index (BMI) of some students from the Jean Lorougnon Guede University in Daloa. The study was conducted on the Daloa campus and included 350 students of different gender and age. Anthropometric data such as weight (P), height (T), waist ratio (TT) and body mass index (BMI) were calculated. The boys in the study are mostly ($171.34 \pm 6.41$ cm) taller than the girls ($158.18 \pm 5.47$ cm), their body weight ($64.01 \pm 7.73$ kg) is greater than that of girls ($57.47 \pm 9.42$ kg). However, girls have a waist size ($69.02 \pm 7.49$ cm) lower than that of boys ($73.20 \pm 5.23$ cm). However, the BMI for girls ($23.00 \pm 3.85$ kg / m²) is higher than that for boys ($21.76 \pm 1.92$ kg / m²). The ratio (waist / waist) of girls ($0.43 \pm 0.04$) is higher than that of boys ($0.42 \pm 0.02$). This allowed us to show that the majority of students are normal weight, however some are overweight and others have abdominal obesity.

**Keywords:** Weight, height, body mass index, abdominal obesity and students

## 1. Introduction
Throughout human history, weight gain and the accumulation of fat stores have been regarded as signs of health and prosperity (WHO, 2003) [8]. The body mass index (BMI) is today the most commonly used tool for measuring body build. This measure has since become the preferred instrument for studying underweight, overweight and obesity. The increase in the prevalence of obesity and the increase in mean BMI values are not without consequence (Roberts *et al.,* 2012) [13]. These increases can cause harmful effects on the health of young people, both physically and psychologically (Lau *et al.,* 2007; Roberts *et al.,* 2012) [13].

Overweight and obesity is the fifth leading risk factor for death worldwide. At least 2.8 million adults die from it each year (WHO, 2013) [10]. Two societal causes of this galloping epidemic of obesity among young people are clearly identified: an increasingly unbalanced diet and a reduction in physical activity linked to changes in social habits in terms of food and leisure (WHO, 2004; Rauner *et al.,* 2013) [9, 12].

It is clear that the students of the town of Daloa carry out little physical activity and have a limited diet due to lack of means.

In order to limit the risks associated with insufficient physical activity and poor nutrition, the student must lead a healthy lifestyle. A study of this group therefore appears useful.

## 2. Material and methods
### 2.1 Material
### 2.1.1 Study population
This study involved 350 students, including 175 boys and 175 girls (Figure 1), who are studying at Jean Lorougnon Guédé University in Daloa. The data have been collected with respect for confidentiality and anonymity.

### 2.1.2 Inclusion and exclusion criteria
Students with the following characteristics: living in the city of Daloa; to be in a good health; be educated at Jean Lorougnon Guédé University in Daloa. On the other hand, Pregnant or breastfeeding students or physically disabled or sick students were excluded.

**Corresponding Author:**
**Niaba Koffi Pierre Valery**
Department of Biochemistry-Microbiology, Agrovalorisation Laboratory, Jean Lorougnon Guédé University of Daloa, BP 150 Daloa - Ivory Coast

## 2.2 Methods
### 2.2.1 Determination of anthropometric parameters of the population studied
The anthropometric parameters of the study population included body weight, height, waist circumference and height / height ratio (Figure 1). Body weight was measured at less than 100 g using an electronic and portable scale (150 ± 0.1 kg) (Figure 1A). The size was measured to the nearest 1 mm using a graduated wooden measuring board (200.0 ± 0.1 cm)

(Figure 1B) (IAEA, 2010) [2]. Waist measurement was measured to the nearest 0.1 cm using a measuring tape. The waist measurement was taken halfway between the last rib and the iliac crest and at the end of the normal expiration (Figure 1C). The size / size ratio was calculated by dividing the waist (cm) by the height (cm). The benchmark size-to-height ratio of 0.50 has been used to define abdominal obesity in boys and girls (McCarthy & Ashwell, 2006) [5].



**(A)**                                **(B)**                                **(C)**

**Fig 1:** Determination of anthropometric parameters

## 3. Statistical analyzes
The processed data were presented as an average ± standard deviation and as a percentage before being subjected to a one-way analysis of variance (Anova) (Statistica 7.1). ANOVA is performed on the means of anthropometric parameters (weight, height, waist circumference, BMI, height / height), physical activity and eating habits. The normality of distribution was tested by the Kolmogorov-Smirnov test. Chi-square and Fisher's test were used to test the association between the models. The results of the quantitative variables were presented as an average and the comparative analysis was carried out by the Student 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 $p < 0.05$.

## 4. Results and discussion
### 4.1 Results
#### 4.1.1 Anthropometric characteristics of the population studied by sex
The anthropometric characteristics studied are presented in Table 1. The majority of the boys in the study (171.34 ± 6.41 cm) are taller than the girls (158.18 ± 5.47 cm), their body weight (64, 01 ± 7.73 kg) is more important than that of girls (57.47 ± 9.42 kg). However, girls have a waist size (69.02 ± 7.49 cm) lower than that of boys (73.20 ± 5.23 cm). However, the BMI for girls (23.00 ± 3.85 kg / m²) is higher than that for boys (21.76 ± 1.92 kg / m²). The ratio (waist / waist) of girls (0.43 ± 0.04) is higher than that of boys (0.42 ± 0.02).

**Table 1**: Anthropometric characteristics of students by gender.

| Anthropometric characteristics of students by gender | | | |
|---|---|---|---|
| | **Boys** | **Girls** | **P. Value** |
| Body weight (kg) | 64,01±7,73 | 57,47±9,42 | 0,004 |
| Height (cm) | 171,34±6,41 | 158,18±5,47 | 0,006 |
| Waist size (cm) | 73,20±5,23 | 69,02±7,49 | 0,007 |
| IMC (kg/m²) | 21,76±1,92 | 23,00±3,85 | 0,0008 |
| TT/T | 0,42±0,02 | 0,43±0,04 | 0,00064 |

## 4.2 Evolution of the body mass index (BMI) of the population studied
Figure 3 shows the evolution of the BMI of the population studied. In girls, 18.18% are underweight and 45.45% are

normal weight. In contrast, 31, 82% of girls are overweight and 4.55% have moderate obesity. In boys, 3.85% are underweight and 89.74% are normal weight. 6.41% of boys are overweight and also do not have obesity (Figure 2)
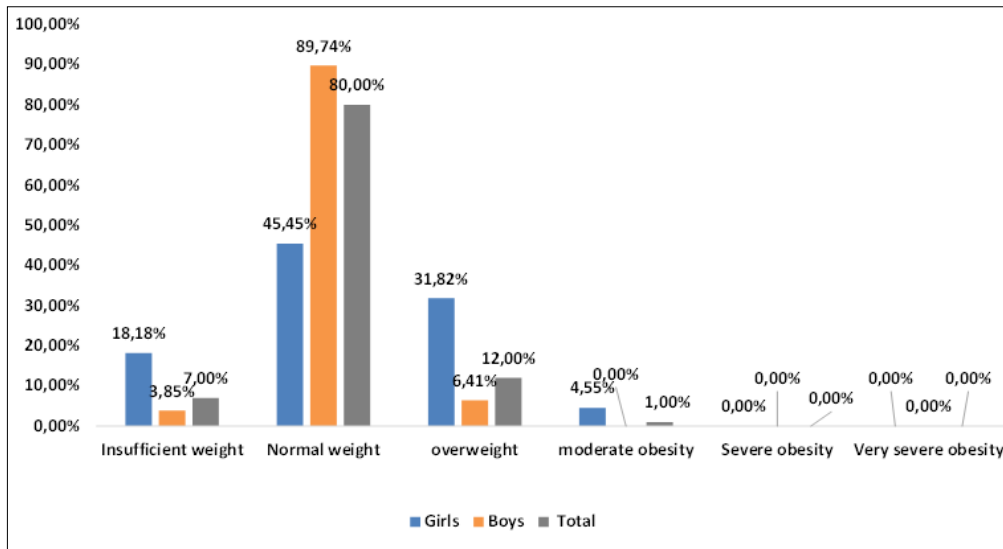
**Fig 2**: Evolution of BMI among students

## 5. Prevalence of abdominal obesity
Figure 3 shows the prevalence of abdominal obesity in the study population. Girls (13.64%) have abdominal obesity than boys (1.28%)
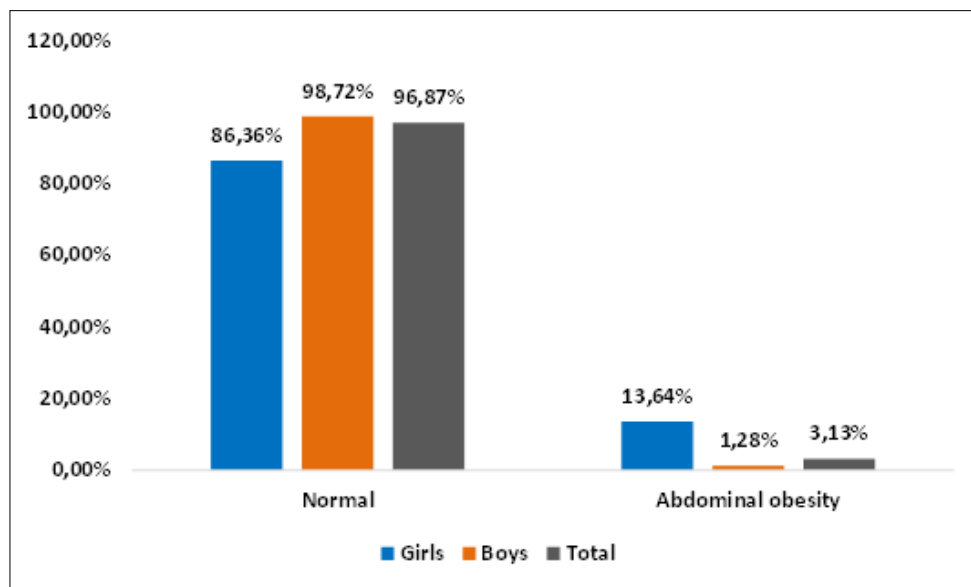


**Fig 3:** Prevalence of abdominal obesity

## 6. Discussion
This active population does not yet know socio-economic affluence. However, the prevalence of overweight exists and in addition increases significantly with age regardless of gender. Overall, there is 12% overweight and 1% obesity. However, the rate of overweight here is high and the rate of obesity is similar compared to previous work done in 16 public high schools in the district of Abidjan, which had shown that 1.42% were overweight and 0.9 % obese (Lokrou & Nioblé C., 2008) [4]. Elsewhere, a study at a university in Douala also showed a different prevalence of overweight and obesity among students (19.4% overweight and 3.6% obese) (Ewane *et al,* 2012) [1]. The study also indicates that the prevalence of overweight increases with age for both men and women. This increase in overweight could be explained by a decrease in physical activity with age (Sallis *et al.,* 1993; Kimm *et al.,* 2002) [12, 3].
The prevalence of underweight (7%) found in our study is lower than that of 10% described by Sbaibi & Aboussaleh, (2011) [15]. Likewise, they differ from those revealed (17.6%)

by Aboussaleh *et al.,* (2007) for a population of 306 pupils whose ages varied from 12 to 16 years. The prevalence of underweight among adolescents could be explained either by the intervention of genetic factors (short stature in some adolescents) or by hormonal problems (growth hormones) (Sbaibi & Aboussaleh, 2011) [15].
This study found that the prevalence of abdominal obesity is higher in girls than in boys. Globally, 5% of mortality is due to overweight and obesity (WHO, 2009). Students with overweight and abdominal obesity are at risk for chronic diseases. However, several studies have shown that obesity is a real risk factor for chronic diseases such as hypertension (Moran, 1999; Cabrinety *et al*., 2002) [6].
The high BMI in girls can be explained on the one hand, by the high proportion of physical activity (lack of regular intense physical activity) and on the other hand, by physiological (hormones), genetic and nutritional factors. However, insufficient intense physical activity may be a risk factor for high BMI in adolescents (boys and girls) (Patrick *et al.,* 2004).

## 7. Conclusion

This work consisted of studying the body mass index of the students. This enabled us to show that the majority of students are of normal weight, however there are some who are overweight and others who are obese. This overweight is much more common in women than in men. As for abdominal obesity, it is also much more prevalent in women.

## 8. Reference

1. Ewane ME, Epacka EM, Mandengue SH, Priso BE, Moumbe T, Founda BA. Screening for cardiovascular diseases among students of the University of Douala and influence of physical and sports activities. Pan Africa. Medicine. Journal. 2012; 11:77.
2. IAEA. (International Atomic Energy Agency). IAEA human health series no. 12. Introduction to body composition assessment using the deuterium dilution technique with analysis of saliva samples by Fourier Transform Infrared Spectrometry. IAEA publication, Vienna, 2010. (ISBN 978-92-0-103210-2).
3. Kimm SY, Glynn NW, Kriska AM, Barton BA, Kronsberg SS, Daniels SR *et al*. Decline in physical activity in black girls and white girls during adolescence. New. England. Journal of Medicine. 2002; 347(10):709-15.
4. Lokrou A, Nioblé C. Prevalence of overweight and obesity in schools in Côte d'Ivoire. Elsevier Masson, 2008; 2(3):303-304.
5. McCarthy HD, Ashwell M. A study of central fatness using waist-to-height ratios in UK children and adolescents over two decades supports the simple message keep your waist circumference to less than half your height. International Journal of Obesity (London). 2006; 30:988-92.
6. Moran R. Evaluation and treatment of childhoodobesity. Am Fam Physician. 1999; 59:8618.
7. OMS (Organisation Mondiale de la Santé). Global healthrisks: mortality and burden of disease attributable to selected major risks. Genève, OMS, 2009.
8. WHO. Obesity: prevention and management of the global epidemic. Technical report series, WHO, N °. 2003; 894:285p.
9. World Health Organization. Global Strategy for Diet, Physical Activity and Health, 2004.
10. World Health Organization. Obesity and overweight. WHO, Fact sheet N ° 311: Geneva, 2013.
11. Patrick H, Nicklas TA. A Review of Family and Social Determinants of Children's Eating Patterns and Diet Quality. Journal of the American College of Nutrition. 2005; 24(2):83-92.
12. Rauner A, Mess F, Woll A. The relationship between physical activity, physical fitness and overweight in adolescents: a systematic review of studies published in or after 2000. BMC Pediatrics. 2013; 13:19. Doi: 10.1186/14712431-13-19;
13. Roberts CK, Shields M, de Groh M, Aziz A, Gilbert J-A. Overweight and Obesity in Children and Youth: Results from the Canadian Health Measures Survey 2009 to 2011. Statistics Canada, 2012.
14. Sallis JF. Epidemiology of physical activity and fitness in children and adolescents. Critical. Review. In food Science and Nutrition. 1993; 33:405-408.
15. Sbaibi R, Aboussaleh Y. Exploratory study of the weight-status of middle school children in the rural commune Sidi El Kamel in northwest Morocco. Antropometry. 2011; 24:61-66. www.didac.ehu.es/antropo