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Role of university restaurants in student food: Case of daloa (Central-West, Cote D'ivoire)

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Abstract
Background: The beginning of university studies is an important transition period in the lives of young adults. However, it is also recognized as a critical period in terms of lifestyle habits, the deterioration of which can have a negative impact on the health of students. It is in this context that this study takes place, which set itself the objective of knowing the student's food preferences and their relationship with the university catering services.
Method: It took place over three months and involved 150 students from Jean Lorougnon Guédé University of Daloa. On the basis of an elaborate questionnaire on general information (sex, age, height, weight, level of education, marital status) on the one hand and on the other hand information concerning their diet and their outlook on the restaurant university.
Results: The study showed that the respondents were male (67.85 %), belonging to the age group between 21-25 years old (50 %). All respondents are single from the bachelor (54.39 %) and master (45.61 %) education levels. It emerges from this study that among the students questioned, the regular attendance rate at the university restaurant is 27%. The majority of students attending the university restaurant are not satisfied with hygiene. However, the people questioned are satisfied with the quantity of the meal served and its price. Regarding the quality of the meal, opinions are mixed. More than half, or 54 % of the students surveyed, eat breakfast regularly. Sixty-two percent (62 %) of the students surveyed say they play sports regularly.
Conclusion: This study has shown that the meals served to students remain very unbalanced and very far from the recommended intake.

Keywords: students, university restaurant, food, sport

Introduction
Food is the first concern of man from a biological point of view. Indeed, it is vital for humans to eat and eat well. It also has a cultural aspect, that is to say that it is not the same according to the countries of the world. Food must be healthy as it plays an important role in the prevention of obesity and noncommunicable diseases such as type 2 diabetes, hypertension and contributes most to premature death. Several studies have shown that young adults especially university students have unhealthy eating habits due to their responsibility and environmental changes, this group has been overlooked in existing health promotion (Neumark-Sztainer *et al*., 1999; Camirand *et al*., 2012; Rodd and Sharma, 2016; Hilger *et al*., 2017) [27, 33, 13].
The consumption of out-of-home food, whether in university or other restaurants, has increased considerably in recent decades and has become an important part of the regular diet. Various studies have shown that eating outside the home is associated with higher energy intakes. Consequently, the mass catering sector is increasingly recognized as a player in promoting health, diets and lifestyles. Eating outside the home has additional nutrients than eating at home (Lopez-Frias *et al*., 2005; Prell *et al*., 2005; Lachat *et al*., 2008; Camirand *et al*., 2012) [23, 32, 18].
University meals must provide the body with all the necessary nutrients and be hygienically-sanitary. Besides students' knowledge quests, learning and finding the right places on campus to satisfy their physical weaknesses is a prerequisite for them (Roos *et al*., 2004; Meyer *et al*., 2008; Wen-Hwa, 2011) [34, 24, 40].
In light of these analyzes, the Jean Lorougnon Guédé University in Daloa is no exception with regard to the nutritional needs of the students, their eating habits and the university restaurant. Students find it difficult to eat a balanced diet, both in the university restaurant and in other restaurants. A survey carried out on this student population made it possible to understand the reasons for this poor diet (Larson *et al*., 2006; Vereecken *et al*., 2010; Van-Hulst *et al*., 2012) [19, 39, 38].
The objective of this study was to know the students' food preferences and their level of satisfaction with the university catering services and to highlight the deficiencies and/or excess to guide those responsible for university catering towards a diet. Healthy that takes into account the specific needs of students.

Material and Methods
1. Type of study
A dietary survey was carried out in accordance with the recommendations of Miller (2000) [25] at the university restaurant (RU) of the Jean Lorougnon Guédé University in Daloa (Central-West, Côte d'Ivoire) from December 2019

to February 2020. It should concern 57 students belonging to the various Training and Research Units (UFR) of this university.

2. Presentation of the study area

Daloa is a city in west central Côte d'Ivoire, in West Africa. Chief town of the Haut Sassandra Region Department. The city is located 141 km from Yamoussoukro, the political capital and 383 km from Abidjan, the economic capital. It is bounded to the north by the Department of Vavoua, to the south By the Department of Issia, to the east by the Department of Zuénoula and Bouaflé and to the west by the Department of Duékoué. In 2012, its population was estimated at 261,789 inhabitants, it is the 3rd most populous city in Côte d'Ivoire (Anonymous, 2017). In addition, the department is watered by the Sassandra river and by its tributary the "Lobo" whose ramifications the Dice and the Gore flood all the localities. The Bété, Niamboua, Zombo and part of Niédéboua, various foreigners and foreigners make up the bulk of this population (Anonymous, 2017). Figure 1 shows the city of Daloa.

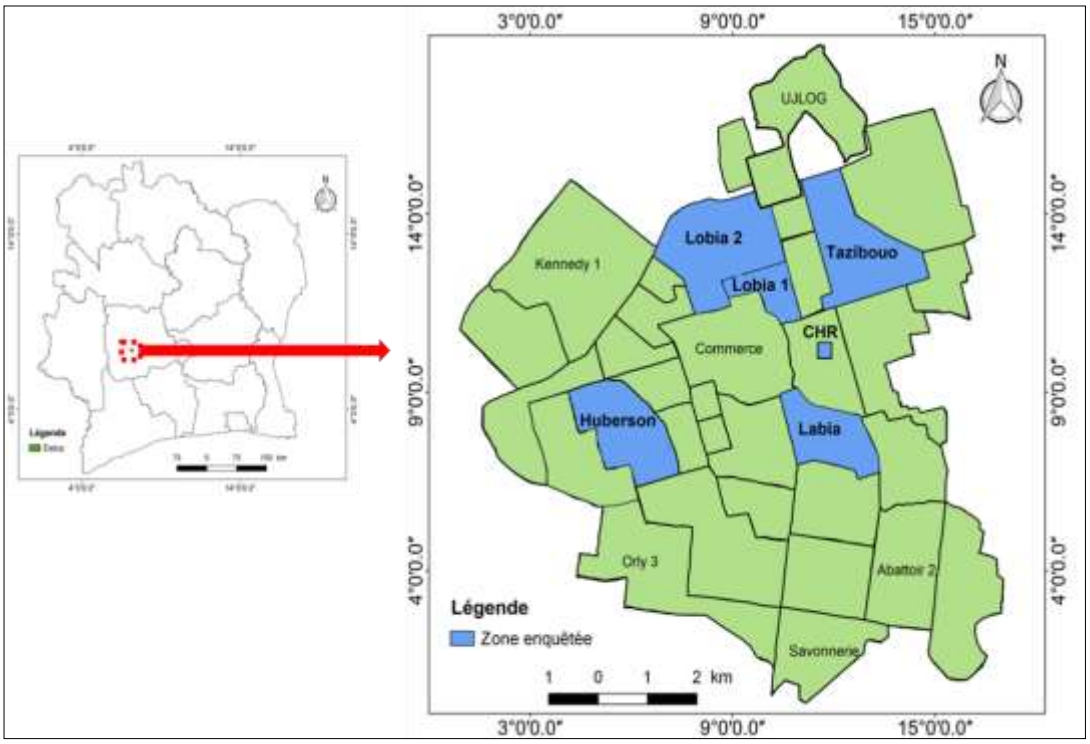

Fig 1: A: Map of the Ivory Coast with the position of the town of Daloa (the point in red) **B**: Map of the city

3. Study population

Our work was carried out in order to study the eating habits of students and the role of university catering in the diet of university students and assess the nutritional quality of the meals served in the university restaurant. The restaurant studied is: the university restaurant of the Jean Lorougnon Guédé University (UJLoG) in the city of Daloa. The 57 students who agreed to answer our questionnaire, attend the following Research and Training Units (UFR): Agroforestry UFR, Environment UFR, Social and Human Sciences UFR, Legal Sciences UFR and UFR Economic Science and Business Administration. These people were interviewed on the basis of a previously established questionnaire comprising two main parts. The first is related to the general information of the respondents (sex, age, weight, height, level of study, UFR of belonging). The second concerns information on their diet and their outlook on the university restaurant. We have deliberately recruited individuals with different scientific and literary backgrounds, in order to see whether their knowledge in the field of nutrition and its role in health, influences their eating habits or not.

4. Survey of meals served in the restaurant studied

We attended for a week the midday meal served between 11h 30 min and 13 h, in order to collect data on the meals served by the restaurant in terms of quality and quantity. The menu for the week of December 16 to 21, 2019 is shown in table 1.

Table 1: Menu of the week from December 16 to 21 at the university restaurant

Day	Menu
Monday	Plain rice / improved rice / seed sauce / clear sauce / cassava semolina
Tuesday	Plain rice / placali / seed sauce / clear sauce / cassava semolina
Wednesday	Plain rice / improved rice / vegetable sauce / clear sauce/cassava semolina
Thursday	Plain rice / improved rice / clear sauce / peanut sauce / cassava semolina
Friday	Plain rice / improved rice /vegetable sauce/peanut sauce/cassava semolina
Saturday	Plain rice / yam stew / seed sucker / clear sauce / cassava semolina

All of these are accompanied by meat and fish. We note that there are no entries in this menu, as far as dessert is concerned, according to the students, seasonal fruits sometimes serve as dessert. The main components of the university restaurant menu are: rice, cassava, yam, vegetables, peanuts, Beef and mackerel fish. Data concerning the food consumed available on the Health

Passport site allowed us to assess the nutritional intake of each food that makes up the menu of the university restaurant.

5. Nutritional survey

This survey was carried out by questionnaire with consenting students to find out the eating habits of students within the university campus. The questions focused on:

- having breakfast
- Lunch and the nature of the food consumed (fast-food, fruit, etc.)
- The number of snacks and their types (sweet, salty, fatty...)
- consumption of coffee and / or tea
- the practice of physical activity

As well as the level of attendance of the university restaurant and the opinions of the students on the menus from a qualitative and quantitative point of view, as well as their level of satisfaction of the service of the university catering (comfort of the rooms, hygiene...). It was conducted in accordance with the work of Belbachir (2017).

6. Ethical considerations

Respect for ethics and professional conduct being an integral part of our study, we therefore have:

- Informed the participants of the purpose of our study and the procedures of our investigation.
- Explained the voluntary nature of their participation as well as the principle of confidentiality included in our research.
- Answered all the questions that were addressed to us in order to make them understand our objectives of the study and its interest.

7. Data processing and analysis

For this study, Microsoft office 2016 (Word, Excel), basic software for calculations and data entry was used.

Results

1. Characteristics of the population studied

1.1. Sociodemographic characteristics of the population studied

Our study on the eating habits of students and the role of university restaurants in their diet provided socio-demographic data on the respondents. These data show a dominance of males (67.85%) compared to females (32.15%). Regarding the age groups, we observe that 50% of the respondents belong to the age group between 21-25 years old. All respondents are single from the bachelor (54.39%) and master (45.61%) education levels. These data are contained in Table 2.

Table 2: Characteristics of the students interviewed

		UFR Agro		UFR Env		UFR SJAP		UFR SEG		UFR SSH		General	
		Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Sex	Male	18	60	22	73.33	15	50	23	76.67	15	50	93	66.67
	Female	12	40	08	26.67	15	50	07	26.33	15	50	57	33.33
Age	18-20 years	05	16.67	00	00	08	26.67	00	00	13	43.33	26	17.55
	21-25 years	16	50.33	12	40	12	40	17	56.67	17	56.67	74	52.63
	26-30 years	09	33	18	60	10	33.33	13	43.33	00	00	50	29.82
Level of study	Licence	19	63.33	11	26.67	21	70	13	43.33	13	43.33	78	54.39
	Master	11	26.67	19	63.33	9	30	17	56.67	17	56.67	72	45.61
Marital status	Married	00	00	00	00	00	00	00	00	00	00	00	00
	Single	30	100	30	100	30	100	30	100	30	100	150	100

UFR Agro: Agroforestry Training and Research Unit UFR Env: Environmental Training and Research Unit UFR SJAP: Training and Research Unit in Legal, Administrative and Political Sciences UFR SEG: Training and Research Unit in Economic Sciences and Management UFR SSH: Training and Research Unit in Social and Human Sciences

1.2. Body mass index of the study population

For all the parameters (gender, level of study, UFR) concerned in this part of our study, we observe that the body mass index (BMI) is located in the normal zone. It varies from 20.5-22.93 kg/m^2 as shown in table 3.

Table 3: Average BMI values of students interviewed as appropriate

		Average BMI (kg/m^2)	Situation
Sex	Male	21.2	Normal
	Female	22.29	Normal
Level of study	Licence	20.5	Normal
	Master	21.59	Normal
UFR	UFR Agro	20.25	Normal
	UFR Env	21.9	Normal
	UFR SJAP	22.93	Normal
	UFR SEG	20.93	Normal
	UFR SSH	21.05	Normal

UFR Agro: Agroforestry Training and Research Unit UFR Env: Environmental Training and Research Unit UFR SJAP: Training and Research Unit in Legal, Administrative and Political Sciences UFR SEG: Training and Research Unit in Economic Sciences and Management UFR SSH: Training and Research Unit in Social and Human Sciences

2. Survey on the university restaurant

2.1. Attendance at the university restaurant

It emerges from this study that among the students questioned, the regular attendance rate at the university restaurant is 27 %. However, a large proportion of these students prefer to eat their meals at home (45 %). Finally, 28 % of the students in this study show an interest in the consumption of food supplied by restaurants owned by individuals (Figure 2).

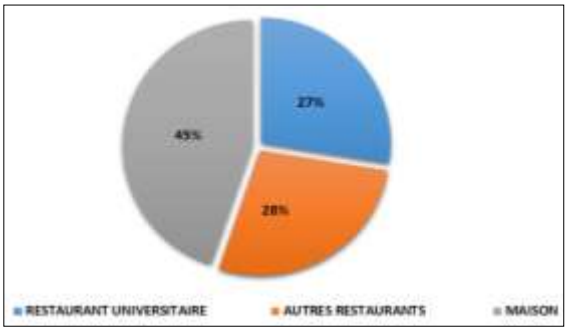

Fig 2: Students lunch location

2.2. Reasons for the low attendance of the university restaurant

Sixty-three percent (63 %) of the students who participated in this study do not attend the university restaurant for the following reasons: the majority because of the poor taste quality of the meals served, the queue which makes them waste time, the lack of hygiene, some students prefer to eat at home because of the proximity of their home (Figure 3).

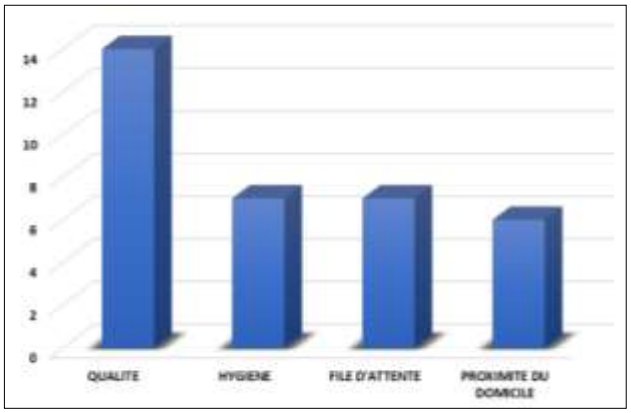

Fig 3: Reasons for students not going to the university restaurant

2.3. Students opinions on the university restaurant

The majority of students attending the university restaurant are not satisfied with hygiene. However, the people questioned are satisfied with the quantity of the meal served and its price.

Regarding the quality of the meal, opinions are mixed as shown in figure 4.

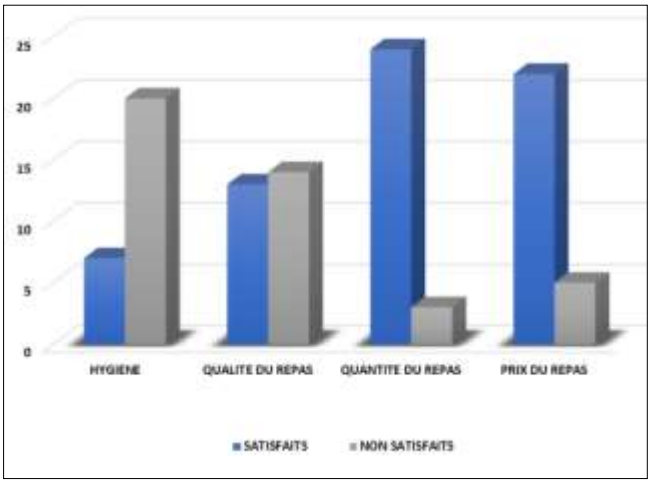

Fig 4: Students opinions on the service of the university restaurant

3. Nutrition and sporting activity

3.1. Analysis of the nutritional quality of meals served in the university restaurant

Regarding the macronutrient intake, we note that the meals served in the university restaurant are rich in carbohydrates and proteins.

The micronutrients consumed in the university restaurant consist mainly of minerals compared to vitamins (Table 4).

Table 4: Nutritional composition of meals

		Macroelements (in g)			Microelements (in mg)			
	Calories (kcal)	Lipids	Carbohydrates	Proteins	Vitamins	Iron	Calcium	Magnesium
Rice	130	0.3	28	2.7	0.08	0.2	10	12
Cassava	159	0.3	38	1.4	21	0.3	10	21
Yam	118	0.2	25	1.5	17.4	0.5	17	22
Vegetables	65	0.2	13	2.9	3.3	0.8	25	22
Peanut	567	49	16	26	0	4.6	92	168
Fish	186	10.2	0	23.6	ND	ND	ND	ND
Meat	250	15	0	26	0.5	2.6	18	2.6

3.2. Eating breakfast

More than half, that is 54 % of the students surveyed, eat breakfast regularly, while 46 % neglect this meal, which is essential for good nutrition (Figure 5).

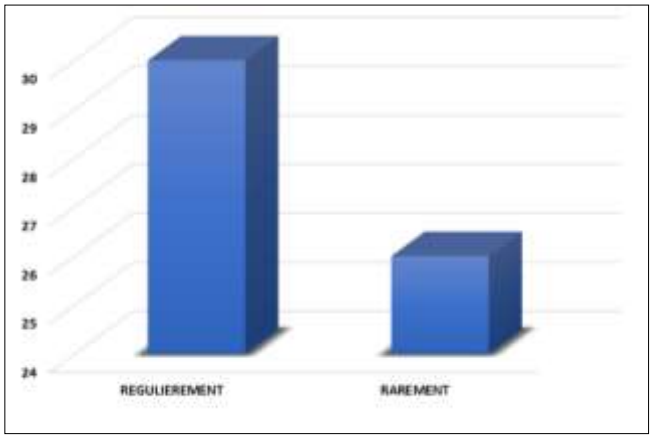

Fig 5: Frequency of eating breakfast

3.3. Sporting activity

Sixty-two percent (62 %) of students surveyed say they play sports regularly compared to 38 % who do not do any physical activity (Figure 6).

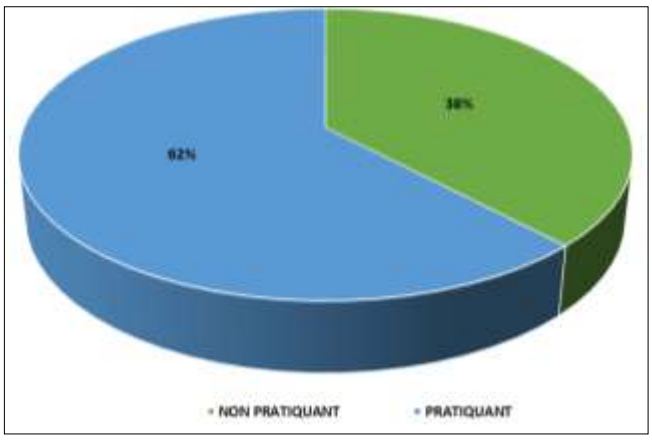

Fig 6: Frequency of physical activity by university student

Discussion

The beginning of university studies is an important transition period in the lives of young adults. However, it is also recognized as a critical period with regard to lifestyle habits, the deterioration of which can have a negative impact on the health of students (Nelson *et al*., 2009; Labonté *et al*., 2012; Pelletier *et al*., 2013) [26, 27, 31].

Data on the characteristics of the study population are of two types, namely at the level of socio-demographic characteristics and at the level of the body mass index. Data on socio-demographic characteristics show that the study population consists mainly of men (66.67 %) compared to women (32.33 %). There are several reasons for this situation, including the low enrollment rate of women, out of 10 students at this university only 3 are women, the lack of interest that women have in certain subjects. Regarding the age groups, we observe that 50 % of the respondents belong to the age group between 21-25 years old. All respondents are single belonging to undergraduate education (54.39 %). Generally, the majority of students in universities are undergraduate. They represent the basic population of this institution. In Africa in general and in Ivory Coast in particular, those who embark on the path of marriage are those who work. The most important thing for students is to finish their study in order to have a job that can help them be able to meet the needs of their future family.

The body mass index (BMI) allows you to quickly assess your body size simply with your weight and height, regardless of your gender. It is the only index validated by the World Health Organization to assess an individual and therefore the possible health risks. BMI helps determine whether you are underweight, overweight or obese. Our results show that all the students who participated in this have a normal BMI. These results are favorable for these students in the measure where on the physical level, obesity is an important risk factor for several chronic and noncommunicable diseases (Lau *et al*., 2007; Sharma and Kushner, 2009) [21, 35]. Indeed, overweight people are more likely to suffer from health problems such as type 2 diabetes, hypertension, dyslipidemia, cardiovascular disease, stroke, osteoarthritis and certain forms of cancer (Lau *et al*., 2007; Sharma and Kushner, 2009; Ogden *et al*., 2014) [21, 35, 29].

Our study was carried out at the university restaurant in Daloa to assess the nutritional quality of the meals served to students during the week. According to specialists, a single meal should contain 50 g of protein, 80 to 100 g of carbohydrates, 30 to 40 g of fat and 13 g of fiber. Regarding macronutrients, analysis shows that the intakes are very insufficient in the meals served in the university restaurant. To avoid deficiencies, dieticians recommend increasing the portions of red meats, adding chicken and varying the type of fish. Regarding carbohydrate intake, it should be noted that the intake provided by restaurant meals is below standard. Carbohydrates are a source of energy providing the glucose needed for the body to function, especially the brain. They are found in cereal products (rice, pasta, etc.), vegetables and fruits, legumes, milk and yogurt (Apfelbaum *et al*., 2009) [1].

Regarding the results obtained, we noted a glaring insufficiency in micronutrients compared to the standards reported by the dietitian, in particular for calcium and vitamins D and A. These elements are available in dairy products, orange fruits and vegetables such as carrots, apricots, radishes and citrus fruits…. (Sources of vitamin A) as well as fatty fish, sardines, organ meats and cold meats (Fischer and Ghanassia, 2004) [11] the dietitian advised to vary vegetables and fruits which are insufficient in the menus of the restaurant. It is the same for dairy products which are non-existent. In addition, it is also recommended to serve the dessert cream occasionally and replace it with yogurt and cheese (source of calcium).

A study was carried out by the Crous d'Aix-Marseille with students in university restaurants in the region to determine whether frequenting the university restaurant was associated with better compliance with the consumption benchmarks of the National Nutrition and Health Program (PNNS benchmarks). This survey revealed that the students who went to the university restaurant at least three times a week, as well as those who ate there with pleasure, respected the PNNS benchmarks better than the others (Brigitte *et al*., 2001) [3].

To improve the meals served in university restaurants, it is possible to raise the prices of meal tickets. This strategy has borne fruit in university restaurants in France, which offer structured meals at a fixed and moderate price (Guagliardo *et al*., 2010) [12]. In our case the ticket price was found acceptable at 81.5 % so it would be incorrect to increase the price of the ticket.

With regard to healthy eating, it is particularly recommended to limit the energy intake from the consumption of fats and to reduce the consumption of saturated fats and fatty acids to favor unsaturated fats to maintain a normal weight and eat more fruits and vegetables as well as legumes, whole grains and nuts. We must also limit the consumption of free sugars and limit the consumption of salt (sodium), all sources combined, and make sure to consume iodized salt (WHO, 2004).

According to the survey we conducted to assess attendance at the university restaurant and collect students' impressions of university catering, the vast majority of students surveyed said they did not eat at the university restaurant. Only 27 % of the students interviewed eat there regularly. The poor taste quality of the meals served, the lack of hygiene as well as the long queues and overall, the organization of the lunch, are all factors that repel students from the university restaurant.

For the morning meal, almost half of the students surveyed neglect to eat breakfast. However, the omission of this meal can contribute to nutritional deficiencies, which are rarely replenished by other meals during the day (Nicklas *et al*., 2004) [28]. The midday meal provides 35% of the daily food ration (Fernandez-Torres, 2014) [10]. It is therefore essential to attach great importance to it and ensure that it is a healthy and balanced meal. This meal is often overlooked by students for reasons that are often economic. This is why the university restaurant can play an important role in the diet of these young adults, by providing them with decent, clean and hot meals. These meals must be prepared by dieticians while respecting nutritional recommendations, the needs of young people and their budget.

The practice of sport in the student environment of Daloa seems to be a current activity, as shown by our results which show that 62 % of the students questioned this activity a habit of life. However, in general, the transition to adulthood is associated with a decrease in the level of physical activity (Kwan *et al*., 2012) [16]. In Canada, a longitudinal study has shown that the level of physical

activity decreased during this period and that this decrease was more accentuated among young men who entered college or university (Kwan *et al*., 2012) [16]. An Ontario study also found that the majority of university students are under-active (Irwin, 2007) [15]. Furthermore, Deforche *et al*. (2015) observed a decrease in participation in sports during the transition to post-secondary education, for both boys and girls (Deforche *et al*., 2015) [8].

Conclusion

We conducted a survey to assess the nutritional quality of meals served in university restaurants, and then submitted the results of the analysis of their composition in macro and micronutrients to dietitians. According to their evaluation, it turns out that the meals served to the students remain very unbalanced and very far from the recommended intakes. Indeed, according to the specialists consulted, the energy and macronutrient intakes are lower than the nutritional needs of the student in the meals served at the university restaurant. The intakes of minerals and vitamins are insufficient in the meals of the university restaurant of this study, we hope to draw the authorities' attention to the need to improve the meals in order to educate our students in healthy eating and properly cover their needs without excess or deficiency. In addition, by describing the eating habits of students, we would like to draw their attention to the need to modify their eating habits, in order to prevent the development of food-dependent illnesses such as obesity and type 2 diabetes.

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