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Research Article

Study of Dietary Risk Factors Involved in the Occurrence of Gastroesophageal Reflux Among Students in Ivory Coast

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Abstract

In 2016, the work of Amoikon *et al* showed a high prevalence of gastroesophageal reflux and inappropriate eating habits in student populations in Ivory Coast. With the aim of continuing this work through the search for explanatory dietary factors, a dietary study was carried out. It took place from October 15, 2016 to February 17, 2017, in a population of 1228 students, with an average age of 22.5 years, dominated by the male sex. This is a prospective cross-sectional study, with a descriptive and analytical aim, with the main objective of studying the relationship between eating habits and the occurrence of gastroesophageal reflux among students in Ivory Coast. The evaluation of pathologies frequently encountered in the population revealed a prevalence of 29.3% of gastroesophageal reflux. The analysis of the relationship between eating behaviors and the occurrence of the pathology revealed the involvement the high consumption of carbonated drinks, spicy foods, non-alcoholic exciting products, and flavor enhancer products. In view of these results we can conclude that unrationalized eating habits can lead to health problems. This study proves that certain inadequate dietary behaviors are responsible for gastroesophageal reflux in students' population and could have repercussions on the success rate in our universities. In order to avoid this situation, it would be important to organize awareness campaigns for behavior change with a view to improve their state of health.

Keywords

Students, Eating Habits, Gastroesophageal Reflux

1. Introduction

Gastroesophageal reflux is a common upper digestive disease in Ivory Coast [12]. It is characterized by the passage of part of the gastric contents into the esophagus and strongly associated with eating behavior [12, 11, 14, 2]. Manifested by heartburn and regurgitation, it begins with acute attacks, then becomes chronic and serious with the occurrence of complications such as esophageal strictures and oropharyngeal cancers [11, 14]. In Black Africa, very few studies have been devoted to gastroesophageal reflux or its risk factors. However, numerous European and American studies have revealed its association with eating behavior [3, 11, 12, 14]. According to an epidemiological study carried out at the Felix Hou-

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phou ët Boigny University in Abidjan in 2016 [1], a significant number of students presented dietary imbalances and digestive disorders such as gastroesophageal reflux. The frequency and the serious evolution of the pathology are life-threatening and make it a real public health problem, hence the need to research the Ivorian dietary risk factors specific to this student population, with a view to offer appropriate and adapted preventive dietary solutions.

2. Materials and Methods of the Study

2.1. Material

2.1.1. Framework of the Study

The study was carried out in West Africa, in Ivory Coast at the F élix Houphou ët Boigny University of Cocody in Abidjan. It is part of the perspectives of the work of Amoikon *et al* (2016) [1] and N'guessan *et al*. (2024) [10] who studied the eating habits and health status of students at the University and who found among them a significant prevalence of Gastroesophageal reflux, and poorly balanced diet.

2.1.2. Study Population (Inclusion and Non-inclusion Criteria)

A total of 1228 males and females students volunteered to participate in the study. Any student enrolled in the second year of Chemistry Biology Geology (CBG) at F élix Houphou ët-Boigny University who wished to participate in the study was included. They were not included, all other people whom did not respect the conditions raised.

2.1.3. Data Collection Tools

A questionnaire was designed and pre-validated by a pilot survey with 45 students from the Agrhymet Regional Center of NIAMEY (NIGER). It is composed of three parts: (i) the first part retraced the socio-demographic characteristics of the study population (ii) the second revealed the medical histories regularly experienced by the patients over a period of one year while (iii) the third part was reserved for eating habits (Frequency of food consumption).

2.2. Methods

2.2.1. Type of Study

This is a prospective cross-sectional study with descriptive and analytical aims.

2.2.2. Sampling

The convenience sampling technique was chosen. A total of 1228 male and female students volunteered to participate in the study.

2.2.3. Diagnosis of Gastroesophageal Reflux

The diagnosis of gastroesophageal reflux is first of all, a clinical diagnosis. We based our investigation on a diagnosis of elimination with a clinical examination consisting of questioning, palpation looking for signs of complication and extension (adenopathy). The diagnosis was made when the patient presented one of the following 3 associations: heartburn-regurgitation, heartburn-postural syndrome or regurgitation-postural syndrome [11].

2.2.4. Statistical Analysis

(i). Quantification of the Frequency of Food Consumption

We based ours study on the methods used by Amoikon *et al*, (2016) [1] and Kouakou Ossei (2010) [7] for the classification of the level of food consumption. Thus, food consumption was assessed by the food consumption frequency method and by retrospective analysis of eating behavior, readjusted by week. So:

a. Consumption of a food less than once to once a week was considered low,
b. Consumption of twice a week was considered medium,
c. When consumption was 3 to 4 times per week, it was reported as high,
d. When it was 5 to 7 times per week, it was considered very high.

(ii). Quantification of the Frequency of Water Consumption

a. Water consumption of less than one liter per day was considered low.
b. Water consumption of 1 to less than 1.5 liters per day was reported as medium and water consumption of 1.5 to 2 liters was considered very high.

2.2.5. Processing of Qualitative and Quantitative Data

The analysis of the quantitative and qualitative data collected was done with SPSS 20.0 software. For quantitative variables, the average and extreme values were highlighted. At the level of qualitative variables, the distribution and comparison of proportions was retained. The relationship between food habit and the pathology has been searched by the Chi square test.

2.2.6. Ethical Aspects

With regard to ethical considerations, the volunteers were informed of all stages before the start of the investigation and were interviewed or examined after free and informed consent. Confidentiality was assured by assigning an anonymity number to each survey sheet. This study was approved by the Felix Houphouët Boigny University of Côte d'Ivoire and the ethical

principles of the Declaration of Helsinki were respected.

3. Results and Discussion

3.1. Results

3.1.1. Socio-demographic Characteristics

In terms of sociodemographic characteristics, three indicators were analyzed, namely ethnic group, age and gender. Regarding the ethnic group, the Akans are the most represented with a number of 621 people, the Krous, the Northern Mandé and the Gour are respectively 161, 109 and 182 and the foreigners are the least represented with a workforce of 31 people (figure 1). Regarding the age of the respondents, the age of the population was subdivided into 3 groups. Thus, respondents aged 17 to 19 years old are 20% and those aged 20 to 24 years old and 25 and over are respectively 77% and 3% (Figure 2). And in this population, 74% are men compared to 26% women (Figure 3).

a. Ethnic group

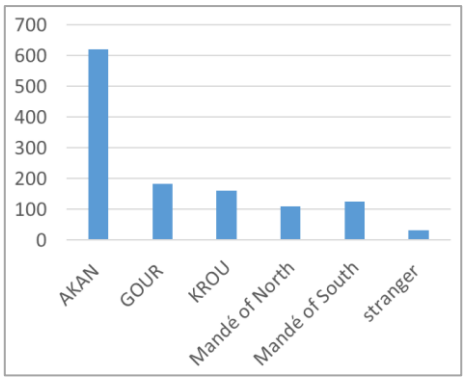

Figure 1. *Distribution of respondents according to ethnic group.*

b. Age of respondent

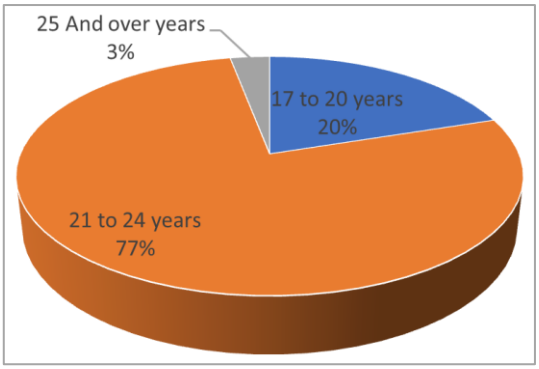

Figure 2. *Distribution of respondents by age.*

c. Sex of respondent

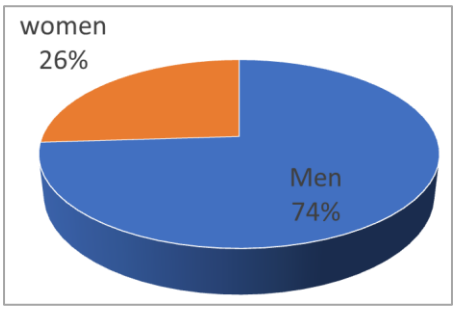

Figure 3. *Distribution of respondents by gender.*

3.1.2. Prevalence of Gastroesophageal Reflux Among Students

The health assessment in the study population revealed a prevalence of 29.80% of gastroesophageal reflux in the population.

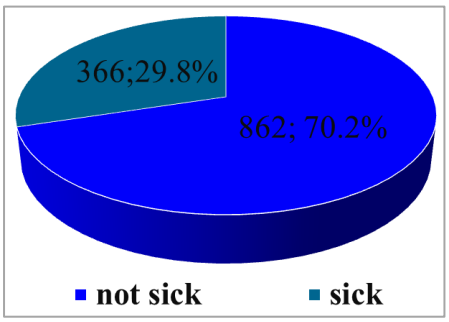

Figure 4. *Distribution of respondents according to their state of health.*

3.1.3. Eating Habits and Occurrence of Gastroesophageal Reflux

The analysis of the relationship between eating habits and the occurrence of gastroesophageal reflux in the study population revealed the involvement of certain categories of food such as carbonated drinks, spicy foods, non-alcoholic exciting products and flavor enhancer products as risk factors. No relationship between the level of consumption of the following foods and the occurrence of gastroesophageal reflux has been established. These include red meat, animal fat, fish or white meat, vegetable fat, starchy foods, fruits and vegetables, cereals, alcoholic products, and water.

Table 1. The relationship between the level of soft drink consumption and the occurrence of gastroesophageal reflux.

Gastroesophageal reflux.	Consumption frequency N (%)				Total	P value
	Low	Medium	High	Very high		
No sick	445 (70%)	116 (73.4%)	264 (71.4%)	37 (57.8%)	862 (70.2%)	P = 0.027
Sick	191 (30%)	42 (26.6%)	106 (28.6%)	27 (42.2%)	366 (29.8%)	
TOTAL	636 (100%)	158 (100%)	370 (100%)	64 (100%)	1228 (100%)	

N=1228

Table 2. The relationship between the level of consumption of flavor enhancer products and the occurrence of gastroesophageal reflux.

Gastroesophageal reflux.	Consumption frequency N (%)				Total	P value
	Low	Medium	High	Very high		
No sick	155 (74.9%)	0 (0.0%)	172 (71.7%)	535 (68.6%)	862 (70.2%)	P =0.041
Sick	52 (25.1%)	1 (100%)	68_b (28.3%)	245 (31.4%)	366 (29.8%)	
TOTAL	207 (100%)	1 (100%)	240 (100%)	780 (100%)	1228 (100%)	

N = 1228

Table 3. The relationship between the level of consumption of spicy foods and the occurrence of gastroesophageal reflux.

Gastroesophageal reflux	Consumption frequency N (%)				Total	P value
	Low	Medium	High	Very high		
No sick	110 (78.6%)	48 (63.2%)	225 (70.3%)	479 (69.2%)	862 (70.2%)	P =0.044
Sick	30 (21.4%)	28 (36.8%)	95 (29.7%)	213 (30.8%)	366 (29.8%)	
TOTAL	140 (100%)	76 (100%)	320 (100%)	692 (100%)	1228 (100%)	

N = 1228

Table 4. The relationship between the level of consumption of non-alcoholic exciting products and the occurrence of gastroesophageal reflux.

Gastroesophageal reflux	Consumption frequency N (%)				Total	P value
	Low	Medium	High	Very high		
No sick	394_a (67.6%)	118 (68.6%)	169 (74.8%)	181_c (73.3%)	862 (70.2%)	P = 0,018
Sick	189 (32.4%)	54 (31.4%)	57 (25.2%)	66 (26.7%)	366 (29.8%)	
TOTAL	583 (100%)	172 (100%)	226 (100%)	247 (100%)	1228 (100%)	

N = 1228

3.2. Discussion

During this study the predominant ethnic group was that of the Koua Akan with 51% of respondents. This could be explained by the geographical location of the Félix Houphouët Boigny University of Abidjan, which is more accessible to this ethnic group, especially because the biosciences specialty is found in other universities in the country located in the North and the center-West. These results are comparable to those of Amoikon *et al* in 2016 [1].

The study population was young with an average age of 22.5 years and dominated by men with a sex ratio of 2.84 in favor of men. This could be explained by the fact that in Ivory Coast the level of education of young boys is higher than that of young girls [8].

According to our previous work, [10], the diet of students is unbalanced, unstructured, little varied and poorly hydrated with a predominance of foods low in fiber. The analysis between the occurrence of the pathology and the level of food consumption was carried out and revealed its relationship with certain eating behaviors such as the high consumption of carbonated drinks, spicy foods, non-alcoholic exciting products and enhancer products. of taste.

Concerning soft drinks, they are artificial compounds, very little nutritious, containing a large quantity of carbon dioxide and caffeine [6, 16, 4]. At high consumption, they exert strong pressure on the cardia (upper end of the stomach) which can lead in the long term to low tone and permanent opening of the gastroesophageal sphincter [9].

At the level of flavor enhancer products, how could we explain the relationship?

These products (Cube Maggi, potash) are food compositions generally based on sodium chloride (salt), maltodextrin, glutamate, guanylate, inosinate or yeast extract, oil, and flavors, salt constituting the majority ingredient [13, 5]. According to a study carried out in Mali by Traoré (2008) [15], high salt consumption was involved in the occurrence of the disease. In fact, 77% of patients with gastroesophageal reflux disease frequently consumed very salty foods.

This study also revealed a risk linked to frequent consumption of spicy foods and non-alcoholic exciting products. In fact, spices and non-alcoholic exciting products inhibit the closure of the cardia [4], allowing gastric contents to rise towards the esophagus and then into the oral cavity and the upper respiratory tract, often with serious consequences such as sinusitis, esophagitis, dental caries, cancers of the upper end of the stomach and the upper aero-digestive tract [9, 15]. On the other hand, certain foods such as fish, vegetable fat, starchy foods, cereals, alcoholic products, vegetables, water and fruits have not been identified, either because of their low aggressiveness for the digestive tract or because of their low level of consumption in the population (alcohol).

4. Conclusion

When the eating habits are not rationalized, they weak the body and expose it to often chronic and serious illnesses. This study revealed that the high consumption of carbonated drinks, spicy foods, non-alcoholic exciting products and taste enhancers are risk factors in the occurrence of gastroesophageal reflux disease in the student's population of Felix Houphouet Boigny University. In view of these results, it would be wise to develop food awareness activities on the various campuses of the country in order to improve food security and the health status of students.

Abbreviations

CBG	Chemistry Biology Geology
INS	National Institute of Public Health

Author Contributions

Anon Franck-Donald N'Guessan: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft

Francis Béranger Angelo Aka: Conceptualization, Formal Analysis, Investigation, Resources, Writing – original draft

Kouamé Hermann Yeboue: Conceptualization, Data curation, Formal Analysis, Resources

Purifine Sassor Odile Aké-Tano: Formal Analysis, Methodology, Project administration, Supervision, Writing – original draft

Ahoua Yapi: Conceptualization, Data curation, Investigation, Methodology, Supervision

Conflicts of Interest

The authors declare no conflicts of interest.

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