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RESEARCH ARTICLE

CARBOHYDRATE CONSUMPTION PROFILE AND INSULIN RESISTANCE IN ADULTS OF BOTH THE GENES

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ABSTRACT

This study is a fraction of a project titled Systemic Evaluation of Chronic Diseases in the population of southwestern Bahia and aims to evaluate the profile of carbohydrate consumption and insulin resistance in adults of both genders. This is a descriptive, cross-sectional and quantitative approach, carried out in the city of Vitória da Conquista, Bahia, Brazil. The sample consisted of 81 individuals, of whom 23 were males and 58 were females. To obtain the data, we used socioeconomic questionnaires and eating habits as well as biochemical tests to measure the individuals' glucose. The results obtained through the Pearson Chi-square test showed that carbohydrate consumption is not related to glucose alteration. With the modernization of society, the world population began to acquire new eating habits, such as consumption of foods rich in calories and to spend little energy in daily activities, so, as a result of this lifestyle, the prevalence of chronic diseases in the population grew. The present study is a fraction of a project titled Systemic Assessment of Chronic Diseases in the population of southwestern Bahia and aimed to evaluate the carbohydrate consumption profile and insulin resistance in adults of both genders. After evaluations of the questionnaires and biochemical tests, it was evidenced that in the population with a mean age of 51.5 years, with a standard deviation of 3,898, it is not possible to positively associate carbohydrate consumption and increase in blood glucose levels.

INTRODUCTION

With the modernization of society, the world population began to acquire new habits of life as changes in the dietary pattern, by increasing the intake of foods rich in calories, and to spend little energy in the daily activities, as a result of this the predominance of chronic diseases in the population grew (Barroso *et al.*, 2018). The increase in the intake of fatty acids in Brazil, caused by the great consumption of margarines, appears to be an even greater risk factor than the consumption of saturated fats for the development of cardiovascular diseases (Molz, 2015). The biases of this nutritional change from urbanization and industrialization in this century point to a more westernized diet, with special emphasis on the growth of energy density, higher consumption of meat, milk and high fat derivatives, and a reduction in the consumption of fruits, cereals, vegetables and vegetables, which, together with little physical activity, characterize the modern Western lifestyle (Molz, 2015).

In addition, research indicates a higher consumption of simple carbohydrates, which is directly linked to the alteration of glucose metabolism, indicating the growth of fasting glycemia (Corrêa, 2017). Thus, several authors began to observe the glycemic load (CG), which indicated a high index of quality and quantity of carbohydrates in foods, due to the glycemic index and the total carbohydrate content in foods (Bahia da, 1996). Such information has more practical use, since it can show the glycemic response that a given food can cause when applied in the calculations of the diets (Barroso *et al.*, 2018). Also known as glycines and sugars, simple carbohydrates have as main function to generate energy for the body (Guariguata, 2013). When they are broken down in the body, they provide glucose into the bloodstream, which is converted into great caloric value. Thus, exaggerated consumption of carbohydrates can cause the individual to develop type 2 diabetes, currently considered as a major cause of morbidity and mortality (Arrelias *et al.*, 2018). Studies indicate that approximately 400 million people live with DM (8.3%), and this number could

reach 592 million in 2035. As regards the mortality rate, it is estimated that more than 5 million people aged 20 and 79 years died due to diabetes (Dias *et al.*, 2018; Gonçalves *et al.*, 2018). By 2040, DM can rise from the ninth to the seventh most significant cause of death worldwide. It is also believed that the number of diabetic people who do not know they have the disease can reach half the global population (Nascimento, 2012). The American Society of Diabetes indicates that the maximum value considered normal for fasting glycemia is reduced from 110 mg / dL to 99 mg / dL, which increases the category of pre-diabetes or fasting blood glucose to results between 100 mg / dL and 125 mg / dL (Guimarães, 2019). In these cases, the oral glucose tolerance test should be performed with fasting and two hours after the overload but using the previous classification and interpretation parameters (Beagley, 2013). The achievement and continuity of appropriate metabolism, with evolution of insulin sensitivity, minimization of plasma glucose levels, loss of waist circumference, LDL-C and triglyceride levels, besides the expansion of HDL-C and prevention of late the indispensable nutritional treatment in Diabetes Mellitus (DM) (Salci *et al.*, 2017). There are few national publications related to the profile of food consumption, in large databases and research, despite important advances in this area. Research and studies correlated to the theme and its consequences are important, since they allow to evaluate this consumption and the possible factors related to nutritional nonconformities, serving as the basis for planning more targeted measures. Thus the present study aimed evaluate carbohydrate consumption profile and insulin resistance in adults of both sexes. In addition, it is expected that the results found may serve as a basis for studies *posteriori*.

MATERIALS AND METHODS

This is a descriptive, cross-sectional and quantitative approach (Vieira, 2017), carried out in the city of Vitória da Conquista, Bahia, Brazil (Latitude: 14 ° 51 '58 S. Longitude: 40 ° 50' 22 W; 923m), located 518,8 km from the capital. The study is part of a project titled Systemic Evaluation of Chronic Diseases in the population of southwestern Bahia and aims to evaluate the carbohydrate consumption profile and insulin resistance in adults of both genders. It should be noted that the age group reported was chosen due to hormonal constancy in the individuals belonging to it and that the sample was composed of 81 individuals. To obtain the results, the participants were asked to answer the following questionnaires: a) Socioeconomic Questionnaire: with the objective of evaluating the socioeconomic profile of individuals that are associated with the onset of diseases, on several occasions. Sociodemographic differences (age, schooling, marital status, family arrangement, employment situation, family income, contribution in family income) were obtained through a self-administered questionnaire, following the standards of the Brazilian Institute of Geography and Statistics (IBGE) (David *et al.*, 2019). b) Food Habits Questionnaire (FFA): because it is one of the most used instruments to evaluate dietary information. Respecting the purposes of the mentioned study, a list of foods withdrawn from the Brazilian Table of Food Composition (TACO) was chosen. These tables are indispensable both in the preparation of the questionnaire and in obtaining the results, since it presents the amount of minerals, vitamins, total calories and fibers (Barroso, 2018). The elements that constitute the FFA are usually divided into food groups, in the research described, were divided as

follows: cereals, tubers, roots and breads; vegetables; fruits; milk and milk products; Meat and eggs; oilseeds; oil and fat; sweets and sugars; drinks; and several (David, 2019). In addition, biochemical tests were carried out to measure the glucose in individuals. It is evidenced that as a criterion for blood collection, the patient had to be fasted for 8 to 12 hours. It should be pointed out that the samples were collected by properly trained and trained people, respecting all safety guidelines for collecting, handling and disposing of biological material (David, 2019). After collection of the blood sample, the tubes with the biological materials were stored in a rigid, waterproof PVC container containing a recyclable ice pack in order to maintain the temperature of the samples until they were transported in a private car of the laboratory responsible for the analysis. Glucose was analyzed by a plasma or serum sample, made by the enzymatic method in the AU 680 equipment (David, 2019). After obtaining the data, these were tabulated and processed by the Excel program and later imported into the SPSS scientific software in version 20.0. The analysis was performed considering a level of significance of $p < 0.05$, in which the Chi-square test was applied. The project was approved by the Ethics and Research Committee (CEP) of Esau Matos Hospital. The participants were clarified about the methods to be used and signed the Free and Informed Consent Term (TCLE), according to Resolution 466/2012.

RESULTS AND DISCUSSION

The sample consisted of 81 individuals, 23 belonging to the male gender and 58 to the female. By means of the analysis of the results, it can be affirmed that of the 81 individuals surveyed, with a mean age of 51.5 years, 17 presented altered carbohydrate and glucose consumption, a valid percentage of 21.0%. In addition, 61 subjects had altered carbohydrate consumption and normal glucose, a valid percentage of 79.0. It was found that 78 individuals had altered carbohydrate consumption, a percentage of 96.3%. Table 1 shows that 96.3% of subjects had altered carbohydrate intake. Research indicates that excessive intake of carbohydrate source foods can lead to weight gain and increased blood triglyceride levels and may also increase the risk of type 2 diabetes (Arrelias, 2018).

Although it is recommended to consume a diet rich in vegetables and other foods with a preventive action against diabetes, the greater adherence to the traditional dietary pattern of the individuals studied may have been influenced by their socioeconomic condition, since the food that contains excess carbohydrates and fats is cheaper when compared to foods called the healthy eating pattern (Stuart, 2018). Food standards are defined as a set or groups of foods consumed by a given population (Bonaccio *et al.*, 2016). The so-called traditional pattern was characterized by higher consumption of rice, chicken and beans, along with other foods such as meat and margarine (França-Santos *et al.*, 2017). Nevertheless, according to the data presented in Table 1, even with high carbohydrate intake, glucose rates did not change. What points to a degree of complexity of the consequences of insulin resistance, a state in which physiological concentrations of this hormone are not enough to promote the uptake of glucose by the cells (Moura, 2007). Shows that there was no positive association between high carbohydrate intake and glucose levels (19). We may not have observed this association because the metabolism of the individuals may be balanced with a greater production of insulin, since the body of an

Table 1. Description and characterization of the sample

Variables	n	%	Total (n)	
Gender	Male	23	28.4	81
	Female	58	71.6	
Glucose	Altered	17	21.0	81
	Normal	64	79.0	
Carbohydrate consumption	Altered	78	96.3	81
	Normal	3	3.7	

Source: Own Research.

Table 2. Analysis of the results through cross-tabulation of the data regarding the number of individuals surveyed who have altered and / or normal Carbohydrate and Glucose Consumption

Carbohydrate consumption		Glucose		p-value
		Altered	Normal	
Altered	Altered	17	61	0,488
	Normal	0	3	
Total		17	64	

Source: Own Research

individual who continuously ingests foods with a high glycemic index may begin to acquire insulin resistance, since the produce a greater amount of insulin each time this intake occurs (Feinman *et al.*, 2015). What makes the level and speed of glycemia rise depends on the quantity and quality of the food. The simpler the carbohydrate consumed, the faster the glycemic change will occur (Sleiman, 2015). Remember that the body does not digest and absorbs all carbohydrates at the same speed. In addition, the glycemic index is independent whether the carbohydrate is simple or complex (Zelber-Sagi, 2017). By prolonging the carbohydrate absorption time, it is likely that it will be possible to interfere in the etiology of chronic diseases (Khazrai, 2013).

The *American Diabetes Association* (ADA) warns of the importance of good glycemic control to prevent chronic complications of diabetes and recommends that changes in the diet composition of patients with DM are relevant tactics for achieving adequate metabolic control (Barroso, 2018). An available strategy is the carbohydrate counting method that allows patients to have a more flexible diet alternative (Pinheiro, 2014). Existing research indicates that there are dietary patterns that are associated with better overall health conditions and are rich in vegetables, fruits, whole grains, seafood, vegetables and nuts, contain moderate amounts of lactose-rich red and processed meat, refined grains and sugar (Molz, 2015). Thus, there seems to be no ideal dietary pattern that will benefit all people with diabetes (Lais, 2016). Current dietary recommendations indicate that regardless of health status or age of the individual, stimulating the consumption of vegetables, vegetables, whole and unrefined foods and limiting the intake of tubers, refined carbohydrates and simple sugars, is a preponderant factor to avoid development of various chronic diseases (Gomes, 2015).

Final Considerations

With the modernization of society, the world population began to acquire new eating habits, such as consumption of foods rich in calories and to spend little energy in daily activities, so, as a result of this lifestyle, the prevalence of chronic diseases in the population grew. The present study is a fraction of a project titled Systemic Assessment of Chronic Diseases in the population of southwestern Bahia and aimed to evaluate the carbohydrate consumption profile and insulin resistance in adults of both genders.

After evaluations of the questionnaires and biochemical tests, it was evidenced that in the population with a mean age of 51.5 years, with a standard deviation of 3,898, it is not possible to positively associate carbohydrate consumption and increase in blood glucose levels.

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