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Fitness of intake and anthropometric after nutritional education of patients with type 2 diabetes mellitus

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Abstract

Introduction: Some authors argue that nutrition education is the key point for control of blood glucose levels and prevention of secondary complications in type 2 diabetes mellitus (DM2). The aim of this study was to analyze dietary adequacy and anthropometric measurements of type 2 diabetic patients before and after nutrition education. *Methodology*: Cross-sectional study with 32 patients with DM2 undertaking group nutrition education, whose anthropometric data and dietary intake were analyzed before and after nutrition education sessions. The number of food servings consumed was classified based on the Brazilian Food Pyramid and the pyramid for diabetics adapted from the American Diabetes Association. *Results*: The study population was composed mostly by women (90.6%). There was no improvement in any of the anthropometric indicators between the two evaluation times, and there was no improvement, after nutrition education, in the consumption of food groups that were inadequate before nutrition education took place, according to the two pyramids. Dietary adequacy, according to the Pyramid from the American Diabetes Association, was significantly worse for the group of grains and carbohydrate sources and legumes ($p = 0.09$) and for the group of fats, sweets and alcohol ($p < 0.01$). *Conclusion*: Despite the nutrition education program evaluated, there was no satisfactory result with regard to the improvement in dietary habits of the study patients, which should be reassessed and encouraged to change.

Key words: Eating Habits. Food and Nutrition Education. Diabetes Mellitus.

Introduction

Type 2 diabetes mellitus (DM2) affects 300 million people worldwide, on average, and approximately 20% of people aged between 65 and 76 years are diagnosed as diabetic.[1] In Brazil, the prevalence of diabetes reaches 7.6% of the population, and nearly half of those affected by the disease (46%) are unaware of the diagnosis.[2]

It is believed that changes in eating habits of patients with DM2, by prioritizing foods with a low glycemic index, high amount of fibers and low amounts of fats, can reduce serum glucose and insulin in the postprandial period.[2] Some authors argue that nutrition education is the key point for the control of blood glucose levels and prevention of secondary complications in type 2 diabetes, since metabolic control cannot be maintained without adequate food.[3] In their study, Wing et al.[4] have provided evidence of effective low-cost lifestyle intervention programs in reducing the incidence of type 2 diabetes mellitus.

The need to develop educational activities or educational health practices, aimed at diabetic patients and their families, is related to the prevention of complications through self-management of the disease, which allows the patient to have a better life despite this problem.[5]

Anthropometric measures are important to assess nutritional status and progress of diabetic individuals, as they help to monitor changes that may occur and prescribe the most appropriate type of dietary treatment. Thus, both measures reflect the effectiveness of the treatment and patients' adherence to it.[6,7]

In light of the above, this study aimed to analyze the adequacy of food intake according to the Brazilian Food Pyramid[8] and the pyramid adapted for diabetics of the *American Diabetes Association*[9], and check anthropometric evolution before and after nutrition education of type 2 diabetic patients, assisted by the the Nutrition Clinic of University Hospital of of Sergipe (HU), Brazil.

Method

The study was cross-sectional with data on nutritional assessment and dietary intake of patients participating in nutrition education groups of people with DM2, assisted in the Nutrition Clinic of the University Hospital of Sergipe, Brazil. The study population consisted of both male and female adults and seniors diagnosed with DM2.

It included all data regarding nutritional assessment and food intake of adult and elderly patients with type 2 diabetes mellitus collected before and after their participation in nutrition education sessions conducted by professional nutritionists in the Nutrition Clinic of HU.

Patients who did not come for a return visit after nutrition education were excluded from the sample and, therefore, their data on nutritional assessment and food consumption was not available in the nutrition protocol of the clinic.

Data collection for dietary intake

Data on food intake was collected from the protocols of the Nutrition Clinic, through 24-hour recalls (24HR) before nutritional education and at the first visit after intervention with the study patients. For the calculation of food servings, the software NutWin (2002) was used, and the number of consumed servings was determined according to the Brazilian Food Pyramid[8] and the pyramid adapted for diabetics of the *American Diabetes Association*.[9]

Anthropometric measurements

Data on weight, height and waist circumference of the sampled patients was collected from the above-mentioned protocols before nutritional education and at the first appointment after such intervention.

Nutrition education assessments

Nutrition education as evaluated in this study is routinely performed by professional nutritionists at the Nutrition Clinic in assistance to diabetic patients as part of nutritional treatment. Nutrition education sessions consist of explanatory lessons about food from a quantitative point of view according to the Brazilian Food Pyramid[8] as well as healthy eating workshops.

It should be noted that the pyramid proposed by the *American Diabetes Association*[9] was used by the authors to assess the adequacy of food intake by the sampled patients through a specific food intake parameter for people with DM2; however, it was not used as a tool in the nutrition education sessions held in the Nutrition Clinic.

Statistical analyses

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) version 18.0. A descriptive analysis of the study variables was performed by calculating means, standard deviations and medians, when most appropriate. For comparison between variables, paired t-tests were used for independent parametric data, and the Wilcoxon test, for nonparametric data.

For all statistical analyses, a level of statistical significance of 5% was adopted, i.e., $p \leq 0.05$. The project was approved by the Research Ethics Committee of the University Hospital, Federal University of Sergipe (HU/UFS).

Results

Thirty-two patients with DM2, participants in the nutrition education project in an outpatient nutrition clinic, were evaluated. The study population consisted mostly of women (90.6%). Patients' ages in the sample ranged from 22 to 85 years, with a mean age of 56.7 ± 16.2 years for men and 53.3 ± 17.8 years for women. The most common comorbidities were hypertension (65.6%), dyslipidemia (43.8%), cardiovascular disease (15.6%) and cancer (6.3%).

In the analysis of anthropometric profile, it was observed that the sample had a mean BMI compatible with the nutritional diagnosis of grade I obesity and there was no significant improvement in any of the anthropometric indicators when both evaluations were performed (Table 1).

Table 1. Analysis of anthropometric profile of type 2 *diabetes mellitus* patients before and after nutrition education. Aracaju-SE, 2014.

Anthropometric Indicators	Before Nutrition Education X + SD*	After Nutrition Education X + SD*	p**
Weight (kg)	78.9 ± 21.9	78.8 ± 22.4	0.76
BMI (kg/m²)	31.7 ± 7.4	31.6 ± 7.6	0.56
Abdominal circumference (cm)	104.8 ± 16.7	104.6 ± 16.6	0.70

*X + SD = Mean + Standard deviation.

** Paired T-test ($p \leq 0.05$).

According to the food intake assessment based on the Brazilian Food Pyramid[8], there was no improvement in the intake of food groups after nutrition education compared with the inadequate intake prior to nutrition education (Table 2).

Table 2. Analysis of intake of food groups before and after nutrition education based on the Brazilian Food Pyramid. Aracaju-SE, 2014.

Food groups	Reference (servings)*	Before Nutrition Education (servings) X + SD**	After Nutrition Education (servings) X + SD**	p***
Bread and cereals	5 - 9	3.7 ± 2.0	3.0 ± 1.5	0.15
Fruit	3 - 5	2.4 ± 2.8	2.8 ± 3.5	0.69
Vegetables	4 - 5	1.8 ± 2.5	1.4 ± 1.5	0.97
Legumes	1	0.9 ± 1.0	1.1 ± 1.2	0.08
Meat and eggs	1 - 2	1.7 ± 1.7	1.6 ± 1.1	0.81
Milk and dary products	3	0.6 ± 0.8	1.2 ± 1.7	0.19
Sugars and sweets	1 - 2	0.2 ± 0.6	0.3 ± 0.8	0.57
Oils and fats	1 - 2	0.6 ± 1.2	0.3 ± 0.7	0.12

* Brazilian Food Pyramid (Philippi et al., 1999).

** X + SD = Mean + Standard Deviation.

*** Wilcoxon test ($p \leq 0.05$).

The analysis of food intake based on the Pyramid of the *American Diabetes Association*[9] also showed no improvement, after nutrition education, in the intake of food groups that were inadequate prior to nutrition education (Table 3).

Tabela 3. Analysis of consumption of food groups before and after nutrition education according to the American Diabetes Association Pyramid (2008). Aracaju- SE, 2014.

Food Groups	Reference (servings)*	Before Nutrition Education (servings) X + SD**	After Nutrition Education (servings) X + SD**	p***
Grains and sources of carbohydrate and legumes	6 - 11	4.4 ± 2.4	4.0 ± 2.2	0.31
Frut	2 - 4	2.4 ± 2.8	2.8 ± 3.5	0.69
Vegetables	3 - 5	1.8 ± 2.5	1.4 ± 1.5	0.97
Meats and subistitutes	4 - 6	1.7 ± 1.7	1.6 ± 1.1	0.08
Milk	2 - 3	0.6 ± 0.8	1.2 ± 1.7	0.19
Fats, sweets and alcohol	1 - 2	0.9 ± 1.2	0.5 ± 0.9	0.26

* Pyramid of the *American Diabetes Association* (2008).

** X + SD = Mean + Standard Deviation.

*** Wilcoxon test ($p \leq 0.05$).

An assessment was made of the percentage of study participants who, after nutrition education, have adapted the intake of food groups to the number of servings recommended by the Brazilian Food Guide Pyramid (Table 4). There was a significant increase in the number of participants who improved intake of legumes ($p < 0.01$), and a significant reduction in the number of participants with adequate intake of the group of bread and cereals ($p = 0.03$).

Tabela 4. Adequacy of intake of food groups before and after nutrition education, according to the Brazilian Food Pyramid. Aracaju-SE, 2014.

Food Groups	Before Education nutrition	After Education nutrition	
	Adequate Intake (%)	Adequate Intake (%)	p*
Bread and cereals	28,1	9,4	0,03
Fruit	31,3	25,0	0,53
Vegetables	15,6	9,4	0,16
Legumes	6,3	28,1	< 0,01
Meats and eggs	47,0	37,5	0,40
Milk and dary products	0,0	0,0	1,00
Sugars and sweets	3,1	6,3	0,56
Oils and fats	9,4	3,1	0,16

* Wilcoxon test ($p \leq 0.05$).

According to the Pyramid of the *American Diabetes Association*9, the percentage of study participants who, after nutrition education, have adapted the intake of food groups to the number of servings recommended by ADA (Table 5) worsened significantly for the group of grains and sources of carbohydrate and legumes ($p = 0.09$) and for the group of fats, sweets and alcohol ($p < 0.01$).

Tabela 5. Adequacy of intake of food groups before and after nutrition education according to the Pyramid of the American Diabetes Association (2008). Aracaju-SE, 2014.

Food Groups	Before Education nutrition	After Education nutrition	
	Adequate Intake (%)	Adequate Intake (%)	p*
Grains and sources of carbohydrate and legumes	34,4	18,8	0,09
Fruit	28,1	37,5	0,37
Vegetables	18,8	15,6	0,56
Meats and substitutes	6,3	3,1	0,56
Milk	9,4	3,1	0,32
Fats, sweets and alcohol	90,6	15,6	< 0,01

* Wilcoxon test ($p \leq 0.05$).

Although the patients have increased the adequate intake of legumes according to the Brazilian Food Pyramid,[8] the fact that legumes are included in the group of grains and sources of carbohydrates in the Pyramid of the *American Diabetes Association*[9] caused its intake to decrease in the adequacy analysis, according to the latter pyramid. Intake of bread and cereals by the Brazilian Food Pyramid,[8] which is equivalent to group of grains and legumes and sources of carbohydrates in the pyramid of the *American Diabetes Association*,[9] also showed significant reduction in intake, as shown above.

Figure 1 shows the graphical representation of the Brazilian Food Pyramid,[8] with deviations of food intake that occurred at the end of nutrition education.

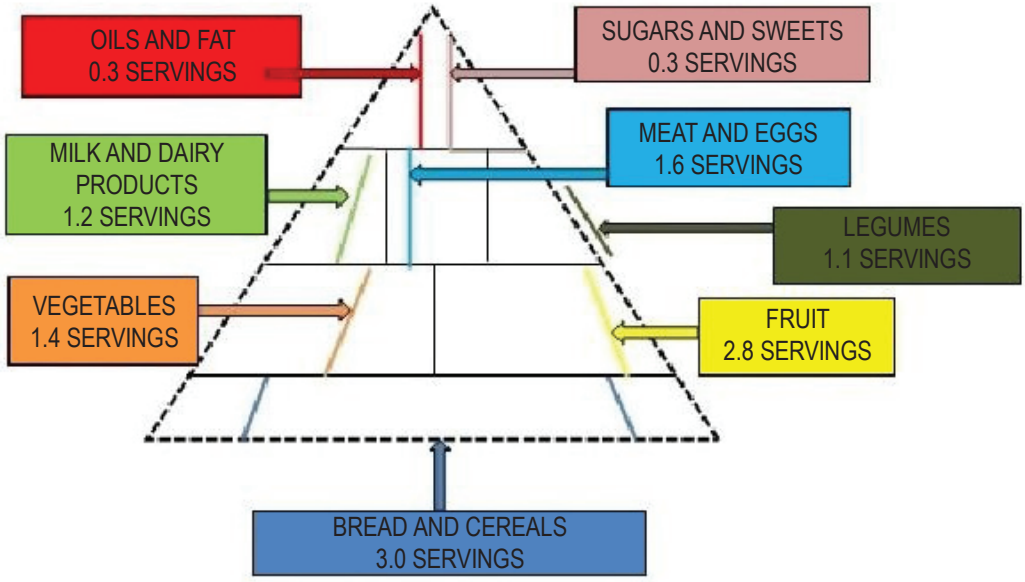

Figure 1. Brazilian Food Pyramid with deviations in food intake after nutrition education.

Discussion

The prevalence of DM is increasing worldwide, and it is currently an epidemic mostly caused by population aging. However, poor diet, physical inactivity and increasing obesity also account for the wordlwide expansion of the disease.[10]

The higher prevalence of women in this study was also reported by Lima- Costa et al.,[11] when they assessed the validity of self-reported diabetes and its determinants in 1,492 individuals in the town of Bambuí, Minas Gerais, in 2007. Their study had four times more women than men. Goldenberg et al.,[12] when assessing the prevalence of DM, the difference and also the equality between sexes in 2,007 individuals, found a higher number of women with the disease (56.9%).

This situation can be attributed to the fact that women seem to seek medical care more often and earlier then men.[13] This idea is also reaffirmed by Pereira et al.,[14] in their study with both male and female diabetic adults.

The most frequent associated diseases were hypertension, dyslipidemia and cardiovascular disease. According to Scheffel et al.,[15] patients with DM2 are two to four times more likely to die of a heart disease compared with non-diabetics, and four times more likely to develop peripheral vascular disease (PVD) and cerebrovascular accident (CVA).

Analysis of the anthropometric profile of the study patients showed that most of them were classified as obese and that there was no significant improvement between the two moments of evaluation in any of the anthropometric indicators being studied. A cross-sectional study16 conducted in Ribeirão Preto (SP) found high prevalence (91%) of overweight and obesity among patients with type 2 diabetes. It is estimated that 80% of diabetic patients are obese or overweight.[17]

The findings of Silveira[18] showed increased blood glucose parallel to the rise of the BMI value, related to increased insulin resistance. The benefits of weight loss after lifestyle interventions have been demonstrated in several studies, with decreased glycated hemoglobin, triglycerides, insulin resistance and inflammatory markers, diastolic pressure and waist circumference and increased levels of HDL.[19-21]

The population of the present study did not show adequate intake of servings of the food groups according to the Brazilian Food Pyramid[8] and the Pyramid of the *American Diabetes Association*9 in any of the evaluation moments. However, after nutrition education, there was a significant increase in the percentage of patients who improved intake of the legumes group in accordance with the Brazilian Food Pyramid.[8]

Some studies indicate that it is difficult to obtain satisfactory results in diabetic patients, for different reasons such as low weight reduction or even weight gain, and increase in waist circumference and in glycated hemoglobin. Such situations highlight the major challenge of changing eating habits for weight loss and good metabolic control.[22]

A meta-analysis[23] of 37 papers on the theme "health and illness versus diabetes", in various formats, reported the daily difficulties experienced by DM patients and their families in controlling the disease. Such difficulties can directly influence the adherence of patients to the prescribed treatment of DM. Thus, behavioral and emotional factors presented by patients should be considered while planning health promotion initiatives for comprehensive care to this population.

In their study, Zanettiet et al.[24] assessed the implementation of the Staged Diabetes Management (SDM) protocol at the Nursing Education Center for Adults and the Elderly (CEEAI) at the College of Nursing of in Ribeirão Preto (EERP-USP), Brazil. The study was conducted over a year, and the authors identified that there is a major challenge to be faced by the multidisciplinary team who monitor the patients both in terms of training in diabetes education, and also in the realization that greater awareness does not necessarily result in a change in behavior.

However, despite the difficulties, education programs for diabetic patients should be encouraged as they help optimize metabolic control, prevention and control of complications as well as improve quality of life in terms of cost- effectiveness.[22]

Because nutritional advice is important to help individuals to improve their eating habits and gain metabolic control of the disease,[25] such advice must be provided following the diagnosis of DM. Dietary advice should be given by a qualified professional, previously trained to develop education programs and nutritional activities.[11,26]

Finally, a limitation of the study, which should be addressed, is patients' underreporting of food intake in dietary assessment. Scagliusi & Lancha[27] explained that underreporting is a quite complex element, involving moral, emotional, social, physical and cognitive factors that significantly compromise the deductions made from food intake assessments. According to the authors,[27] women underreport their food intake more often than men. This is partly because they suffer more social pressure about their body image, which leads them to report food intake that is considered to be healthy, rather than their real intake.

Conclusion

Although the assessed nutrition education program has not shown satisfactory results as regards the improvement in the eating habits of the study patients, it should be re-evaluated and encouraged, because nutrition education is crucial in maintaining adequate food intake and, consequently, metabolic control and prevention of complications in DM2 as well.

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