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Food and nutrition education improves knowledge about the treatment of type 2 diabetes mellitus: a qualitative study

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Abstract

Food and nutrition education is a determining factor for the prevention and control of chronic non-communicable diseases such as type 2 diabetes mellitus. Thus, the aim of this study was to evaluate the effect of food and nutrition education actions on the perception and knowledge about the disease, its treatment, and the difficulties faced by people with type 2 diabetes mellitus. Longitudinal quantitative-qualitative study, carried out with 10 adults with type 2 diabetes mellitus, assisted by the Academic Diabetes Nutrition League of the Federal University of Sergipe. Individuals were invited to participate of the food and nutrition education activities carried out weekly for six weeks. Participants were interviewed before (T0) and after (T1) the activities in order to investigate the knowledge obtained. A semi-structured interview with two questions was used to obtain their responses, the first was related to the perception about the disease and treatment, and the second concerned the difficulties faced in the search for healthy eating. The analysis was performed using the Content Analysis technique. For the first question, responses were categorized into emotional, physiological meanings and treatment, while for the second, external, internal aspects and those without difficulties emerged. After the activities, the responses were positive about the adoption of healthy eating in the treatment. The intervention allowed individuals to gain more knowledge of the disease and aspects related to treatment.

Palavras-chave: Diabetes Mellitus. Food and Nutrition Education. Health Education. Healthy Eating.

INTRODUCTION

Type 2 diabetes mellitus is a metabolic disease with multifactorial causes, widely studied and with an increasing prevalence worldwide. Data from the International Diabetes Federation show that Brazil is the fifth country with the most cases of diabetes in the world, with 16.8 million people aged between 20 and 79 years old, and it is expected that in 2045 there will be an increase to 26 million people with diabetes in Brazil[1]. Poor glycemic control can lead individuals with diabetes into macro and microvascular complications, which reduce the quality of life of these individuals, in addition to increasing government spending on treatment[1, 2].

Studies carried out in various regions of Brazil and the world show that knowledge about self-

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care in diabetes is essential for individuals with this disease to obtain satisfactory glycemic control[3,4]. This knowledge permeates aspects related to treatment, especially nutrition. A systematic review followed by a meta-analysis[5] showed that food and nutrition education actions have been effective in increasing the knowledge of this population.

It is noteworthy that food and nutrition education is a field of knowledge requiring a continuous and permanent, transdisciplinary, intersectoral and multidisciplinary practice, which aims to promote the autonomous and voluntary practice of healthy eating habits, as highlighted by the Framework of Reference for food and nutrition education[6]. It is important to highlight that the effectiveness of food and nutrition education interventions depends on factors related to the method itself, such as the choice of content to be worked and the duration of these interventions, as well as factors inherent to individuals such as age and gender[7,8]. Thus, actions aimed at this type of education reflect on the individual's health, mainly because they promote changes in lifestyle[9].

Moreover, Muller and Fietz[10] point out that food and nutrition education is also a determining factor for the prevention and control of chronic non-communicable diseases, and one of its priorities is promoting increased knowledge about food and its role in diabetes. It is also noted that such actions contribute to greater autonomy of individuals, as they manage to improve their perception of themselves, understanding more of the signals that their body transmits[10].

Given the above, the knowledge generated through food and nutrition education programs is extremely important in public health[6]. This knowledge allows the individual to have better control of the disease, and the methodology, the way the program is developed, can generate exchanges of experiences and knowledge among participants, which, in turn, can help to improve physical, biochemical, and mental aspects[11]. Furthermore, by knowing the real needs and difficulties in coping with diabetes, institutions that work with this public can take measures so that disease control and health promotion are more effective[12].

Thus, the aim of this study was to evaluate the effect of food and nutrition education actions on the perception and knowledge about the disease, its treatment, and the difficulties faced by individuals with type 2 diabetes mellitus.

METHODS

Participants

Adult individuals with type 2 diabetes mellitus, attended to by the Academic Diabetes Nutrition League (ADNL) of the Federal University of Sergipe (FUS) were evaluated. Participants were selected through the analysis of medical records and the invitation was given through telephone contact. The inclusion criteria were those aged between 20 and 59 years old and having a diagnosis of type 2 diabetes mellitus. Individuals diagnosed with other types of diabetes (type 1 or gestational diabetes mellitus), aged outside the aforementioned age group, or individuals who had any identifiable cognitive deficit that interfered with the understanding of the questions or the answers expressed were excluded from

the sample. Of the total number of patients assisted by ADNL (n = 65), 24 met the inclusion and exclusion criteria, of which 12 agreed to participate in the study.

Study design

This is a quantitative, qualitative longitudinal study. The study lasted eight weeks. In the initial stage (T0), carried out in the first week, a semi-structured individual interview was applied. As a result, six food and nutrition education activities were promoted weekly. After the activities (T1), in the eighth week, the interview was applied again to verify the influence of the intervention on the participants' perception and knowledge about the disease and its treatment, and the difficulties faced in the search for healthy eating. Anthropometric and food intake data were also collected at the beginning and at the end of the study with the secondary objective of characterizing the sample in the two stages.

Execution Procedures

Individual semi-structured interviews were carried out, with the consent to record and the use of their voice before (T0) and after (T1) the intervention period with the food and nutrition education activities. The interviews were recorded and guided through a previously prepared script, containing two guiding questions. The first question was "In your opinion, what is diabetes and what do you consider is important in its treatment?" and the second "What are the difficulties you have encountered in adopting a healthy diet?"

Data on sex, age, average family income, level of education, level of physical activity, tobacco use, alcohol consumption, time since disease diagnosis, use of medication, associated comorbidities, and diabetes symptoms were obtained at time T0.

Weight, height, and waist circumference were also measured according to the methods standardized by the Food and Nutritional Surveillance System – (FNSS)[13] and classified according to the World Health Organization – WHO (2000). The measurement and classification of the arm circumference was performed as proposed by Frisancho[14]. Food intake was assessed using the 24-hour Food Recall method (R24H) applied on three non-consecutive days, two days a week, and one day on the weekend, and the analysis was performed using the Nutwin software. All these assessments were carried out before and after the intervention with food and nutrition education activities.

Food and nutrition education actions were scheduled for six weekly meetings. The themes and methodologies presented in Table 1 were based upon the proposed methodologies for food and nutrition activities in primary care[15] and based upon the study by Araújo *et al.*[16] carried out with individuals with type 2 diabetes mellitus. most important information about each theme. Folders with the most important information on each theme were handed out at all meetings.

Analytical Procedures

The recorded interviews had a single literal transcription, with content analysis being performed, in which we sought to identify the meaning contained in the text (semantics)[18], producing inferences based on theoretical assumptions. Following the methodological procedure described by Bardin[19], initially, there was a pre-analysis of the transcripts, with floating reading and constitution of the text's corpus (answer set). The recording units were categorized a posteriori, with the analysis in percentages of frequencies.

Quantitative data were presented as mean and standard deviation [X (±SD)], and relative frequency (%). Windows Excel (2010) was used to tabulate the numerical variables. The normality test was performed and noting that all

samples were normal, then Student's t test was performed for dependent samples and $p<0.05$ was considered significant. The SPSS Software (Version 26.0) was used to perform the statistical analyses.

Ethical aspects

All participants were informed about the execution procedures, as well as the risks and benefits involved in this research. All participants signed the Informed Consent Form (ICF) and the Authorization for the use of their voice. This study was approved by the Ethics Committee for Research with Human Beings of the Federal University of Sergipe, under Opinion No. 2.378.361, in accordance with Resolutions No. 466/12 and No. 510/16 of the National Health Council.

RESULTS

Twelve individuals were interviewed in T0, but two did not participate in any meeting, and it was not possible to carry out a subsequent interview (T1) with them. The 10 individuals who participated in the meetings had at least 50% attendance.

As for the characterization of the sample, it was observed that the evaluated group had a good education, considering the percentage of individuals who had at least completed high school, as shown in Table 1. The practice of physical activity reported by the participants corresponded to walking or running. No individual reported being a smoker.

Figure 1 – Methodologies used in food and nutrition education actions.

Activity Title	Methodology
Healthy eating to control blood glucose	Through an expository and dialogued lecture, it was explained what diabetes mellitus is, the types of the disease, what are the possible complications when decompensated and the types of treatment, emphasizing the importance of adherence to changing eating habits and lifestyle for an adequate metabolic control. At the end, the 10 steps to healthy eating contained in the Brazilian Food Guide were shown[17].
Learning About Food Labels	Conversation circle in which it was explained, in a simplified way, what labeling is and how to interpret the information contained in it. Explanations were given concerning Diet, Light, and Zero foods and the differences between them, also addressing the types of sweeteners and the positive and/or negative aspects of the main options on the market. Imaging instruments were used, exposing the amount of sugar, salt, and oil, to demonstrate the carbohydrate, sodium, and total fat content in some processed and ultra-processed foods.
Myths and truths	A dynamic was carried out in which individuals took statements from a box and read them aloud. Then the group voted with a board whether it was myth or truth. In this way, doubts about the disease and its relationship with food could be discussed and resolved.
Physical Activity and Diabetes	Through an expository lecture, given by a physical education professional, the importance of physical activity and the benefits for individuals with diabetes was addressed. The professional performed some stretching exercises at the end to make the meeting more dynamic.
The mind and diabetes	The meeting included the participation of a psychologist who, through a psychodrama technique, showed the importance of the mind for achieving emotional balance and, consequently, better management and coexistence with diabetes.
How to eat healthily while spending little	At this meeting, a culinary workshop was held at the FUS Dietetic Technique Laboratory with the development of practical and low-cost recipes, so that the participants realized that eating healthy can be tasty and cheap. Participants were divided into groups to carry out the different preparations.

Table 1 – Sociodemographic and clinical characteristics of individuals with type 2 diabetes mellitus who participated in food and nutrition education actions (n=10), Aracaju, Sergipe, 2018.

Variables	Individuals with type 2 diabetes mellitus
Age (years)[a]	49.8 ± 5.0 [32-56]
Sex[b]	50.0%
Female	
Education[b]	
Elementary School Completed	25.0%
High School Completed	66.6%
Higher Education Completed	8.3%
Time since disease diagnosis (years)[a]	7.0 ± 3.6
Family income[b]	100%
1 to 3 Minimum Wages	
Physical activity practice[b]	41.6%
Consumption of alcoholic beverages[b]	33.3%
Presence of diseases associated with DM2[b]	
Hypertension	50.0%
Hypercholesterolemia	50.0%
Cardiovascular Diseases	25.0%

Results expressed as mean and standard deviation [X±SD] and/or minimum and maximum [min-max]a or relative frequency [%]b.

Table 2 – Anthropometric and food intake characterization of participants with type 2 diabetes mellitus before and after the intervention of food and nutrition education (n=10), Aracaju, Sergipe, 2018.

Variables	T0	T1	p-value*
Anthropometrics			
Weight (kg)	82.0 ± 15.0	81.7 ±14.5	0.392
Height (m)	1.65 ± 0.07	-	-
WC (cm)	103.4 ± 15.2	103.4 ± 15.1	1.000
AC (cm)	34.0 ± 4.2	33.5 ± 3.9	0.119
BMI (kg/m²)	30.1 ± 5.7	30.0 ± 5.5	0.369
Food intake Energy			
Kcal/dia)	1599.9 ± 677.5	1762.4 ± 577.5	0.141
Protein (%)	20.5 ± 3.6	21.9 ± 4.3	0.421
Protein (g/dia)	88.9 ± 35.9	107.4 ± 49.6	0.323
Protein (g/kg of weight/day) Carbohydrate (%)	1.1 ± 0.4	1.4 ± 0.8	0.224
Carbohydrate (g/day)	54.6 ± 7.7	53.5 ± 5.1	0.753
Lipids (%)	371.0 ± 474.0	358.4 ± 411.6	0.953
Lipids (g/day)	24.2 ± 7.1	24.7 ± 4.3	0.864
Saturated Fatty Acids (%)	45.4 ± 23.4	52.9 ± 18.9	0.207
Monounsaturated Fatty Acids (%)	7.9 ± 2.0	9.0 ± 1.6	0.462
Polyunsaturated Fatty Acids (%)	8.4 ± 2.5	7.0 ± 1.1	0.232
Fibers (g/day)	3.2 ± 1.0	3.9 ± 1.2	0.412
Fibras (g/dia)	15.2 ± 8.1	17.9 ± 5.4	0.216

Results expressed as mean and standard deviation [X ± SD]. Caption: WC - Waist Circumference; AC - Arm Circumference. * Student t-test.

Anthropometric and food intake characterization

The anthropometric and food intake variables showed no differences after the food and nutrition education activities, as shown in Table 2. When evaluating the frequency of individuals according to nutritional status, it was observed that before the activities 20% of the individuals were eutrophic, 40% were overweight, 20% had grade 1 obesity, 10% grade 2 obesity, and 10% grade 3 obesity. After the intervention the changes that occurred were that 30% were overweight, 30% had grade 1 obesity, 20% grade 2 obesity, and no individual presented grade 3 obesity, with no statistical difference between the two evaluated moments.

Qualitative Interview Analysis

The interviews lasted approximately 30 minutes, and from the reports of the interviewed individuals, three thematic categories were identified for each question, before and after the intervention, with their respective subcategories and percentages, as shown in Tables 3 and 4.

It was observed that individuals, when asked about what diabetes was and what the appropriate treatment was, their answers were subdivided into three categories: emotional, physiological, and appropriate treatment. From these three categories, subcategories emerged that changed after the intervention in terms of content and response percentage (Table 3).

Table 3 – Sociodemographic and clinical characteristics of individuals with type 2 diabetes mellitus who participated in food and nutrition education actions (n=10), Aracaju, Sergipe, 2018.

Categories	Subcategories	% Response
	T0 (n=12)	
Emotional Meaning	(1) Bad disease	33.3%
	(2) Limitation	8.3%
Physiological Significance	(1) Lack of insulin	33.3%
	(2) Malfunction of the pancreas	25.0%
	(3) High amount of blood sugar	25.0%
	(4) Hereditary Disease	8.3%
Proper treatment	(1) Food	100.0%
	(2) Medication	58.3%
	(3) Physical Activity	50.0%
	T1 (n=10)	
Emotional Meaning	(1) Possible to socialize	30.0%
Physiological Significance	(1) Pancreas malfunction	60.0%
	(2) High amount of blood sugar	60.0%
	(3) Lack of insulin	40.0%
	(4) No cure	10.0%
Proper treatment	(1) Food	100.0%
	(2) Physical Activity	80.0%
	(3) Medication	80.0%
	(4) Psychological	30.0%

* Question 1: What is diabetes and what do you consider is important in its treatment?

Emotional meaning

When asked about what diabetes was and what was its treatment, it was observed that before the intervention (T0), some individuals attributed the emotional meaning to the disease, describing it as a bad disease with limitations:

"Diabetes for me... it's a terrible thing... because I know about diabetes through my mother... and I learned to live with diabetes" (E 06, 53 years old).

"I think it's a very bad disease... and that it kills silently, I didn't know" (E 01, 50 years old).

"Diabetes, as far as I know, is the pancreas that stops producing insulin... and then... life tends to be normal... with some very big quotes... because you are limited in everything" (E 04, 45 years).

After the actions (T1), some individuals also attributed an emotional meaning, but with the positive sense, that it is possible to live with the disease:

"Diabetes for me...I thought it was a seven-headed animal...but now I see that it's easier to take care of" (E 06, 53 years old).

"... as long as you know how to control it, it's a disease that you can live with for many, many years" (E 08, 55 years old).

Physiological Significance

Some individuals had attributed to diabetes, before the actions (T0), the physiological meaning, and the most common answers were in relation to the malfunction of the pancreas, the high amount of sugar in the blood, the lack of insulin in the body, and the heredity nature of the disease:

"Diabetes... from what I've read... is the insufficient production or non-production of insulin... that there is an increase in the glycemic level in the blood... which can damage the tissues in the medium and long term" (E 07, 32 years old).

"Diabetes is an imbalance you have in the pancreas..." (E 12, 56 years old).

"Diabetes is a disease that is already hereditary... it comes from your grandparents who had it..." (E 05, 41 years old).

After the actions (T1), it was observed that the response subcategories showed few changes; however, it was possible to verify that a higher percentage of individuals recognized the physiological meaning of diabetes, compared to before (T0).

Proper Treatment

When asked about treatment in the initial interview (T0), food, medication, and physical acti-

vity were the most frequent answers:

"...and for the treatment it must be the food part... not only the pills... because the pills help... but I think that the correct diet is essential. Physical exercise is also important... I watch a lot... and I see people saying that without exercise it won't help so much" (E 03, 54 years old).

"... and for the treatment, food is the basis of everything. Because if you have a good diet... you can re-educate yourself and have a normal life... maintain a healthier life" (E 04, 45 years old).

After the activities (T1), it is possible to observe that the subcategories concerning food, medication, and physical activity were reported more frequently when compared to the initial interview (T0). That is, more individuals listed such items as essential for an adequate treatment of the disease.

In addition, it was observed that the psychological side was considered in their responses, a fact that did not occur before the actions:

"In the treatment, there are several factors... mainly the diet and your day-to-day life combined with healthy habits... both diet... and exercise and medical follow-up" (E 07, 32 years old).

"The important thing is the diet... which I learned with you on how to improve... taking the medication and physical activity" (E 08, 55 years old).

"You also have to consider the psychological side of the person... because it's one thing to know that something is wrong... but there is the issue of desire... and this can lead to a conflict... the psychologist will help the person to have a new life... to gain control to overcome that difficulty" (E 11, 53 years old).

Regarding the second question, which questioned the difficulties encountered in adopting a healthy diet, three categories emerged before (T0) the intervention (external aspects, internal aspects, and without difficulties) and two of these aspects (external aspects and without difficulties) after (T1) the food and nutrition education activities, all with their respective subcategories (Table 4).

Table 4 – Qualitative Summary of Social Representations for the second question* before and after the intervention of food and nutrition education with individuals with type 2 diabetes mellitus, Aracaju, Sergipe, 2018.

Categories	Subcategories	% of responses
T0 (n=12)		
External aspects	(1) Financial	75.0%
(environment)	(2) Lack of family support	25.0%
	(3) Routine	16.7%
Internal Aspects	(1) Addictions	25.0%
(personal)	(2) Emotional	16.7%
No difficulties	(1) No difficulties	8.3%
T1 (n=10)		
External aspects	(1) Financial	40.0%
(environment)	(2) Routine	10.0%
No difficulties	(1) No difficulties	60.0%

* Question 2: What are the difficulties encountered in adopting a healthy diet?

External aspects

When asked about the possible difficulties in adopting a healthy diet, the majority of individuals (75%) before actions (T0) reported that finance was the main difficulty, followed by routine and lack of family support:

"First it's financially... because I don't work... I don't have a steady job... I keep living on my own... when I have... I have... when I don't..." (E 01, 50 years old).

"Everything on a diet is very expensive... a stupid example... you're going to buy a can of condensed milk because you're in the mood for a candy... it's 20 reais a can... while the other is 4 reais. ... industrialized products are very expensive... the cost is something that weighs very, very, very heavily" (E 04, 45 years old).

"It costs a lot... everything for diabetics is expensive... imagine for those who don't have... everything for me... being a diabetic person is expensive" (E 05, 41 years old).

After the actions (T1), finances still appeared as an answer, but in a smaller proportion (40%):

"There are no major difficulties in having a good diet... but in my case... I take several medications for diabetes and blood pressure... and the treatment ends up being expensive... the cost of food in general could be even more cheap" (E 11, 53 years old).

Internal Aspects

Some individuals reported that personal aspects also influenced the adoption of healthy eating, such as emotional aspects and food addictions. These aspects only appeared in the initial interview (T0):

"The emotional factor also counts... when you have some anxiety... some problem... diabetes triggers... you can even try to control it... but you can't... the person has to accept that they have to re-educate" (E 04, 45 years old).

"The difficulty is the desire to eat certain things... sweets... the person works... so they sit there... they want more practical food... faster, then they eat a cookie... some bread ... a piece of cake..." (E 10, 51 years old).

"The addictions, right... for example... I still drink wine on Fridays... because I sing at night... and sometimes depending on where you sing... you get tense... then I have to drink a little more... this weekend I drank 6 to 8 doses of whiskey... that's what I find difficult to give up" (E 02, 50 years old).

No difficulties

Before the actions (T0), only one individual reported having no difficulty in adopting a healthy diet, but after the actions (T1) the percentage that reported having no difficulties increased:

"I don't think it's difficult... I've even prepared two recipes for myself this week... the bread and the rice cake... I didn't have all the vegetables... so I put what I had... and I still took it to a diabetic friend... she asked for the recipe and said it was excellent" (E 06, 53 years old).

"Today I don't have it anymore... but at the beginning I had a lot of difficulty with certain types of food... at first it's really bad... but then you adapt... and now I see that it's not that complicated to treat diabetes... keep following the rules and the person will start to feel different... because they start to regulate themselves... avoid the things they cannot consume... Today I can already eat more healthier foods... and I'm feeling much better." (E 09, 53 years old).

DISCUSSION

In the present study, the primary objective was to capture the perception of individuals before and after the dietary education intervention, aiming to analyze the content of the interviews[19] and understand whether or not there was any change in knowledge about diabetes, its treatment, and the possible challenges faced. Quantitative analysis was also performed and there was a high prevalence of overweight or obese individuals, corroborating the findings of Flor *et al.*[20] who found 49.2%, 58.3%, and 70.6% of individuals with type diabetes mellitus 2 were females who were overweight, obese, and had excess weight, respectively. Among men, these percentages were 40.5%, 45.4%, and 60.3%, respectively[20].

There are few studies that manage to analyze the knowledge that individuals with diabetes have about the disease itself and healthy eating, as well as the difficulties faced[21], especially analyzing such aspects after food and nutrition education activities, which gives this study a greater relevance and unique character. Furthermore, it is known that intervention studies like this, in addition to stimulating the interaction of the individual with their social environment guided by

theoretical knowledge, also expands and reinforces the importance of the role of the nutritionist in the development of food and nutrition education actions[22].

When analyzing the speeches obtained from the question "what is diabetes and what is the appropriate treatment", it was observed that the answers with emotional meaning were more frequent before of the intervention. From the food and nutrition education activities, which aimed not only to provide knowledge for self-care, but also the exchange of experiences and knowledge, aspects that can positively influence the participants' confidence, it was observed that the emotional meaning was less frequent after the intervention, as in the following speech:

"... as long as you know how to control it, it's a disease that you can live with for many, many years" (E 08, 55 years old).

The emotional aspect was also reported by Oliveira *et al.*[23], who, through a cross-sectional study with a semi-structured interview, sought to analyze the content of the responses of 84 adults with diabetes in relation to the disease, and found that most categories were more directed to emotional aspects.

The answers were also categorized according to their physiological meaning, and the content of the subcategories did not change after the intervention. However, it is possible to observe that the most frequent speeches for "Malfunction of the pancreas" and "High amount of sugar in the blood" were higher than those observed before the intervention.

This result shows that the actions may have contributed to knowledge about the physiological meaning of the disease. It is noteworthy that both meanings are valid, but it was observed that individuals who attributed the emotional meaning before, rather than the physiological one, had a lower level of education (elementary school completed), suggesting that they had no basis to explain the physiology. After the actions, the same individuals attributed, in addition to the emotional, the physiological meaning of the disease, demonstrating the relevance of the actions.

In the category of adequate treatment for the disease, it was observed that after the actions, the subcategories of food, physical activity, and medication were more frequently reported by individuals. Adding to this positive point, the psychological aspect was also considered in the responses by the individuals, concluding that the themes of the actions, especially the meeting with the psychologist, were effective. Such concepts were also seen by Vigeta *et al.*[24], from which a qualitative study carried out through an interview about the meaning of diabetes and the perceptions of treatment, six elderly people between 60 and 75 years old reported diet, medication, psychologist, and physical activity for a proper treatment.

It was found that, before the actions, the financial aspect was one the most relevant, reported as a difficulty in adopting a healthy diet, followed by a lack of family support and a routine. In a study carried out with 77 parents of students from a day care center in Belo Horizonte, MG, whose income ranged from 1 to 3 minimum wages, as well as the population studied herein, it was observed that the greatest difficulty in eating healthy was the financial condition, followed by a lack of time (routine) and lifestyle habits, such as eating fatty and fried foods on a daily basis instead of fruits and vegetables[25].

Based on this information, a cooking workshop was held with the theme "How to eat healthily while spending little", with

the aim of teaching participants to prepare healthy recipes that would not be costly. The cooking workshop with this theme was considered relevant as individuals mentioned the financial aspect less frequently in the second assessment (T1). It is possible to see that they understood that to eat healthily it is not necessary to spend a lot. The idea of healthy eating that they had before the actions was based on the consumption of "diet", "light", and lactose-free products, that is, industrialized foods that have a higher economic value and are not always healthy. After the actions, participants mentioned that healthy eating was based on "farmer's market food".

Regarding internal aspects, individuals reported that addictions and the emotional factor negatively influenced them in the search for healthy eating, a fact explained by Rothes and Cunha[26], who wisely cite a phrase "we are what we eat, we eat what we are, what we feel, and how we are." In this sentence, one can see how one's inner being, the emotional one, can influence food choices. Without a doubt, a person's personal history, culture, beliefs, and values must be considered for effective treatment.

When evaluating the anthropometric measurements and dietary data of individuals (Table 2) after the actions, no significant changes were observed. This result was also observed by De Souza and Araújo[27], in which, even after nutritional education actions, there were no changes in eating habits and anthropometric data of 32 individuals with type 2 diabetes mellitus. However, even with this finding, food and nutrition education should be encouraged and re-evaluated.

In the present study, this fact may have occurred for some reasons, one of which would be the short period of time (six weeks) in which the actions were developed, since the weight loss process is complex and variable, and it is common that for some individuals weight loss occurs more slowly[28]. Furthermore, there was no significant difference in food intake after the intervention. However, as this was a quantitative analysis, it is not possible to discuss whether there was an improvement in the quality of the individuals' diet.

From the participants' reports, it was observed that food and nutrition education was important in the process of knowledge about the disease, healthy eating, and their perceptions about the difficulties faced. The small sample size and the frequency of participants in the actions were the limitations of this study. Other qualitative studies were carried out with a number of individuals similar to the one herein[29]. Moreover, these aspects are justified by the nature of the study, with sample loss occurring during the intervention.

Since this is a qualitative study, which, through semi-structured interviews, aimed to assess the influence of nutrition education on the knowledge of individuals, the analysis of the responses may be subjective[25], with more than one interpretation being given to the response. However, qualitative research is of great importance. As defined by André[30], knowledge is a process socially constructed by individuals and their interactions with the environment. From this perspective, everyday experiences, language, culture, and ways of acting are the main sources of content and importance for the researcher.

CONCLUSION

Food and nutrition education activities proved to be relevant in the perception and knowledge of individuals with type 2 diabetes mellitus, especially in understanding the relationship of the disease associated with emotional, physiological, and treatment aspects. In addition, internal aspects subcategorized by addictions and emotional aspects that could hinder the adoption of a healthy diet were not expressed in the reports after the intervention. Studies of this nature should be encouraged, as food and nutrition education are important in understanding the disease, healthy eating, its proper treatment and, consequently, in changing habits and preventing complications; thus, ensuring a better quality of life for individuals who have type 2 diabetes mellitus.

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Supplementary Material:

STRUCTURED QUESTIONNAIRE FOR THE INTERVIEW

Guiding Question 1: "In your opinion, what is diabetes and what do you consider is important for its treatment?"

Guiding Question 2: "What are the difficulties you have encountered in adopting a healthy diet?"