Adherence to pharmacological and nonpharmacological treatments in adults with type 2 diabetes

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Abstract

Treatment in diabetes is basically performed by pharmacological and nonpharmacological (physical activity and nutrition) therapies. However, adherence to treatment is a constant challenge, requiring a greater understanding and direction of the multiple aspects that can interfere with adherence to these different types of treatment. Therefore, the study sought to estimate the prevalence of aspects that influence adherence to pharmacological and nonpharmacological treatments of people living with type 2 diabetes. This was a descriptive and cross-sectional study, with 139 users, registered and participating in programs aimed at the diabetic population in a Basic Family Health Unit in the city of Manaus, Amazonas, Brazil. Data were collected through an interview using a semi-structured form with questions related to sociodemographic, economic, clinical and health aspects in general, and pharmacological and nonpharmacological treatments (physical activity and nutrition). The prevalence of adherence to pharmacological treatments was the highest (74.8%), followed by adherence only to physical activity (56.1%). There was a low prevalence of adherence only to nutrition (10.2%). When estimating the combined prevalence, pharmacological treatments associated with physical activity was the most prevalent (40.3%). The combined adherence between pharmacological and nonpharmacological treatments (physical activity and nutrition) was low (5.8%). The study concludes by reinforcing that the action of the multiprofessional health team is a fundamental tool that acts with a comprehensive approach to promoting, preventing and maintaining health and that it can contribute to greater adherence to the treatment of users with type 2 diabetes.

Keywords: Diabetes Mellitus. Primary Health Care. Cooperation and Adherence to Treatment. Pharmacological treatment. Noncommunicable Diseases.

INTRODUCTION

Type 2 Diabetes Mellitus has become one of the main public health problems both in Brazil and worldwide, and is one of the most frequent chronic diseases, which ends up being a challenge for health services, as well as for professionals in the area[1]. It is worth mentioning that the treatment of the disease requires a change in lifestyle, including nutritional counseling, regular and guided practice of physical activity, and rational use of medications for glycemic control according to the needs observed[2]. In addition, it is important to highlight that in the long term, uncontrolled diabetes can compromise visual acuity, causing blindness, kidney failure, cardiovascular complications, and limb amputations. This disease is responsible for significant health expenses and even

increased mortality[1,3]. Thus, it is extremely important that treatment adherence is carried out in a serious and committed manner.

In this context, the control of diabetes, within the scope of Primary Care, can prevent the emergence of serious complications and contribute to reducing the number of hospital admissions and deaths[3,4]. The early detection of individuals with this disease by health services is one of the essential elements for the success of disease control, considering that, from the diagnosis, the Family Health Strategy (FHS) team can perform periodic monitoring with the purpose of fully meeting the needs of the social groups responsible for the area5, according to the general guidelines determined by the National Primary Care Policy[6].

Most studies emphasize that adherence to pharmacological treatment is paramount, and, in addition, there is a need to investigate factors related to the practice of physical activity and dietary aspects at the same time[7,8]. Regular physical activity is directly related to glycemic control, decreased medication dosages, disposition, and a sense of well-being9. In addition, when adhering to the dietary plan, DM patients can reduce their glycemic percentage in the short, medium, and long terms, which is important to prevent, control, and avoid illness, and is a strategy for self-care in adhering to treatment[10].

The concept of adherence is defined as the degree to which a person's behavior - use of medications, following a prescribed diet and changes in lifestyle - corresponds and agrees with the recommendations of health professionals[11]. This, however, cannot be seen as a unitary construct, since a diabetes patient can adhere to one type of treatment, but not adhere to another[8]. In this sense, it is important to assess isolated and simultaneous adherence to different types of treatment.

Despite the direction concerning factors associated with diabetes, in most components[11], there is a tendency of non-adherence to treatment, which leads to an increase in pathologically related comorbidities, such as obesity, dyslipidemia, vascular changes, and hypertension[12]. In this sense, most studies have investigated aspects related to pharmacological treatment, but nonpharmacological treatment needs further support. Furthermore, in addition to verifying individual adherence, it is necessary to assess simultaneous adherence to different types of treatment. There is also a need in the literature to identify the relationship between sociodemographic, economic, clinical, and general health aspects that can interfere with treatment adherence in diabetes. Thus, the aim of this study was to estimate the prevalence of sociodemographic, economic, clinical, and health factors that interfere with adherence to pharmacological and nonpharmacological treatments (physical activity and nutrition) of users diagnosed with type 2 diabetes in a primary health care unit in Manaus, Amazonas.

METHODOLGY

This was an epidemiological, cross-sectional, and quantitative study, which was based upon primary data collected between October 2016 and January 2017 and was approved by the Research Ethics Committee of the Universidade do Estado do Amazonas, with opinion No. 1.907.494.

The research was carried out in a Basic Family Health Unit (BFHU), located on the east side of Manaus, the capital of the state of Amazonas. The inclusion criteria were: being over 18 years old, type 2 diabetic, registered by BFHU and/or participating in programs

developed by BFHU aimed at the diabetic public, and who, during the study, were living in a home belonging to the territory covered by the BFHU. Individuals who did not meet any of the established criteria were excluded, as well as were patients who declared themselves to be indigenous.

The sample was determined from a target population of 217 diabetic users registered in the Hypertension and Diabetes Program (HiperDia). A non-probabilistic sample of the convenience type was performed. The approach to the target audience of the study took place on the BFHU premises while the user waited for their consultation, or during a home visit to the address registered at the BFHU, or at the time when the user picked up their medication at the BFHU pharmacy. After the invitation and obtaining their consent for the study, by signing the Informed Consent Form (ICF), the questionnaire was applied by a member of the research team.

The collection team was previously trained and was formed by a multidisciplinary team in the areas of pharmacy, dentistry, physical education, and nursing. Data were collected through interviews with the application of a form for eligible users. Each team member was at a strategic point of the BFHU (screening room, public pharmacy, consultation waiting room, and/or reception), inviting eligible people for the study. The interview took place at the BFHU facilities. The collection instrument was divided into three axes: 1) profile of users' sociodemographic, economic, clinical, and health aspects; 2) profile of aspects related to users' pharmacological treatment; 3) profile of aspects related to users' nonpharmacological treatment.

The socio-demographic and economic aspects investigated were gender (male or female), age group [30 - 59 years (adults), 60 - 79 years (young elderly) or >80 years (long-living elderly)] 13, marital status (married/ stable union, divorced, single, or widowed), housing situation (lives with others or lives alone), education (illiterate, elementary school, high school, or higher education), family income in minimum wages (≤1, 2 to 3, or ≥4) with value in reais referring to the year 2017 (R$ 937.00), profession or professional activity (unemployed, retired, homemaker, commerce/services, or others), and religion or belief (yes or no). The age group was categorized in this way in order to characterize the participants according to the risk of major complications related to type 2 diabetes.

For the clinical and health profile of users, the time of diagnosis (<1 year, ≥1 to 3 years, >3 to 5 years, or >5 years) was investigated; how they discovered the disease (after an acute episode, after they had symptoms, or routine tests); the presence of comorbidities due to diabetes such as diseases of the kidneys, heart, eyes, brain, amputations, vascular diseases (yes or no); if they have other chronic diseases (yes or no); if they have oral diseases (yes or no); habits of consuming cigarettes and alcohol (smoking, drinking, or no habits).

Additionally, the Body Mass Index (BMI) was calculated by measuring height (in centimeters) and body mass (in kilograms), which were collected according to the standardization proposed by Marfell-Jones et al.14 For the height, the instrument used was the Sanny® compact tape-type stadiometer (São Bernardo do Campo, São Paulo, Brazil), with a maximum height up to 210 cm. Body mass was measured with a Welmy® digital anthropometric medical scale, model W200A (São Paulo, Brazil), with a capacity of up to 200 kg. All measurements were performed by the data collection team in the BFHU screening room, where the instruments were located. BMI values were classified according to the cutoff points of the World Health

Organization (WHO) 15, which considered: Normal weight (BMI 18.5 to 24.99); Excess weight (BMI 25.0 to 29.99); Grade 1 obesity (BMI 30.0 to 34.99); Grade 2 obesity (BMI 35.0 to 39.99); and Grade 3, morbid obesity (BMI ≥40).

In addition, the waist circumference was measured (in centimeters) using the Cescorf® anthropometric measuring tape (Porto Alegre, Brazil) with metal rods, precision of 0.1 centimeters, and is up to two meters in length. The values were classified according to the WHO cutoff points16, respectively: Low risk (<94 and <80); Increased risk (≥94 to 102 and ≥80 to 88); and Very increased risk (≥102 and ≥88). For the presentation of the results, the data were dichotomized into risk (increased risk and greatly increased risk) and low risk.

Aspects related to pharmacological treatments were weekly glycemic control (yes and no); use of medication [daily, irregular use (only when feeling bad or remembering), or not taking it]; medication used (metformin, glibenclamide, gliclazide) or not used; location of access to medication (free pharmacy at BHU, popular pharmacy in Brazil, or commercial pharmacy); and use of home medicine (yes or no). Regarding adherence to individual treatments, users who took some type of medication were classified as "I adhered to pharmacological treatment" and those who reported not using any medication as "I did not adhere to pharmacological treatment".

Nonpharmacological treatment was identified through aspects related to physical activity and nutrition. For physical activity, the level of habitual physical activity and the presence of limitations for the practice of physical activity (yes or no) were investigated. Usual physical activity was measured using a questionnaire adapted from the International Physical Activity Questionnaire (IPAQ)17 and

the Summary of Diabetes Self-Care Activities Questionnaire (SDSCA)18 (Chart 1).

The classification of the level of physical activity by the IPAQ was determined by counting the intensity (light, moderate, or vigorous), frequency (in days of the week), and duration (in minutes), which were subdivided into the categories: very active; active; irregularly active; and sedentary)17. Concerning individual adherence to treatment, the "very active" and "active" participants were considered those that adhered to the nonpharmacological treatment of physical activity.

For the nutritional aspects, it was verified whether the user performed nutritional monitoring (yes or no) and followed their dietary prescription (yes or no). In addition, the isolated and simultaneous intake of foods that are directly associated with decompensated diabetes, such as starchy foods (yes or no), glucose risks (yes or no), and more than three servings of fruits a day (yes or no) were evaluated3. To classify adherence, responses in relation to following the dietary prescription were considered as adherence. Those who answered "yes" were considered to have adhered to nonpharmacological treatment through nutrition.

Adherence to pharmacological and nonpharmacological treatments was carried out in isolation, that is, adherence only through medication, physical activity, or nutrition. In addition, the types of treatment adherence were assessed simultaneously. For this, several combinations were made according to the types of adherence investigated, that is, the medication, the activity, and the nutritional aspects.

Data were entered and analyzed using Epiinfo software, version 7.2® (Atlanta, Georgia United States of America). The descriptive analysis of the data was estimated through the distribution of frequencies and percentage description.

RESULTS

A total of 139 type 2 diabetic users participated in the study. Regarding the sociodemographic profile, most users were female, aged 30 to 59 years, married/in a stable relationship, living with family or other people, with an education up to elementary school, with a family income of less than a minimum wage, homemakers, and reported having some religious belief (Table 1).

Regarding the clinical and health profile of the interviewed patients, most of the research participants reported having a diagnosis time of more than five years, discovered the disease through routine examination, have other chronic diseases, do not have oral problems related to diabetes, do not have the habit of consuming cigarettes or alcohol, are overweight or obese, and are at risk for metabolic complications (Table 2).

The prevalence of people with comorbidities was high (48.2%) (Table 2). In relation to other chronic diseases, the most commonly mentioned were: systemic arterial hypertension, dyslipidemia, rheumatic diseases, autoimmune diseases, kidney diseases, respiratory diseases, and cancer. The oral alterations reported were: periodontal disease, dry mouth, tooth decay, tooth loss, taste and sensitivity disorders, and thrush.

According to the information collected, users with type 2 diabetes reported a higher prevalence of adherence to pharmacological treatment (74.8%) compared to nonpharmacological treatment (physical activity and nutrition) (Figure 1-A). Analyzing alone, physical activity was the most prevalent type of nonpharmacological treatment (56.1%), and nutrition was the type with the least adherence (10.1%) (Figure 1-A).

When verifying simultaneous adherence, the combined treatment between medication and physical activity had the highest prevalence (40.3%). In contrast, a low prevalence (5.8%) was identified for what is considered ideal adherence for the treatment of type 2 diabetes (combination of medication, physical activity, and nutrition) (Figure 1B).

Regarding the profile of pharmacological treatment, most users performed glycemic control weekly, used their medication daily, reported using the drugs metformin and glibenclamide, picked-up their medication at the free BFHU pharmacy, and did not use homemade medication (Table 3).

When they adhered to pharmacological treatment, 88.5% of users are able to explain how they use the medication, and of these, 61.8% do so according to medical prescription. When asked if they had any difficulty in using the prescribed medications, 56.1% said yes, and among the most reported difficulties, the adverse effects, forgetfulness, and difficulty in administering the medication were mentioned. However, it is worth noting that strategies to help the users remember to use their medication were mentioned by 87.0%, the main one being storing the medication in an easy place.

With regards to the profile of nonpharmacological treatment, most users were active or very physically active, had no limitation for the practice of physical activity, did not perform nutritional monitoring, did

not follow the dietary prescription (Table 3).

Still in relation to nutritional aspects, it is important to highlight that the proportions of users who reported eating certain types of foods were: 98.6% consumed foods rich in starch, 67.6% consumed foods rich in glucose, and 36.7% consumed more than 3 servings of fruit per day. Many diabetic users, 45.3%, eat starchy foods associated with glucose-rich foods, followed by an combination of all food types (rich in starch + rich in glucose + more than 3 servings of fruits/day) at 22.3%. Individually, 17.3% of users reported only eating starchy foods and 13.7% starchy foods + >3 servings of fruit. The associations "> 3 servings of fruit" and "None of the options" were identified in only 1.4% (Table 3).

Of the users who reported some limitation for the practice of physical activity, 55.9% indicated rheumatic impairments, followed by 14.7% of users with decompensated diabetes complications, and 10.3% with uncontrolled blood pressure. The fear of being hurt or falling and the presence of respiratory disorders was reported by 8.8% and 5.9%, respectively. The limitations of indisposition/tiredness, insecurity/local violence, and urinary tract problems were also individually mentioned as limitations for the practice of physical activity.

Of the users who declared that they carry out nutritional monitoring, only 6.5% followed the food prescription, that is, they adhered to nutrition as a therapy for the control of diabetes. Meanwhile 3.6% (five) did not follow/did not adhere to the dietary prescription.

Table 1– Profile of the sociodemographic and economic aspects of diabetic users of a Basic Family Health Unit in the Municipality of Manaus, Amazonas, 2017.

Variable	n (139)	%
Sex		
Male	57	41.0
Female	82	59.0
Age group (years)		
30-59	75	54.0
60-79	62	44.6
>80	02	1.4
Marital Status		
Married/Stable Union	85	61.2
Divorced	14	10.1
Single	23	16.5
Widowed	17	12.2
Living Situation		
Lives with others (family, others)	125	89.9
Lives alone	14	10.1
Education		
Illiterate	07	5.0
Elementary School	70	50.4
High school	50	36.0
University education	12	8.6
Family Income (Minimum Wage)		
≤ 1	66	47.5
2 to 3	56	40.3
≥ 4	17	12.2
Profession or Professional Activity		
Unemployed	07	5.0
Retired	31	22.3
From home	42	30.2
Commerce and services	39	28.1
Others	20	14.4
Religion/ Belief		
Yes	108	77.7
No	31	22.3

n: sample number; %: percentage. Source: Research data, 2017.

Table 2– Clinical and health profile of type 2 diabetic users of a Basic Family Health Unit in the Municipality of Manaus, Amazonas, 2017.

Variables	n (139)	%
Variables		
Diagnosis time	25	18.0
<1 year	31	22.3
≥ 1 to 3 years	14	10.1
> 3 to 5 years	69	49.6
> 5 years		
How the disease was discovered	25	18.0
After acute episode	47	33.8
Symptoms	67	48.2
Routine examination		
Presence of comorbidities	67	48.2
Yes	72	51.8
No		
Chronic Diseases	102	73.4
Yes	37	26.6
No		
Oral Diseases	43	30.9

| Variables	n (139)	%
Yes	96	69.1
No		
Cigarette and Alcohol Habits	13	9.4
Smoking	39	28.0
Alcoholism	87	62.6
No habits		
Body Mass Index (kg/m²)	33	23.7
Normal Weight	53	38.1
Overweight	36	25.9
Obesity 1	13	9.4
Obesity 2	04	2.9
Obesity 3		
Waist Circumference (cm)	71	51.1
Risk	68	48.9
Low risk		

n: número amostral, %: porcentagem; kg/m²: quilogramas por metro ao quadrado; cm: centímetros. Fonte: Dados da pesquisa, 2017.

Table 3– Profile of aspects related to pharmacological and nonpharmacological treatments of diabetic users of a Basic Family Health Unit, Manaus, Amazonas, 2017.

Variables of pharmacological treatment		
Glycemic Control (weekly)		
Yes	96	69.0
No	43	31.0
Use of medication		
Daily	104	74.8
Irregular use	28	20.2
Does not use	07	5.0
Medication used*		
Metformin (500 mg or 850mg)	105	75.5
Glibenclamide (5 mg)	74	53.2
Gliclazide (30 mg or 60 mg)	7	5.0
Does no use	17	12.2
Access to medication*		
Free Pharmacy	130	93.5
Popular Pharmacy of Brazil	6	4.3
Commercial Pharmacy	31	22.3
Uses homemade treatment		
Yes	67	48.2
No	72	51.8
Variables of nonpharmacological treatment	**n**	**%**
Level of habitual physical activity		
Very active	10	7.2
Active	68	48.9

Irregularly active	39	28.1
Sedentary	22	15.8
Presence of limitation for practicing PA		
Yes	68	48.9
No	71	51.1
Performs nutritional follow-up		
Yes	13	9.4
No	126	90.6
Follows prescribed diet		
Yes	14	10.1
No	125	89.9
Isolated intake of foods harmful to the health of diabetics **		
Starchy Foods	137	98.6
Glucose-rich foods	94	67.6
Ingestion >3 servings of fruit per day	51	36.7
Simultaneous intake of foods harmful to the health of diabetics		
Rich Starch + Rich Glucose + >3 servings of fruit	31	22.3
Rich Starch + Rich Glucose	63	45.3
Rich Starch + >3 servings fruit	19	13.7
Only Rich Starch	24	17.3
Other combinations	2	1.4

* The participant could check more than one answer option; ** only those who answered yes to these variables were placed in the table. Source: Research data, 2017.

Types of Treatment Adhesion
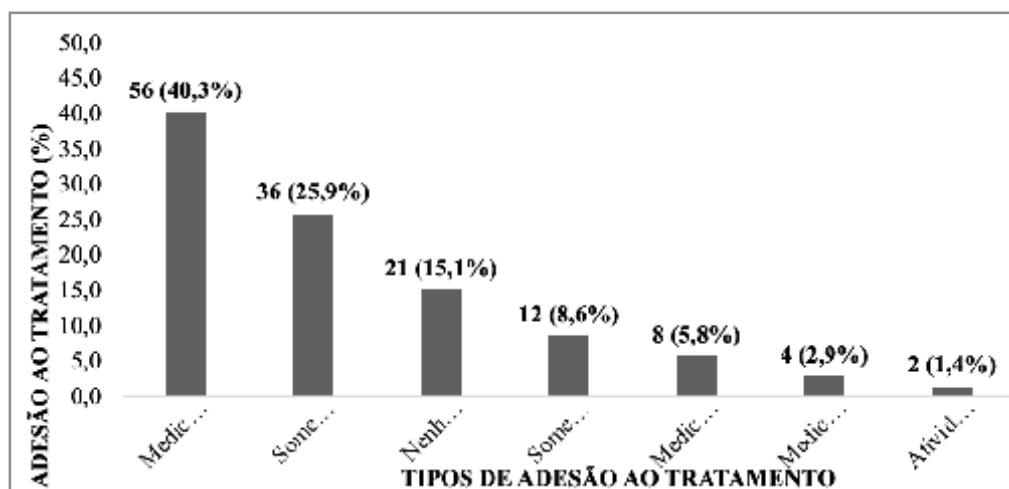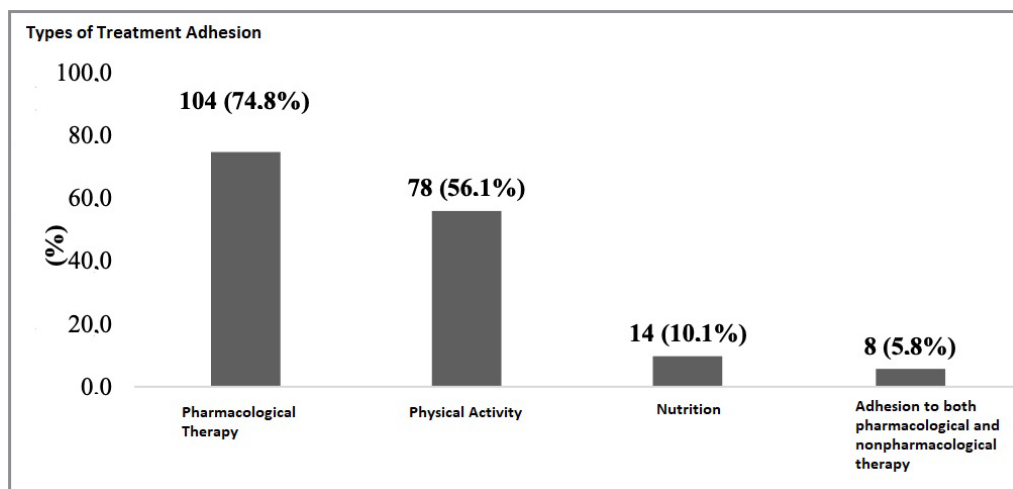
Source: Research data, 2017.

Figure 1– Adherence to pharmacological and nonpharmacological treatment (individually and simultaneously) by diabetic users in a Basic Family Health Unit in Manaus, Amazonas, 2017.

DISCUSSION

The main results of this study were: 1) sociodemographic profile (participants were female, aged less than 60 years old, low income, and low education); 2) clinical profile and (users had a time of diagnosis of diabetes greater than 5 years, discovered the disease by routine examination, comorbidities related to diabetes (mainly hypertension), oral diseases, overweight, and cardiovascular risk). The prevalence of adherence to an individual treatment was higher for pharmacological therapy (74.8%) followed by physical activity (56.1%). In estimating the combined prevalence the following was identified: 1) pharmacological therapy associated with physical activity was

the most prevalent (40.3%); 2) the combined adherence between pharmacological therapy, physical activity, and nutrition was low (5.8%). In addition, 15.1% of people living with diabetes would not adhere to any treatment.

Regarding the sociodemographic characteristics of the sample, there was a prevalence of females (59%), which corroborates the guidelines and other national surveys[3,7,19–21], in which the prevalence of diabetes was higher in women, and shows that this it is a particularly vulnerable group that needs special attention. The reduced participation of the male public can be justified due to the fact that they seek the health service only in situations of manifested illnesses, sometimes not recognizing the importance and the need for preventive or health promoting activities[22]. In addition, the incompatibility between working hours and the periods of operation of the BFHU can be a barrier.

The average age of the diabetic patients interviewed was 57.6 years, approaching the average age found by the study carried out at Hospital das Clínicas in Ribeirão Preto[19]. Regarding monthly family income, this was declared to be less than a minimum wage, corroborating with a study from São Paulo that reported that 43.4% of diabetic users live with up to one minimum wage7, which impacts several aspects (quality of life, preventive health behavior, quality of treatment, social support, community resources, self-knowledge of the disease, physical activities, and diet) that interfere with treatment adherence. Still, in relation to this issue, another study showed a directly proportional association between income and treatment adherence[23].

There was a low level of education in the sample of the present study (50.4% with an elementary education), which corroborates the results found in other national studies[7,24]. Regarding the time since the disease was diagnosed, 49.6% said they had diabetes for more than 5 years, confirming the results of previous studies[7,20,25].

Most patients (48.2%) discovered the disease through routine examinations, affirming the commitment of professionals in the Family Health Strategy to performing screenings and diagnosis of the disease in the population of the area enrolled. Since the examination of glycemia, used in the diagnosis, is recommended for all individuals over the age of 45, anyone who is overweight and has some risk factor associated with chronic diseases (physical inactivity, diabetics within the immediate family, Afro-American, Latin or indigenous ethnicity, diagnosis or treatment of arterial hypertension)[3,10]. These data suggest that the strategy applied by professionals has been effective for the early diagnosis of the disease.

Among the survey participants, 48.2% had one or more comorbidities related to diabetes, the most common being vision problems or blindness. In addition, 30.9% reported having one or more chronic diseases, the most prevalent being systemic arterial hypertension. Likewise, a study carried out in João Pessoa[9] identified an association between diabetes, systemic arterial hypertension, and retinopathy. Additionally, a study carried out in Porto Alegre identified that the most prevalent profile of diabetic patients was low income, low education level, users of oral hypoglycemic agents, and those with a retinopathy[10]. The study emphasizes that the majority performed medical follow-ups, did not adhere to the recommendations, and

were unaware of the diseases associated with diabetes, which potentiates the complications resulting from the disease.

Of the total sample, 30.94% reported the presence of oral diseases, the most common being periodontal disease. A systematic review26 found that periodontitis is in fact the most prevalent problem in diabetics. A study showed that 59.8% of diabetics had periodontitis, and the main cause was decompensated glycemia (>126mg/dl)[27].

In the studied sample, there was significant adherence (74.8%) to the use of medications. A similar result was identified in a study carried out in Minas Gerais (84.4%)[28]. Possible justification for this result may be related to the easy access to the medication (free pharmacy), since 93.6% of users obtained their medication through the BFHU on a regular basis, using other sources only in the when prescribed medications were partially or totally lacking.

As for users who use home remedies, many said they had not received any indication from health professionals, and doing so according to popular knowledge. There were conflicts regarding information and standards in preparation or use. Due to the concomitant use of home remedies with medications prescribed by doctors, opportunities are opened to ask about the adverse effects and the difficulty in following the therapy. For this reason, it is necessary to ask users about the use of therapeutic alternatives, which can either optimize or bring costs to the treatment.

The findings on the use of medications indicated for cardiovascular and renal comorbidities by 58.3% of users is justified by the fact that 73.4% of users have chronic diseases, among them, the most notable is systemic arterial hypertension. It is worth mentioning that few users use oral antidiabetics or measure blood glucose on a regular basis, even though it is highly recommended[29]. This reinforces the need for health education interventions that encourage and facilitate adherence to treatment in the daily practice of diabetics.

Regarding nonpharmacological therapy, 56.1% of the participants adhered to physical activity. These findings are in accordance with the results found in studies carried out in other Brazilian capitals[7,8]. The level of habitual physical activity comprises four domains: physical activities at work, domestic activities, commuting, and leisure time. In the present study, most performed domestic activities. This data can be explained by the fact that females are the most prevalent in this study and that the main activity/profession reported was that of being a "homemaker". In the leisure domain, the main activity performed was walking (22.3%, data not shown in tables), that is, an aerobic activity (low intensity and high duration). The American College of Sports Medicine[30] recommends that people with diabetes perform strength exercises (weight training) associated with aerobic exercises. Therefore, despite the high prevalence of physically active diabetics, it is necessary to rethink the type of physical activity being practiced.

One of the possible explanations for choosing only aerobic exercises (mainly walking) are the limitations reported for the practice of physical activity, as 55.9% of the interviewees have some type of rheumatic impairment, and 14.7% had complications of decompensated diabetes, which are barriers to practicing physical activities.

Moreover, it was found that only 10.1% adhered to nutritional therapy. The data found in this research corroborate the results of another study28 that showed low adherence to nutritional therapy (1.6%) among diabetics. One of the difficulties

that may be related to low adherence is the choice of foods, since almost all users (98.6%) ate foods rich in starch (bread, flour, rice, pasta) and 67.6% ate glucose-rich foods (sweets, cakes, puddings) weekly, or consumed these two types of foods together (45.3%). In addition, regional and cultural factors are associated with the high consumption of starch, as the manauara diet which is based on cassava flour and French bread. Such behaviors are directly associated with being overweight.

Approximately 76.3% of users were overweight (38.1% were overweight, 38.1% were obese). The data of this study corroborates a study carried out in Minas Gerais28, in which 90% of users were overweight and obese. Overweight and obesity increase the risk of developing cardiovascular disease, especially when the fat is located in the abdominal region. Among the survey participants, the majority (51.0%) were at risk, that is, they had a high concentration of abdominal fat. This finding is in line with a survey conducted in southeastern Brazil (76.1%)28. Therefore, it is necessary to rethink the strategies of nutritional intervention at the level of public health since healthy eating and the type of physical activity practiced remain as the main barriers of treatment management for type 2 diabetes[31].

Regarding the different types of treatments, individually, the most prevalent types of adherence were the use of medication (74.8%) and the practice of physical activity (56.1%), with nutrition having the lowest adherence (10.1%). Only 5.8% of users attended the ideal treatment recommended internationally[11], that is, adherence to pharmacological therapy, physical activity, and nutritional therapy, concomitantly. Even so, it was possible to observe associations between the types of treatment that lead to significant gains and the reduction of damage in the control of diabetes. The simultaneous adherence between pharmacological therapy and physical activity (40.3%) stands out. The use of oral antidiabetics associated with physical exercise produces increased insulin sensitivity, lower fasting glycemia, lower glycemic response to oral glucose overload, and lower concentration of glycated hemoglobin, thus, demonstrating what can lead to better glycemic control in type 2 diabetic individuals[32,33]. These benefits become accentuated when there is a combination of aerobic exercises with strength training, a profile not presented in the sample of this study.

A significant and worrisome data from the present study is the proportion of users who have not adhered to any type of treatment (15.1%). This is an alarming scenario, as the user is exposed to the complications of diabetes and, consequently, to the development of comorbidities that may reduce their life expectancy[3,4]. The nature, feelings, and determining factors of non-adherence to treatment are complex and difficult to understand[34]. Therefore, it is necessary to consider this issue from another perspective, considering the subjectivity of the patient, as well as their needs and difficulties, rather than the precision with which they follow the recommendations. Hence, it is worthwhile that health teams investigate the reasons that lead these users to not choose any adherence.

The limitations found for carrying out this study was the recruitment of patients, which reflected in a longer collection time. However, it was found that the studied population accessed the health service less frequently than expected and recommended. The study's strengths were the evaluation of several factors related to treatment

adherence in diabetes, direct measurement of BMI and waist circumference, and descriptive analysis of types of treatment adherence (pharmacological and nonpharmacological) in an individual and simultaneous manner, which can serve as a subsidy for future intervention projects and a better understanding of the barriers and facilitators related to adherence to treatment in diabetes.

CONCLUSION

In general, this study offered an overview of the sociodemographic, economic, clinical, and health-related aspects of users with type 2 diabetes. It was also observed that many adhered to pharmacological therapy individually or together with physical activity, and nutritional therapy was the type of therapy that users have less adhered to. However, many users were considered non-adherent to the ideal treatment, since only 5.8% adhered to pharmacological therapy, nutritional therapy, and physical activity on a regular basis.

In this sense, the action of the multiprofessional health team is a fundamental tool for acting with a comprehensive approach to promoting, preventing, and maintaining health, and can contribute to greater adherence to the treatment of users with type 2 diabetes.

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