



Variables associated with adherence to the treatment of type 2 diabetes mellitus among elderly people

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Abstract

Aim To estimate the prevalence and variables associated with the adherence to medical treatment for type 2 diabetes mellitus in elderly people attending the family healthcare units in Ribeirão Preto, State of São Paulo, Brazil.

Methods This is a population-based household survey with a random conglomerate sample of 338 elderly people. Treatment adherence was measured with the Brief Medication Questionnaire. Poisson regression model was used for gross and adjusted analyses at 95% confidence intervals and *P* value.

Results Adherence to treatment of type 2 diabetes mellitus among elderly people was found to be 52.4% (95%CI 47.9–57.7). There was evidence of positive associations between treatment adherence and age older than 80 years, one to four years of schooling, non-abusive alcoholic use, self-efficacy, clinical diagnosis of type 2 diabetes mellitus only, non-obesity, use of oral anti-diabetic drugs, non-occurrence of side effects, no daily use of multiple-dose medication, no delay in medication delivery and treatment at family healthcare units (*P* < 0.05).

Conclusion Low treatment adherence was found to be important and it was also possible to know the variables influencing this process. Strategies aimed at improving adherence to medical treatment should be a priority in the family healthcare units for the control of diabetes.

Introduction

Low adherence is one of the main problems for treatment and control of type 2 diabetes mellitus (T2DM) in elderly people [1]. This age group's population uses medications for a prolonged period of time to improve the disease prognosis, and thus it becomes a challenge for multiprofessional teams. The evidence shows that poorly-treated T2DM results in significant complications to elderly patients, community, and health care system [2, 3].

It is estimated that treatment adherence for non-communicable chronic diseases (NCDs) is 50% in Brazil and worldwide [4]. It is known that this phenomenon is complex and multidimensional involving aspects related to individual, disease, beliefs, behaviour, culture, and health care services. Actions favouring treatment adherence combine different approaches and require planning and qualification of the health care team [5].

People aged 60 years or older have some features which should be taken into consideration since T2DM is a high-impact disease requiring careful clinical evaluation periodically and individually [2]. This chronic condition is related to life expectancy reduction and is positively associated with other comorbidities, mainly major geriatric syndromes [6, 7]. Therefore, treating T2DM concomitantly with other diseases leads to a pharmacotherapeutic approach which is difficult to implement. This can contribute to poor treatment adherence and a decrease in functional capacity, autonomy and quality of life [2, 8].

It is important to know the factors influencing the treatment adherence so that health care can be clinically and successfully performed. In Brazil, family healthcare units (FHUs) are public health services designed to provide

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continuous care in basic specialties, being the main places for the treatment of diabetes. There is a multidisciplinary team qualified to carry out the activities of promoting, protecting and recovering characteristics of primary health care (PHC). Therefore, the objective of the present study was to estimate the prevalence and assess the variables associated with adherence to medical treatment for T2DM in elderly people attending FHUs in the city of Ribeirão Preto, State of São Paulo, Brazil.

Methods

This is a population-based household survey performed with data collected between March and October 2018 in a Brazilian city where 22.4% of its population were registered in the Family Health System involving 45 health care teams.

Sampling size was calculated by considering a population of 2,766 elderly people with T2DM who were registered in the FHUs. Adherence to drug treatment was used with a frequency of 50-percent [4], acceptable absolute error of 5% and a confidence interval of 95%. Therefore, a final sample of 338 subjects was obtained.

Sampling was performed by clusters. Sixteen conglomerates (team from each FHU) were randomly selected among 45 groups (i.e. total of FHU teams in the municipality). Then, the participants in each conglomerate were drawn in proportion to the number of elderly people with T2DM. The interviews were conducted on a household basis after previous contact with the participants.

The inclusion criteria were the following: people older than or equal to 60 years old; no gender differentiation; clinical diagnosis of T2DM regardless of time; use of medication for the treatment of the disease within the past seven days before the interview and registration in the family health units surveyed. Elderly people with cognitive deficit or communication difficulty, history of surgery or hospitalisation within the past three months before the interview, or confined to bed or dependent on caretakers were excluded from the study.

The survey instrument consisted of a structure questionnaire on the variables influencing treatment adherence, namely: sociodemographic and economic characteristics, health care, access to health care services, impact of T2DM on daily activities, and medical treatment.

Treatment adherence was estimated by using the Brief Medication Questionnaire (BMQ), which is based on three dimensions: regime, beliefs and memory. This instrument was translated and validated to assess adherence to the treatment of NCDs in Brazil [10]. The resulting score allowed us to categorise the treatment adherence as follows: adherence (no positive answer), probable adherence (one positive answer), probable low adherence (two positive answers) and

low adherence (three or more positive answers). The BMQ score was dichotomised for statistical analysis, showing that subjects who answered positively two or more questions in any domain were considered to have a low adherence to medication treatment.

The resulting data were assessed by using the software R and exploratory analysis was performed based on absolute and relative frequencies with respective 95% confidence intervals (95%CI). Chi-square test was used to demonstrate the associations between dichotomous BMQ score and categorical variables. Prevalence ratios were calculated by using the Poisson regression model. The possible confounding variables were the following: gender, age, education level, economic status, number, and types of medications used in the treatment of T2DM. The level of significance adopted was 5%.

The present study as approved by the Dr. Joel Domingos Machado Research Ethics Committee of the Ribeirão Preto Medical School, University of São Paulo according to protocol number 2487864 and ethics certification number 82225317.0.0000.5414. All legal and regulatory requirements were fulfilled, with all the subjects signing an informed consent form before being interviewed.

Results

In our sample, we observed female predominance (65.9%; 95%CI 60.6–71.1), age group of 60–69 years old (49.4%; 95%CI 43.9–54.8), self-reported white skin colour (60.9%; 95%CI 55.5–66.1) and less than 5 years of schooling (69.5%; 95%CI 64.6–74.4). The majority of them belonged to socioeconomic classes from C to E [11] (82.3%; 95%CI 78.1–86.3), had a spouse (55.6%; 95%CI 50.1–60.9) and were retired or pensioner (65.4%; 95%CI 60.0–70.3).

The prevalence of adherence to the treatment of T2DM among elderly people was estimated to be 52.4% (95%CI 47.0–57.7). Figure 1 shows the frequencies of adherence, probable low adherence and low adherence depending on the BMQ score [10].

Descriptive analysis of the data showed that treatment adherence among elderly males and females was, respectively, 53.5% (95%CI 48.1–58.8) and 51.7% (95%CI 46.4–57.1) (Fig. 2a). Subjects aged 80 years or older had a treatment adherence of 62.7% (95%CI 57.5–67.8) (Fig. 2b), and among those who never studied, non-adherence was estimated to be of 58.4% (95%CI 53.2–63.4) (Fig. 2c). Treatment adherence was predominant among those subjects diagnosed with T2DM only (76.1%; 95%CI 71.6–80.7) (Fig. 2d) as well as those using oral anti-diabetic drugs only (56.2%; 95%CI 50.9–61.5) (Fig. 2e) and undergoing monotherapy (59.8%; 95%CI 54.6–65.1) (Fig. 2f). The use of sulfonylurea alone was evidenced

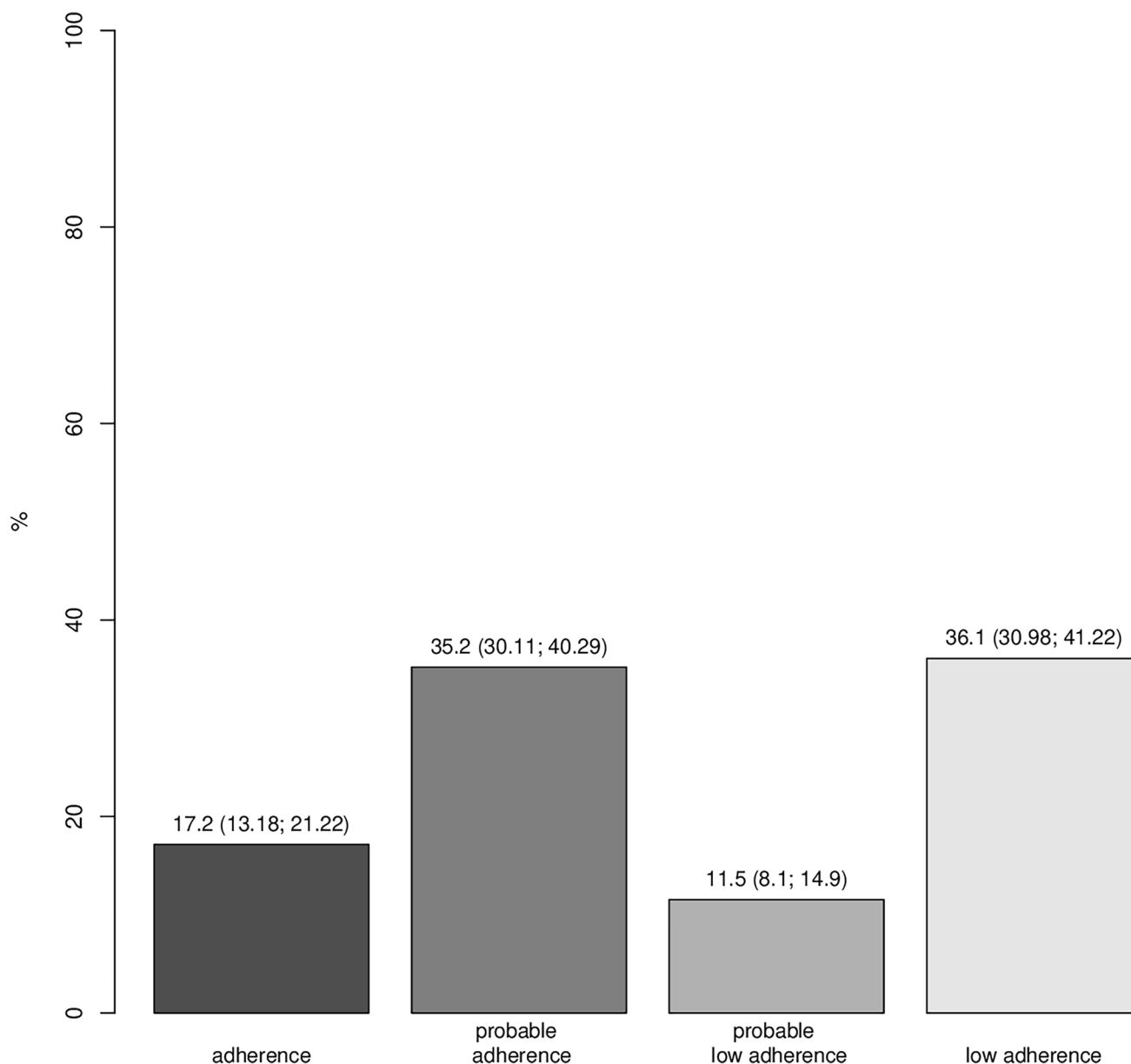


Fig. 1 Categorical score for adherence to medical treatment of type 2 diabetes mellitus among elderly people in a Brazilian city based on the Brief Medication Questionnaire [10]

in 9.8% of the total elderly subjects. Gliclazide 60 mg or 30 mg (62%), glibenclamide 5 mg (28%) and glimepiride 2 mg (10%) were the main representatives of this pharmacological class.

Gross analysis showed positive associations between treatment adherence and age group equal to or above 80 years old, no alcohol consumption, self-perception of own health condition as being very good or good, self-efficacy, clinical diagnosis of T2DM only, non-obesity, use of one medication for the treatment of the disease, non-occurrence of side effects, no daily use of multiple-dose medication, and no delay in medication delivery (Tables 1, 2, 3).

After adjustment for potential confounding factors, the above-described associations were maintained, except for the following variables: self-perception of own health condition as being very good or good, use of one medication for treatment of the disease and use of oral anti-diabetic drugs only. Nevertheless, there were statistically significant relationships between treatment adherence and low education level (i.e. 1–4 years of schooling) as well as treatment for T2DM at family health units (Tables 1, 2, 3).

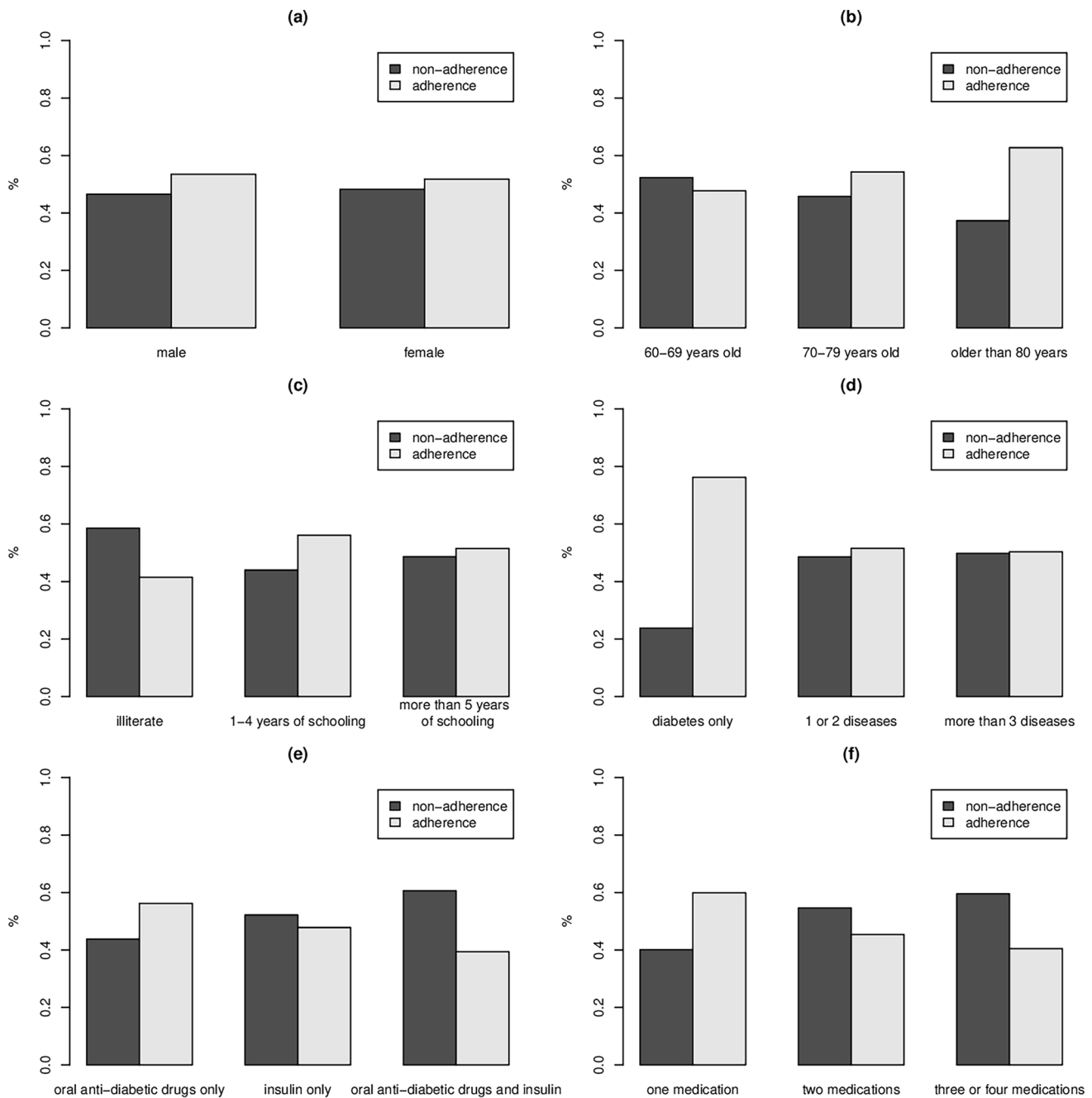


Fig. 2 Frequency of adherence to medical treatment of type 2 diabetes mellitus among elderly people in a Brazilian city according to **a** gender, **b** age group, **c** education level, **d** number of diseases, **e** types of medication used, and **f** number of medications used

Discussion

Adherence to medical treatment in elderly people with T2DM who attend family health units in the city of Ribeirão Preto, SP, Brazil, was shown to be low and of concern in view of the possible variables influencing this process. These data corroborate other Brazilian and foreign studies. However, the heterogeneity in the methodology used makes a comparison of the results difficult [14–19].

The subjects aged 80 years old or older showed better treatment adherence compared to those in the 60–69-year age group. The literature reports that elderly patients recognise the need for continued health care, as they believe that medical treatment is an alternative to prolong their life [20, 21].

Adherence was positively associated with 1–4 years of schooling. Our results corroborate the information available elsewhere [21]. It is known that low education can make

Table 1 Gross and adjusted prevalence ratios for adherence to medical treatment of type 2 diabetes mellitus among elderly people in a Brazilian city according to sociodemographic and economic variables ($n = 338$)

Variable	Gross analysis			Adjusted analysis		
	PR ^a	95% CI ^b	P^c	PR	95% CI	P
Gender						
Male	1					
Female	0.97	0.78–1.20	0.76	0.98	0.80–1.20	0.85
Age (years)						
60–69	1					
70–79	1.14	0.90–1.44	0.27	1.11	0.88–1.41	0.37
≥ 80	1.32	1.02–1.69	0.03	1.40	1.08–1.81	0.01
Skin colour						
White	1					
Non-white	1.12	0.91–1.37	0.27	1.24	1.00–1.53	0.05
Marital status						
With spouse	1					
Without spouse	0.84	0.68–1.03	0.10	0.86	0.69–1.07	0.17
Education level (years of schooling)						
0	1					
1–4	1.35	0.96–1.91	0.08	1.44	1.03–2.03	0.03
≥ 5	1.24	0.86–1.80	0.25	1.40	0.94–2.09	0.09
Socioeconomic class ^d						
A/B	1					
C	0.78	0.60–1.02	0.07	0.81	0.62–1.07	0.14
D/E	1.03	0.79–1.35	0.81	1.05	0.80–1.39	0.71
Private healthcare plan						
No	1					
Yes	1.13	0.91–1.40	0.28	1.07	0.85–1.35	0.58
Abusive use of alcohol ^e						
No	1					
Yes	0.66	0.47–0.92	0.01	0.61	0.43–0.85	0.003
Smoking						
No	1					
Yes	0.84	0.58–1.21	0.35	0.82	0.58–1.18	0.28

^aPrevalence ratio^b95% confidence interval^cChi-square test^d2018 Brazil economic classification criterion of the Brazilian association of survey firms[11]^eAccording to the alcohol use disorders identification Test[12]

it difficult to understand the instructions provided by the health care team, even the identification of the medications to be used. Therefore, it is recommended that less complex therapeutic schemes should be used by making them suitable for the bio-psychosocial characteristics of this elderly population [1, 2]. It is up to multiprofessional teams to recognise the people's needs, elaborate a healthcare plan and ensure a continuous follow-up of the treatment at the family health unit [22].

Treatment adherence was found to be low among subjects consuming alcoholic beverage abusively as well as among those self-reporting overweight. These variables affect glycaemic control and favour the development of other NCDs

[23]. It is highlighted that the health care team should analyse these features in the glycaemic control among elderly people, with family health units playing a key role in the execution of actions to reduce alcohol consumption and overweight in the community [24, 25].

The positive association between treatment adherence and self-efficacy shows the importance of considering the behavioural determinants in the care of diabetic elderly patients during individual and collective consultations. Other studies ratify that people capable of controlling the disease had better treatment adherence [26].

In the present study, elderly people who had been diagnosed with T2DM only showed better treatment adherence

Table 2 Gross and adjusted prevalence ratios for adherence to medical treatment of type 2 diabetes mellitus among elderly people in a Brazilian city according to the variables self-perception of health, comorbidities, and control of the disease ($n=338$)

Variable	Gross analysis			Adjusted analysis		
	PR ^a	95% CI ^b	<i>P</i> ^c	PR	95% CI	<i>P</i>
Self-perception of health status						
Regular/bad/very bad	1					
Very good/good	1.37	1.09–1.72	0.007	1.25	1.00–1.58	0.05
Self-efficacy						
No	1					
Yes	2.00	1.31–3.06	0.001	1.79	1.18–2.74	0.006
Emotional distress due to diabetes ^d						
No	1					
Yes	0.74	0.54–1.01	0.05	0.82	0.59–1.15	0.25
Time since the diagnosis of diabetes (yrs)						
<5	1					
5–14	1.22	0.87–1.71	0.23	1.24	0.90–1.72	0.19
≥15	0.99	0.69–1.41	0.94	0.97	0.68–1.39	0.87
Number of diabetes-related diseases						
0	1					
1–2	0.68	0.51–0.90	0.008	0.66	0.51–0.85	0.001
≥3	0.66	0.50–0.87	0.003	0.66	0.52–0.84	<0.001
Depression						
No	1					
Yes	0.73	0.51–1.05	0.08	0.78	0.54–1.14	0.19
Overweight						
No	1					
Yes	0.70	0.53–0.94	0.01	0.73	0.55–0.97	0.02
Treatment of diabetes at a FHU ^e						
No	1					
Yes	1.34	0.94–1.93	0.11	1.49	1.07–2.08	0.01
Medical visit for treatment of diabetes (mos)						
<6	1					
≥6	0.90	0.64–1.25	0.52	0.89	0.64–1.23	0.47

^aPrevalence ratio^b95% confidence interval^cChi-square test^dAccording to problem areas in diabetes[13]^eFamily healthcare unit

compared to those with other diseases. It is notorious that during the aging process there may be a higher frequency of NCDs contributing to the increased number of medications used. This scenario shows that diabetic elderly people with concomitant diseases represent a subgroup of at-risk individuals needing strategies to prevent or delay the emergence of diabetes-related complications [16, 27].

T2DM is considered a condition sensitive to the public health care, that is, an appropriate handling of this situation at primary level avoids hospitalisations and death resulting mainly from cardiovascular and cerebrovascular complications [9]. This study showed that elderly people attending family health units for treatment of T2DM had better treatment adherence compared to those followed up by other

health services. Therefore, one highlights the role of the family health units regarding extension, integrity and coordination of diabetes care. These health care professionals should increasingly know treatment adherence is a multi-dimensional phenomenon and attention should be directed towards the elderly, disease, treatment, and health services [1, 2, 9].

As for the variables related to medical treatment, one can observe a low adherence among elderly people who reported side effects from medications, use of multiple doses and delay in medication delivery. In this sense, the importance of managing the medical treatment by the health care team in collaboration with users should be emphasised, meaning that it is necessary to involve elderly people, caretakers,

Table 3 Gross and adjusted prevalence ratios for adherence to medical treatment of type 2 diabetes mellitus among elderly people in a Brazilian city according to clinical and pharmacotherapeutic variables ($n = 338$)

Variable	Gross analysis			Adjusted analysis		
	PR ^a	95% CI ^b	<i>P</i> ^c	PR	95% CI	<i>P</i>
Glycated hemoglobin (%) ($n = 243$)						
< 8.0	1					
≥ 8.0	1.01	0.79–1.33	0.97	1.29	0.97–1.73	0.08
Fasting blood glycemia (mg/dL) ($n = 257$)						
< 150	1					
≥ 150	0.89	0.67–1.19	0.42	1.09	0.82–1.45	0.53
Number of medications for treatment of diabetes						
1	1					
2	0.76	0.60–0.96	0.01	0.78	0.61–1.00	0.05
3–4	0.68	0.46–0.99	0.04	0.77	0.48–1.24	0.28
Medications used for treatment of diabetes						
Oral anti-diabetic drug	1					
Insulin only	0.85	0.55–1.32	0.47	0.85	0.55–1.30	0.44
Oral anti-diabetic drug plus Insulin	0.70	0.51–0.96	0.02	0.85	0.56–1.28	0.42
Main source of medications						
Public pharmacy	1					
Popular pharmacy	1.09	0.83–1.42	0.54	0.91	0.69–1.19	0.48
Private pharmacy	1.18	0.85–1.63	0.33	1.09	0.77–1.54	0.63
Mixed source ^d	0.88	0.63–1.24	0.47	1.07	0.73–1.58	0.71
Medication side effects						
No	1					
Yes	0.11	0.04–0.28	0.0001	0.12	0.04–0.30	<0.001
Multiple-dose medications						
No	1					
Yes	0.52	0.44–0.62	0.0001	0.52	0.43–0.64	<0.001
Delay in medication delivery						
No	1					
Yes	0.07	0.01–0.44	0.005	0.07	0.01–0.46	0.005

^aPrevalence ratio

^b95% confidence interval

^cChi-square test

^dPublic pharmacy and private pharmacy

families and community as a whole to promote individual ability to manage one's own life and care responsibility [28]. The involvement of different individuals has been shown to be promising for improving treatment adherence, whereas punitive actions should be avoided [5].

Among the limitations of the present study, one can cite the lack of knowledge on medications used by the participants within the seven days before the interview for the assessment of treatment adherence, which might have created a memory bias among them. To minimise this effect, the participants were asked to bring prescriptions and package inserts of the medication. Moreover, subjects self-reporting their medical treatment tend to overestimate it. Thus, non-adherence to medical treatment may be more frequent. Another limitation was not using instruments to track

cognitive impairment and frailty in the elderly. Thus, the subject's health record was analysed to identify the absence of cognitive impairment for inclusion in this study.

It should be noted that glycemic control in the elderly depends on individual characteristics, life expectancy, pharmacotherapy, as well as family and social support. Current evidence has not shown that strict glycemic control prevented microvascular and macrovascular complications. However, one should keep in mind the risks of hypoglycemia and potential adverse events to the drugs used [1, 2, 29].

In this context, the data shown here contribute to the understanding of the phenomenon of low adherence to medical treatment and to the planning of strategic actions for glycemic control among elderly people at FHUs. It is believed that the evidence shown here is consistent with

other primary health care services. Therefore, educational and motivational activities should be implemented to stimulate self-care practice. Support should also be given to health care managers to strengthen the institutional policies, which is crucial to reduce unfavourable clinical outcomes resulting from the non-adherence to medical treatment for T2DM.

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Declarations

Conflict of interest The authors declare no conflicts of interest.

Ethical approval The present study was approved in 06/02/2018 by the Dr. Joel Domingos Machado Research Ethics Committee of the Ribeirão Preto Medical School, University of São Paulo, Brazil, according to protocol number 2487864 and ethics certification number 82225317.0.0000.5414.

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