

## REFERÊNCIA

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# Access and adherence to medication among people with diabetes in Brazil: evidences from PNAUM

*Acesso e adesão a medicamentos entre pessoas com diabetes no Brasil: evidências da PNAUM*

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**ABSTRACT:** *Objective:* To describe people with diabetes in Brazil and to compare their sociodemographic characteristics, access and self-reported adherence to diabetes prescribed drugs. *Methods:* Data analysis from the National Survey on Access, Use and Promotion of the Rational Use of Medicines, a household survey, with sampling by clusters, according to sex and age domains and national and macro-regional representativeness. Adults ( $\geq 20$  years old) who reported having diabetes constituted the sample. The weighted frequencies of the variables in the sample were analyzed and the Pearson  $\chi^2$  test was applied to evaluate the statistical significance of the differences between the strata for the data of access, form of financing and adherence to the drugs, considering the level of significance of 5%. *Results:* We found a higher proportion of women, people over 60 years and economy class C. Most participants reported having two or more comorbidities, in addition to diabetes, and taking five or more drugs. Regarding access, 97.8% say they have access to prescription drugs for diabetes and 70.7% say they get them totally free of charge. There was low adherence to anti-diabetic treatment, with significant macro-regional differences ( $p = 0,001$ ), and greater vulnerability in the South and Northeast regions. *Conclusion:* Better access to diabetes medicines in the country has been demonstrated. However, to improve the efficiency of health public spending, it is necessary to achieve higher rates of adherence to treatment.

**Keywords:** Diabetes mellitus. Health services accessibility. Prescription drugs. Medication adherence. Public policies.

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**RESUMO:** *Objetivo:* Descrever as pessoas com diabetes no Brasil e comparar suas características sociodemográficas, o acesso e a adesão autorreferida aos medicamentos prescritos. *Métodos:* Análise de dados oriundos da Pesquisa Nacional sobre Acesso, Utilização e Promoção do Uso Racional de Medicamentos, um inquérito domiciliar, com plano amostral por conglomerados, segundo domínios de sexo e idade e representatividade nacional e macrorregional. Os adultos ( $\geq 20$  anos) que referiram ter diabetes constituíram a amostra. Analisaram-se as frequências ponderadas das variáveis na amostra e aplicou-se o teste do  $\chi^2$  de Pearson para avaliar a significância estatística das diferenças entre os estratos para os dados de acesso, forma de financiamento e adesão aos medicamentos, considerando o nível de significância de 5%. *Resultados:* Encontrou-se uma maior proporção de mulheres, de maiores de 60 anos e da classe econômica C. A maioria referiu ter duas ou mais comorbidades além do diabetes e tomar cinco ou mais medicamentos. Quanto ao acesso, 97,8% dizem ter acesso aos medicamentos prescritos para diabetes e 70,7%, que os obtêm de forma totalmente gratuita. Verificou-se baixa adesão ao tratamento farmacológico, com diferenças macrorregionais significativas ( $p = 0,001$ ) e maior vulnerabilidade nas regiões sul e nordeste. *Conclusão:* Demonstrou-se melhor acesso aos medicamentos para diabetes no país. Entretanto, para melhorar a eficiência dos gastos públicos, ficou demonstrada a necessidade de melhorar a adesão ao tratamento medicamentoso.

**Palavras-chave:** Diabetes mellitus. Acesso aos serviços de saúde. Medicamentos sob prescrição. Adesão ao tratamento medicamentoso. Políticas públicas.

## INTRODUCTION

Noncommunicable chronic diseases (NCDs), including diabetes mellitus (DM), are the leading cause of mortality and premature disability in most developing countries, including Brazil. This problem affects socioeconomic issues, increasing inequities and compromising the quality of life of millions of people<sup>1,2</sup>. The predictions regarding the evolution of its global prevalence are alarming. An international review of 751 studies on the worldwide trends in diabetes in the period 1980-2014 estimated an increase in cases of the disease from 4.3 to 9.0% and from 5.0 to 7.8% among adult men and women, respectively, when standardized by age<sup>3</sup>. National data on the prevalence of DM in Brazil come from surveys that use self-reported morbidity<sup>4,5</sup> and estimate a prevalence between 6.2 and 8.0%.

Morbidity data indicate that the disease contributes to the development of other neurological and macro and microvascular conditions, which may cause physical limitations and premature death<sup>6</sup>. The hospitalization rate for DM in Brazil has been estimated at around 77/100,000 population<sup>7</sup>. DM appears as the basic cause of death in about 55,000 deaths reported in Brazil, representing a mortality rate of 28.8/100,000 population in 2010<sup>8</sup>, of which 2.45/100,000 were due to acute complications<sup>9</sup>.

Brazil has prioritized DM in public health policies since 2001, with the implementation of the Plan for the Reorganization of Care to Hypertension and Diabetes Mellitus, of the National Program of Pharmaceutical Assistance for Hypertension and Diabetes and the Health Information System (SIS-Hiperdia)<sup>10</sup>. Since 2006, Federal Law No. 11,347

guarantees access to medication and self-monitoring supplies to people with DM<sup>11</sup>. Currently, the Brazilian Strategic Action Plan to Combat Chronic Non-communicable Diseases, (2011 – 2022<sup>12</sup>), and the organization of the National Public Health System (SUS) on networks to offer a comprehensive delivery system design for chronic conditions, promote integrated treatment of people with DM, with the coordination of actions from primary health care (PHC)<sup>13</sup>.

Therapeutic goals for people with DM include controlling metabolic changes, preventing complications and promoting quality of life. Thus, the most effective treatment associates non-pharmacological measures (physical activity and diet) with pharmacological measures (hypoglycemic agents)<sup>14,15</sup>. Therefore, access and adherence to medication are important factors in achieving these goals.

By 2014, access to medication in Brazil was only studied indirectly<sup>16-18</sup> or in local<sup>19-22</sup> and regional studies<sup>23</sup>, with different approaches, analytical cuts, methodologies and with little possibility of expansion of results. Results from the Brazilian National Health Survey (NHS) provided information on the use of the Brazilian Popular Pharmacy Program (BPPP)<sup>24</sup>, the prevalence of use of NCD medicines<sup>25</sup>, and the care of people with self-reported DM in Brazil, such as the use of medications (oral or insulin)<sup>26</sup>.

Adherence to treatment is defined as the degree to which a person's behavior — taking a medication, following a diet and/or performing lifestyle changes — corresponds to the recommendations agreed upon with a health professional<sup>27</sup>. Non adhesion to treatment, especially of NCD such as DM, leads to serious health consequences such as the reduction of the quality of life of users and family members and the increase of direct and indirect health costs<sup>27-29</sup>. We found no studies on adherence to treatment among people with DM with national coverage before 2014. We could only find local studies<sup>30-32</sup>, which used different methods to measure adherence.

Thus, before the National Survey on Access, Utilization and Promotion of the Rational Use of Medicines in Brazil (PNAUM)<sup>33,34</sup>, we observe a gap of studies with greater generalization power and external validity that portray the access and way of obtaining medicines. PNAUM aimed to verify the advances of the National Medicines Policy (NMP) in Brazil, evaluating the expansion of its access and its use in different population groups and characterizing the morbidities for which these medicines are used<sup>33,34</sup>.

The present study approaches the PNAUM to describe and analyze the profile of people with DM in Brazil — socioeconomic and demographic characteristics, aspects related to health and use of health services — and especially to characterize access and adherence to non-insulin hypoglycemic drugs prescribed for the treatment of the disease.

## METHODS

PNAUM is a population-based household survey with a cross-sectional design based on a probabilistic sample of the Brazilian population. Data collection took place from September

2013 to January 2014. The study population was composed of residents of private households in urban areas of the Brazilian territory, all ages included ( $n = 41,433$ ). Sample size estimates considered 8 demographic domains (different sex and age ranges) for each macroregion in the country, resulting in 40 sample domains. In order to reach the expected proportion of each demographic group in the final sample, the sample was selected in three stages: municipality (primary unit); census area and domicile; and individuals within households. That is, it is a complex sample with national representativeness from the five macroregions of Brazil, stratified by sex and age groups<sup>33,34</sup>.

In order to carry out this study, we sectioned PNAUM database using as inclusion criteria subjects 20 years of age and older who answered affirmatively to the question: "Has a doctor ever told you that you have diabetes or high blood sugar?" ( $n = 2,624$ ,  $N = 8,154,204$ ) with yes and no as possible answers<sup>33</sup>. The estimated prevalence of self-reported DM in the total sample was 6.8%<sup>35</sup>.

## STUDY VARIABLES

The available data from PNAUM allowed the investigation of the following variables for the demographic and socioeconomic characterization of the people with DM: sex (male or female); age group (20 – 59 years and 60 years and older); race/skin color (according to the classification of the Brazilian Institute of Geography and Statistics, white, brown, black and others – for Asian and indigenous people); marital status (with or without partner); level of schooling (categorized from full years of study — never went to school, complete primary education, complete secondary education and higher education or more); economic classification (according to the Brazilian Classification of Economic Criteria – BCEC, developed by the Brazilian Research Company Association – ABEP, 2013<sup>36</sup>, under categories A/B, C and D/E); coverage by private health plan (yes or no); and region of the country (North, Northeast, Southeast, South and Midwest).

Regarding the characteristics of the disease, we analyzed the time of diagnosis of DM (categorized as follows from the declared diagnosis year in: up to 5 years, 5-10 years, 10-15 years and 15 or more); comorbidities (classified as: only DM, 1 more chronic condition and 2 or more chronic conditions); frequency of comorbidities or referred complications (hypertension, dyslipidemia, heart disease, depression); self-perception of health (arranged in a five-level scale ranging from very good to very bad); perception of limitations imposed by DM (arranged in a five-level scale ranging from not limited to very intensely limited); and frequency of hospital admission and use of emergency care, by any reason, in the last 12 months. In addition, we described the number of continuous- and/or eventual-use medications in the last 30 days.

We evaluated the access to medicines for DM treatment for the prescribed hypoglycemic agents (excluding insulins and their analogues) based on the theoretical model developed by Penchansky and Thomas (1981)<sup>37</sup> and adapted by Luiza (2003)<sup>38</sup> using two variables: access to medicines and purchasing methods.

Access was defined as the acquisition of medicines prescribed for DM and classified into three categories: total (when the respondent had access to all drugs prescribed for DM

within 30 days prior to the interview); partial (if respondent lacked any medication in the period); or null (if no prescribed medication was obtained in the period, due to lack of user resources or lack of supply in the SUS unit)<sup>32,33</sup>.

The method of purchasing was also classified into three categories: free (when the respondent did not pay for any DM medication); mixed (at least one of the medicines was purchased out of the respondent's own resources); or out of their own resources (when respondents paid for all medicines in use)<sup>32,33</sup>.

The analysis of adherence to treatment with hypoglycemic agents (excluding insulins and their analogs) among people with DM was done using a scale generated from the Brief Medication Questionnaire (BMQ)<sup>39</sup>, which assesses adherence from three dimensions: regimen screen (five questions), belief screen (two questions) and recall screen (two questions). This questionnaire was tested for NCDs and validated for Brazilian Portuguese<sup>40</sup>. The calculated score allows the classification of adherence as: adherence (did not answer affirmatively to any questions); probable adherence (said yes to only one question); probable low adherence (answered yes to two questions); and low adherence (said yes to three or more questions).

## DATA ANALYSIS

Data were analyzed from a database stored in the Statistical Package for the Social Sciences (SPSS) version 18.0® for Windows (SPSS Inc., Chicago, IL, USA). CSPLAN command set was used, suitable for the analysis of complex samples, guaranteeing the necessary sample weighting<sup>33,34</sup>. The variables were calculated in percentages, with respective 95% confidence intervals (95%CI) and Pearson's chi-square tests were used to evaluate the statistical significance of the differences between the strata, considering a significance level of 5%. Results with coefficients of variation greater than 30% were pointed out due to the need for caution when interpreting the data.

## ETHICAL ASPECTS

The source research was approved by the Brazilian National Commission for Research Ethics (CONEP) through Opinion no. 398,131, dated September 16, 2013. Interviews were all conducted after participants or their legal guardians read and signed the Informed Consent Form.

## RESULTS

We observed the predominance of elderly women (60 years of age or older), people with complete primary education, members of socioeconomic class C and without private health insurance coverage (Table 1).

The characteristics of the disease, its comorbidities and limitations, and self-perception of health among people with DM are presented in Table 2, which reveals a predominance of recent diagnoses (45.6% up to 5 years). Most subjects had a prescription of 4 or more medications of occasional or continuous use in the 30 days prior to the interview (41.7%; 95%CI 38.7 – 44.8), and used 0-19 different medicinal products, with a median of 4 medicines in use by the same person during the period.

Most people with DM reported having two or more comorbidities. However, self-reported health and the reported limitation of daily activities yielded more positive results: almost 80% considered their health to be fair or good and approximately 66% considered that DM did not limit their activities. About 28% of people reported using emergency services and about 15% reported hospitalization in the 12 months prior to the interview.

Total access to the evaluated hypoglycemic drugs was broad (almost 98%) and without statistically significant differences (Table 3). The variables *schooling* and *race/color* – which are not included in the table – were analyzed and did not have significant differences either ( $p = 0.694$  and  $0.853$ , respectively).

The results of the drug financing method (Table 4) showed statistically significant differences for the variables *Region*, *BCEC* and *private health plan*. The frequency of subjects who received free medication for DM treatment (with total public financing from SUS) was 70.7%. The variables *schooling* and *race/color* were evaluated and were not significant ( $p = 0.848$  and  $0.072$ , respectively).

Regarding adherence to treatment with hypoglycemic agents, we observed a low percentage of adherence (2%; 95%CI 1.3 – 3.1), and most people with DM classified as probable adherence (71%; 95% IC: 67.2 – 74.5). However, an expressive part was classified as probable low adhesion (9.8%, 95% IC, 8 – 12) or low adhesion (17.2%, 95%CI 14.6 – 20.1). The difference in adherence to DM treatment was significant only for the variable *Region* ( $p = 0.001$ ), with the midwest region having the highest adherence rates (6.2%; 95%CI 3.6 – 10.3) and the northeastern region, the lowest (1.5%, 95%CI 0.6 – 2.8). The southern region had the highest rates of low adhesion (23.0%; 95%CI 18.1 – 28.8), as it can be observed in Figure 1A. Results for other variables observed, such as sex (Figure 1B), showed no significant differences between adhesion and low adhesion.

## DISCUSSION

The higher proportion of women and elderly found in the sample studied corroborates the results presented in the NHS conducted in 2013: a higher prevalence of DM among women compared to men, in a ratio of 2:1<sup>4</sup>.

The percentage of people with DM who reported never having studied was high, in accordance with other national surveys that point to the higher health vulnerability of low education groups<sup>4,5</sup>. That is, chronic diseases seem to be more prevalent among the country's most vulnerable populations, which increases inequity among countries and among populations within the same country<sup>2,41</sup>.

**Table 1.** Socioeconomic and demographic characteristics of people aged 20 years or older who reported having diabetes (n = 2,624). PNAUM, Brasil, 2014.

Variables	%*	95%CI
Sex		
Male	37.5	35.0 – 40.1
Female	62.5	59.9 – 65.0
Age (years)		
20 – 39	7.5	5.9 – 9.5
40 – 59	39.5	37.0 – 42.1
≥ 60	53.0	50.5 – 55.6
Race/Skin color		
White	49.2	45.4 – 53.0
Brown	39.2	35.8 – 42.7
Black	10.1	8.5 – 11.9
Others	1.4	0.7 – 1.8
Marital status		
With a partner	61.4	58.6 – 64.0
Without a partner	38.6	36.0 – 41.4
Education		
Never went to school	15.7	13.7 – 17.9
Complete primary education	42.1	39.1 – 45.1
Complete secondary education	32.0	29.2 – 35.0
Higher education or more	10.2	8.5 – 12.1
BCEC		
A/B	23.7	20.8 – 26.9
C	54.9	51.8 – 57.9
D/E	21.4	19.0 – 24.1
Private health plan		
Yes	25.4	21.9 – 28.1
No	74.6	71.9 – 78.1
Region		
North	4.3	3.3 – 5.5
Northeast	20.3	16.3 – 24.9
Southeast	53.0	46.8 – 59.1
South	15.0	11.8 – 18.8
Midwest	7.5	5.8 – 9.6

National Survey on Access, Use and Promotion of the Rational Use of Medicines in Brazil.

\*Percentage data originated from the expanded sample; 95%CI: 95% confidence interval; BCEC: Brazilian Criteria for Economic Classification of the Brazilian Research Company Association (ABEP), 2013.

The time of diagnosis, the age range of the population and the proportion of comorbidities and complications reported in the sample suggest late diagnosis, a fact reinforced by the complexity of the pharmacological treatment<sup>6,13-14</sup>.

The impact of the disease on people's quality of life — expressed in limitation of daily activities and self-perception of health — was small, which was considered a positive result

**Table 2. Characteristics of the disease of persons aged 20 years or older who reported diagnosis of diabetes (n = 2,624). PNAUM, Brazil, 2014.**

Variables	%*	95%CI
<b>Time of diagnosis of diabetes (years)</b>		
Up to 5	45.6	43.1 – 48.2
5 – 10	19.9	17.9 – 22.1
10 – 15	13.6	11.7 – 15.7
15 or more	20.9	18.9 – 23.1
<b>Comorbidities</b>		
Only diabetes	15.4	13.4 – 17.6
1 more chronic condition	29.7	27.2 – 32.3
2 chronic conditions or more	54.9	51.8 – 58.0
<b>Prevalence of comorbidities or complications</b>		
Hypertension	72.7	70.2 – 75.0
Dyslipidemia	36.6	33.9 – 39.3
Heart disease(s)	21.5	19.1 – 24.2
Depression	11.7	9.9 – 13.8
<b>Self-perception of health</b>		
Very good	2.7	2.0 – 3.7
Good	38.3	35.5 – 41.2
Fair	46.6	44.0 – 49.2
Bad	9.0	7.6 – 10.5
Very bad	3.4	2.6 – 4.4
<b>Perception of diabetes limitation</b>		
Does not limit	65.8	63.3 – 68.2
Limits a little	19.2	17.2 – 21.3
Moderately limits	8.8	7.3 – 10.6
Intensely limits	4.1	3.2 – 5.3
Very intensely limits	2.2	1.5 – 3.1
Hospitalizations in the last 12 months	15.2	13.3 – 17.4
Use of emergency medical service in the last 12 months	27.7	25.0 – 30.5

National Survey on Access, Use and Promotion of the Rational Use of Medicines in Brazil.

\*Percentage data originated from the expanded sample; 95%CI: 95% confidence interval.

of the study for people with DM. The prevalence of depression was lower than expected when compared to data from a systematic review of cross-sectional population-based studies conducted in the Brazilian adult population (13.7%)<sup>42</sup>. An international systematic review on depression and diabetes identified a higher prevalence of depression among people with DM, up to twice the prevalence of those without diabetes (19.1% for type 2 DM). However, the prevalence varied considerably among the studies analyzed due to the different methods used<sup>43</sup>.

The proportion of people in the sample who reported hospitalization for any cause in the 12 months prior to the interview was considered high. In a review study, Almeida et al<sup>44</sup> revealed a hospitalization rate of 10.26% among people who reported having a chronic

Table 3. Access to drugs prescribed for diabetes among 20 year olds and older who reported having diabetes according to demographic and socioeconomic characteristics. PNAUM, Brazil, 2014.

	Total access (%)	95%CI	Partial access* (%)	95%CI	Null access** (%)	95%CI	p-value
<b>Sex</b>							
Male	98.5	97.0 – 99.3	1.5†	0.7 – 3.0	–	–	0.225
Female	97.4	95.4 – 98.5	2.5	1.4 – 4.5	0.1	0.0 – 0.4	
<b>Age (years)</b>							
20 – 59	96.8	94.0 – 98.4	3.0†	1.5 – 5.9	0.2	0.0 – 0.6	0.084
Older than 60	98.5	97.4 – 99.2	1.5	0.8 – 2.6	–	–	
<b>Region</b>							
North	97.3	94.7 – 98.6	2.5†	1.2 – 5.0	0.2	0.0 – 1.4	0.899
Northeast	97.9	95.7 – 99.0	1.9†	0.9 – 4.1	0.2	0.1 – 1.4	
Southeast	97.9	95.3 – 99.1	2.1†	0.9 – 4.7	–	–	
South	97.7	94.5 – 99.0	2.2†	0.9 – 5.4	0.1	0.0 – 1.1	
Midwest	97.3	94.9 – 98.5	2.7†	1.5 – 5.1	–	–	
<b>BCEC</b>							
A/B	97.5	92.1 – 99.3	2.5†	0.7 – 7.9	–	–	0.877
C	97.9	96.2 – 98.9	2.0†	1.0 – 3.7	0.1	0.0 – 0.5	
D/E	97.8	95.2 – 99.0	2.2†	1.0 – 4.8	0.1	0.0 – 0.3	
<b>Private health plan</b>							
Yes	98.3	96.1 – 99.3	1.7	0.7 – 3.9	–	–	0.526
No	97.6	96.0 – 98.6	2.3	1.3 – 4.0	0.1	0.0 – 0.4	
Total	97.8	96.5 – 98.6	2.3	1.3 – 3.5	0.1	0.0 – 0.3	

National Survey on Access, Use and Promotion of the Rational Use of Medicines in Brazil. Percentage data originated from the expanded sample.

95%CI: 95% confidence interval; \*do not have access to at least one of the drugs of the drug therapy because they are not available or for not being able to afford them; \*\*do not have access to the drugs because they are not available and are not able to afford them; BCEC: Brazilian Criteria for Economic Classification of the Brazilian Research Company Association (ABEP, 2013);†coefficient of variation greater than 0.3: caution is suggested in the interpretation of the data.

disease. Francisco et al.<sup>45</sup>, in turn, reported a hospitalization rate of 19.6% among the elderly with DM in municipalities in the state of São Paulo. Despite the different designs, the studies indicate that hospitalization rates among people with DM are higher than the estimates obtained from the Datasus Hospital Information System (HIS), as described by Santos et al.<sup>7</sup>. This could be justified by the fact that the HIS is a management system and the completion of diagnosis or reasons for hospitalization are likely to underestimate the data of people with DM.

We found very low prevalences for emergency care in national studies. In the USA, a national survey conducted in 1999 indicated a prevalence of 26.9%<sup>46</sup>; in Australia, a longitudinal study among people with DM found a prevalence of 21.6%<sup>47</sup>, results close to those found in our study.

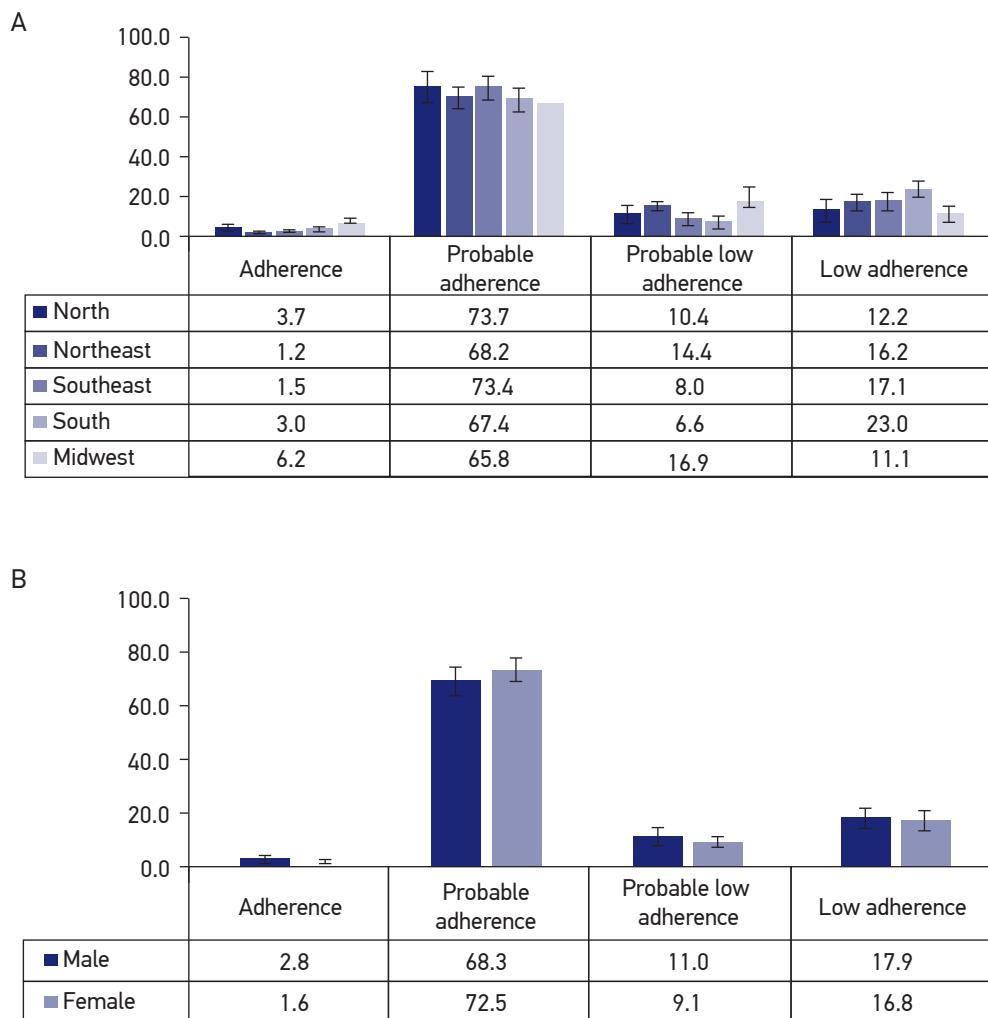
**Table 4.** Access to drugs prescribed for diabetes among 20 year olds and older who reported having diabetes according to demographic and socioeconomic characteristics. PNAUM, Brazil, 2014.

	Free (%)	95%CI	Mixed* (%)	95%CI	Own expense** (%)	95%CI	p-value
<b>Sex</b>							
Male	65.7	59.3 – 71.1	10.2	7.2 – 14.3	24.0	18.8 – 30.2	0.052
Female	73.5	69.5 – 77.2	7.1	5.4 – 9.2	19.4	16.2 – 23.0	
<b>Age (years)</b>							
20 – 59	73.4	68.2 – 78.0	7.2	4.9 – 10.4	19.4	15.4 – 24.2	0.220
Older than 60	68.5	64.4 – 72.4	9.1	7.2 – 11.4	22.4	18.9 – 26.3	
<b>Region</b>							
North	63.0	55.3 – 70.1	8.1	5.1 – 12.6	28.9	22.7 – 36.0	0.016
Northeast	66.4	60.8 – 71.1	6.5	4.5 – 9.4	27.1	22.4 – 32.2	
Southeast	73.1	67.1 – 78.4	7.9	5.4 – 11.4	19.0	14.4 – 24.7	
South	74.5	68.1 – 80.0	10.3	7.3 – 14.3	15.2	10.8 – 21.0	
Midwest	61.7	52.8 – 69.8	13.8†	7.4 – 24.3	24.6	18.2 – 32.3	
<b>BCEC</b>							
A/B	63.3	56.0 – 70.0	11.4	7.7 – 16.4	25.4	19.3 – 32.5	0.037
C	71.4	66.5 – 75.9	8.0	6.0 – 10.6	20.6	16.7 – 25.1	
D/E	77.5	70.7 – 83.1	5.2	2.9 – 9.2	17.3	12.5 – 23.5	
<b>Private health plan</b>							
Yes	49.9	42.6 – 57.2	15.1	10.7 – 20.8	35.1	28.8 – 41.9	< 0.001
No	78.6	75.0 – 81.8	5.6	4.1 – 7.6	15.8	13.0 – 19.1	
Total	70.7	67.1 – 74.1	10.2	7.2 – 14.3	21.1	18.1 – 24.4	

National Survey on Access, Use and Promotion of the Rational Use of Medicines in Brazil. Percentage data originated from the expanded sample.

\*Purchase one or more drugs with their own resources; \*\*Purchase all drugs with their own resources; BCEC: Brazilian Criteria for Economic Classification of the Brazilian Research Company Association (ABEP) 2013; †coefficient of variation greater than 0.3: caution is suggested in the interpretation of the data.

There are no comparative studies on drug access for DM treatment that use PNAUM findings. A study that uses data from the 2008 National Household Sample Survey (PNAD) estimated a rate of approximately 30% of free access to medications of continuous use among the elderly<sup>18</sup>. Other analytical studies of the NHS estimated that 80.2% of people with DM who were 18 years of age or older used medicines (oral and/or insulin)<sup>26</sup>, of which 57.4% acquired at least one through the BPPP<sup>25</sup>.



Data from the National Survey on Access, Use and Promotion of the Rational Use of Medicines in Brazil.

\*Scores obtained from answers to the Brief Medication Questionnaire (Svarstad et al., 1999<sup>39</sup>) Portuguese version (Ben et al., 2012<sup>40</sup>): adherence (did not answer yes to any question), probable adherence (answered yes to only one question) probable low adherence (answered yes to two questions) and low adherence (answered yes to 3 or more questions); \*\* Percentage data originated from the expanded sample.

Figure 1. Adherence score to drug treatment for diabetes\* among those over 20 years old who reported having the disease\*\* according to the country's Region (A) and sex (B). PNAUM, Brazil, 2014.

Access to hypoglycemic drugs (except insulin and its analogues) was found to be quite high, with the vast majority of people getting all medicines free of charge, especially those with a lower economic level and without a private health plan coverage, totally dependent on SUS. This finding is in line with what was suggested in a study carried out in the city of São Paulo<sup>22</sup>, that is, the financing of pharmaceutical assistance can contribute to equity of access to health. For other NCDs, free access was not as broad, as pointed out by Tavares et al. in another PNAUM study (48%).<sup>48</sup>

However, the data show some regional weaknesses in access to medication in the country, with greater vulnerability in the Midwest and North regions. Thus, these gaps should be observed with new studies in an attempt to find solutions to reduce regional inequities.

In addition, it is essential to guarantee the efficient use of medicines through the improvement of adherence to treatment among beneficiaries. The literature emphasizes that, if, at the end of the whole care process, patients fail to adhere to treatment, the whole health system fails and expenditures can be considered inefficient<sup>27-29</sup>.

A recent systematic review of 27 studies on adherence among people with DM<sup>49</sup> reports drug adherence rates ranging from 38.5-93.1%. Only 6 studies reported rates higher than 80%, which was considered acceptable by the authors.

Adhesion rates found in national studies also vary widely. Cross-sectional studies involving DM patients in PHC reported rates between 13.7 and 84.4%<sup>30-32</sup>, depending on the method used to measure adherence. It is possible to observe the great variation between the rates found in the literature, probably due to the methods applied and interpretation of the results.

Adherence results for the present study were presented in four levels, based on BMQ scores. We verified that only 2% of people with DM were considered adherents, well below the values found in the literature. If the first two levels were grouped (adherence and probable adherence), the prevalence of adherence would be compatible with that described in the literature, but still below what would be considered acceptable<sup>47</sup>. In addition, we found significant regional differences, which should be further studied.

Besides the informed prevalence bias that the surveys may present, the survival factor is considered a limitation of the present study, since the sample was not corrected for the early deaths due to DM and its comorbidities, cases that could have worse results in the health conditions<sup>50</sup>. Also, the use of self-reported morbidity and memory bias in the assessment of dependent variables, access and adherence to treatment, may bring error analysis. In addition, we used a subjective method (validated questionnaire) to access adherence, which, according to the literature, has some limitations<sup>51</sup>.

However, we consider that the originality of the data brings to light important results on health policies that should be widely debated. We believe that new studies could support the alignment of policies and new actions to improve the delivery system design and healthcare system based on the best scientific evidence.

## CONCLUSION

The present study brings unprecedented data on access and adherence to treatment for people with diabetes, as well as the socioeconomic, demographic and health characteristics of this population. Our results suggest that the access and the way of getting hypoglycemic drugs among the Brazilian population, between 2013 and 2014, occurred in order to guarantee equity of access to health.

We verified the effectiveness of pharmaceutical assistance programs to guarantee the access to pharmacological treatment for people with DM, demonstrating that well-structured health policies and legislation can support the viability of the constitutional right to health.

However, low adherence deserves reflection. New studies should be conducted aiming at the formulation of effective interventions that have an impact on the reduction of health costs and on people's quality of life. Consequently, we should observe a greater efficiency in the application of public resources.

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