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Original Article

Patients lacking glycemic control place more burdens on health services with the use of medications

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ABSTRACT

Introduction: DM spending in the world is high, and Brazilian studies of public spending caused by DM are scarce.

Objective: To estimate the annual direct cost for the municipal health sphere, related to DM2 treatment, in patients with and without glycemic control.

Method: A cross-sectional study carried out in a city in the interior of Minas Gerais state, with patients with DM2, being municipal PHS users. Data were collected from the computerized system of the municipality and patient records, and analyzed using the IBM SPSS v.19 statistical package. The response variable was categorized into controlled A1c ($\leq 7\%$) and uncontrolled A1c ($> 7\%$).

Results: Glycemic control in 56.6% of the patients was unsatisfactory; the mean cost of pharmacotherapy for DM2 was US\$ 3.14 per year for patients in the control group and US\$ 45.54 per year for uncontrolled patients.

Conclusion: Patients with unsatisfactory glycemic control are more expensive for the municipal health system.

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1. Introduction

Worldwide DM spending ranges from US\$ 673 million to US\$ 1.197 billion annually. By 2015 there were 415 million adults with DM in the world, and it is estimated that this number could reach 642 million by 2040 [1]. In Brazil the DM population is approximately 12 million, and DM type 2 represents 90% of the cases [2].

For the treatment of DM and its complications, there are direct medical costs such as medication, hospitalizations, complementary exams, prosthetics and medical fees. There are also non-medical costs such as transportation of the patient to the hospital, hiring of temporary nurses, and indirect costs that are the social costs that result in loss of productivity, disability, premature death and decrease in the patient's quality of life due to illness [3].

Direct DM costs range from 2.5 to 15% of a country's annual health budget [2]. The total cost of DM outpatient care is

approximately US\$ 2108/patient/year, of which 63.3% is related to direct costs and 36.7% to indirect costs [4].

Despite the great relevance of chronic diseases to the PHS, Brazilian studies of public expenditures caused by DM are scarce. Given this and the limited financial resources allocated to health in the current Brazilian context, it is essential to investigate costs related to this disease, which has a growing prevalence in Brazil.

The objective of the study is to estimate the annual direct cost for the municipal health sphere, related to DM2 treatment, in patients with and without glycemic control.

2. Methodology

Cross-sectional study based on baseline data from the study "Pharmacoeconomic Analysis of an Individual Strategy for Pharmacotherapeutic Empowerment of Patients with Type II Diabetes Mellitus" [5]. The study was carried out with patients residing in an area covered by five primary care centers in a city in the interior of the state of Minas Gerais, Brazil, under the perspective of the Public Health System (PHS).

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The sample size was established for a larger study in order to allow the detection of a difference of 0.67 in the mean of Glycated Hemoglobin (A1c), it was estimated that a minimum study population of 80 patients was necessary [5,6]. For this estimation a 95% confidence interval, 80% power and 1.69 variance, and an estimated loss of 25% of the sample were considered.

All patients who were enrolled in the Hypertension and Diabetes program (HIPERDIA) and who fulfilled the following inclusion criteria were selected: age equal to or greater than 18 years, of both genders, and with low or moderate cardiovascular risk, according to the score of Framingham [7].

Individuals from other intervention projects related to DM education, patients with reduced cognitive ability (categorized by the primary care center team as unable to reproduce the information passed on), patients with no A1c score, or with duplicate and/or incomplete data in the Integrated Health System (IHS – health information system used in the municipality) during the collection period, were excluded.

The pharmacotherapeutic schemes of the patient and the A1c value were collected from the Integrated Health System (IHS) and from the patient's records. To estimate the cost of treatment, the period of one year of treatment was considered. Glycemic control of the patient was established by the A1c score recorded in the IHS and categorized into two groups: controlled A1c ($\leq 7\%$) and uncontrolled A1c ($> 7\%$) [3].

The explanatory variables considered were: gender, age, marital status, race, schooling and pharmacotherapy. The latter variable was divided into two groups: number of medications for DM2, and other medications.

To estimate the annual consumption of each medication, the daily dosage was multiplied by the number of days of use during the period of data collection. For acute medications, such as analgesics and anti-inflammatories, the quantity considered was 20 tablets, according to the Standard Operating Procedure (SOP) established by the municipality. The cost of medications and supplies was obtained from the Municipal Health Department (SEMUSA) and the value considered was the amount paid by the municipality for the medications in accordance with the bidding process for acquisition for the year 2015. The amounts were converted into US dollars from the website of the Central Bank of Brazil [8], based on the quotation on September 14, 2017.

The analyzes were performed considering a 95% significance level, through the IBM SPSS v.19 statistical package. Data normality was analyzed by the Kolmogorov-Sminorv test, and the Student's *t*-test, Fisher's Exact Test, Mann-Whitney Test and Chi-Square were also performed.

The study was approved by the Research Ethics Committee of the Federal University of São João Del-Rei, Central West Campus, number CAAE 32787914.0.0000.5545.

3. Results

A total of 352 primary care center users were identified, of which 176 (50.0%) were not eligible because they had high cardiovascular risk or another type of diabetes, thus 176 (50.0%) were potentially eligible. When analyzing the exclusion criteria, 83 patients were selected. After recruitment, the patients were classified according to A1c values, with 36 patients (43.4%)

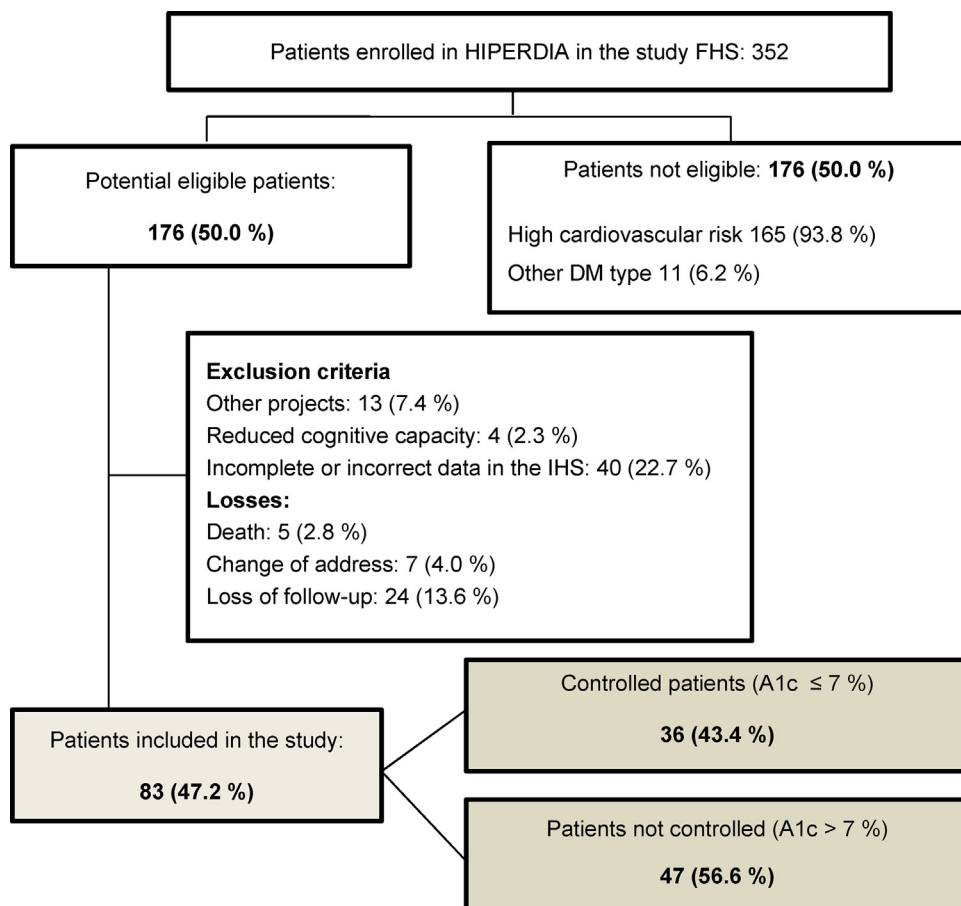


Fig. 1. Recruitment of patients for the study. Legend: IHS: Integrated Health System; DM: Diabetes Mellitus; HIPERDIA: Registration and monitoring system of hypertensive and diabetic patients; FHS: Family Health Strategy.

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