

The cost of type 1 diabetes: a nationwide multicentre study in Brazil

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Objective To determine the direct medical costs of type 1 diabetes mellitus (T1DM) to the National Brazilian Health-Care System (NBHCS) and quantify the contribution of each individual component to the total cost.

Methods A retrospective, cross-sectional, nationwide multicentre study was conducted between 2008 and 2010 in 28 public clinics in 20 Brazilian cities. The study included 3180 patients with T1DM (mean age 22 years \pm 11.8) who were surveyed while receiving health care from the NBHCS. The mean duration of their diabetes was 10.3 years (\pm 8.0). The costs of tests and medical procedures, insulin pumps, and supplies for administration, and supplies for self-monitoring of blood glucose (SMBG) were obtained from national and local health system sources for 2010–2011. Annual direct medical costs were derived by adding the costs of medications, supplies, tests, medical consultations, procedures and hospitalizations over the year preceding the interview.

Findings The average annual direct medical cost per capita was 1319.15 United States dollars (US\$). Treatment-related expenditure – US\$ 1216.33 per patient per year – represented 92.20% of total direct medical costs. Insulin administration supplies and SMBG (US\$ 696.78 per patient per year) accounted for 52.82% of these total costs. Together, medical procedures and haemodialysis accounted for 5.73% (US\$ 75.64 per patient per year) of direct medical costs. Consultations accounted for 1.94% of direct medical costs (US\$ 25.62 per patient per year).

Conclusion Health technologies accounted for most direct medical costs of T1DM. These data can serve to reassess the distribution of resources for managing T1DM in Brazil's public health-care system.

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Introduction

Type 1 diabetes mellitus (T1DM) is a chronic lifelong disease, commonly diagnosed in youth, that requires strict multidisciplinary treatment for the patient's entire life.¹ Over the last decades, the incidence of T1DM has been increasing in most regions of the world.^{2,3} In the State of São Paulo in Brazil, the average annual incidence of T1DM between 1987 and 1991 was 7.6 per 100 000.⁴ Additionally, in the city of Bauru in the same state, the incidence of T1DM in children younger than 15 years, increased 9.6 times from 1986–2006, especially among children of low socioeconomic status between the ages of 5 and 9 years.⁵

T1DM is associated with long-term complications that cause high morbidity and mortality,⁶ affect the quality of life and increase health-care costs.^{7,8} In the Diabetes Control and Complications Trial (conducted from 1983 to 1993) and its follow-up study, known as the Epidemiology of Diabetes Interventions and Complications study (DCCT/EDIC), which assesses incidence, predictors of complications, and the impact and cost-effectiveness of intensive versus standard control, intensive control has been shown to reduce the development of microvascular and cardiovascular complications^{2,9} and to be cost-effective.¹⁰ Nonetheless, approximately one third of the patients who participated in our study were not screened for chronic complications over the previous year and the majority did not meet metabolic control goals.¹¹

In the United States of America, average health expenditure is 2.3-fold higher for people with diabetes than for people without the disease.⁸ In a study in Scotland, the hospitaliza-

tion rate and inpatient costs among people with diabetes were 2.1- and 2.2-fold greater, respectively, than among the general population.¹² Most costing studies on diabetes include both T1DM and type 2 diabetes mellitus (T2DM),⁸ or only T2DM.¹³ Hence, little is known about the impact of T1DM alone.¹² Although previous studies have investigated the costs associated with diabetes in Brazil,^{7,14} the impact of T1DM alone has never been assessed.

The objective of this study was to perform a partial economic evaluation of the direct medical costs of T1DM, from the public health-care system's perspective, in a representative sample of patients attending the public health-care system in Brazil. We also aimed to identify and quantify the contribution of individual determinants to the total direct costs. Data on the use of resources and on the costs of T1DM from the public health-care system's perspective will allow health-care providers to better understand the effects of the disease, define management strategies and appropriately allocate resources.

Methods

Study design

This study was a retrospective, cross-sectional cost-of-illness study conducted nationwide at multiple centres between December 2008 and December 2010. The centres were 28 Brazilian secondary and tertiary public care clinics located in urban centres in four geographic regions of Brazil: north/north-east, mid-west, south-east and south. All patients received health care from the National Brazilian Health Care

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System (NBHCS). We determined the number of patients enrolled in the study in each region on the basis of the estimated prevalence of T1DM in Brazil and the population density in each geographic region. Since patients with T1DM in Brazil are usually treated at secondary or tertiary centres, primary care centres were not included in the study. Each clinic provided data from at least 50 consecutive outpatients with an initial diagnosis of T1DM who regularly attended the clinic. Data were collected through interviews during clinic visits using a chart form. The detailed methods have been described elsewhere.¹¹ Written informed consent for the study was obtained from all patients aged 18 years or older or from the parents or guardians of patients younger than 18 years. The study was approved by each local centre's ethics committee. Only patients who had had at least 12 months of follow-up at the centre were included in the cost-of-illness study. This inclusion criterion allowed us to quantify the variables required to determine costs over the year that preceded the study.

Clinical and demographic variables

We obtained demographic data and data on economic status and defined economic status according to the Brazilian Economic Classification Criteria,¹⁵ used to estimate the purchasing power of urban individuals and families and to classify the urban population into economic strata. These criteria provide scores based on the ownership of items and educational level.¹⁵ We defined the duration of the diabetes as the time elapsed since the diagnosis.

During the clinic interviews we obtained information on diabetic treatment modalities; source of insulin pumps, medications and supplies for self-monitoring of blood glucose (SMBG); frequency of SMBG, and routine diabetes care. We obtained the following information from medical records: total number of glycated haemoglobin (HbA1c) measurements over the prior year, fructosamine levels, fasting and 2-hour postprandial glycaemia, total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), triglycerides, uric acid, plasma creatinine, plasma urea, sodium, potassium, liver enzymes (aspartate [AST] and alanine aminotransferase [ALT]), C-reactive protein (CRP),

thyroid-stimulating hormone (TSH), urine protein and urine albumin. We recorded the number of tests performed to screen for complications of diabetes, such as electrocardiograms, exercise stress tests, stress echocardiographs, calcium score tomographies, coronary artery angiographs and fundoscopies. We also analysed the frequency of various medical procedures, such as vitrectomy, laser therapy and haemodialysis, and of hospitalizations due to diabetes decompensation or ketoacidosis.

Costs and health-care resource distribution

We calculated direct medical costs from the costs of medications (oral drugs and insulin), SMBG supplies, blood analysis and other tests, consultations with physicians, nurses and dietitians, medical procedures and hospitalizations during the preceding year. The drugs included in the analysis were those used specifically to treat T1DM or its comorbidities (arterial hypertension, dyslipidaemia, obesity) and related complications (diabetic nephropathy/chronic renal failure, neuropathy and neuropathic pain, retinopathy, cardiovascular disease). We also included the costs of the nutritional supplements given to patients with chronic renal failure or neuropathy, such as calcium, vitamin D and vitamin B12. In the case of drugs provided by public institutions, we obtained the costs from the web site of the Brazilian Ministry of Health¹⁶; for drugs that were privately acquired, we used the average price found in three nationwide pharmaceutical web sites. These privately-acquired drugs include medications or supplies that are not standardized by the health system. When the price varied by region, we calculated an average cost. We obtained the costs of tests and medical procedures from a 2010–2011 NBHCS source that gives the prices used to reimburse public health-care units. The cost of insulin pumps and administration supplies was based on what the Municipal Health Bureau of Rio de Janeiro (RJ-SMS) paid in May 2010 (Roche). We determined the costs of SMBG supplies from what the RJ-SMS paid in April 2011 or, when privately acquired, by calculating the mean costs for three nationwide pharmaceutical companies.

We converted all costs to United States dollars (US\$) using a conversion rate of US\$ 1.00 = 1.9315 reais, which

was the average for the period from 2008 to 2010.

Data storage and statistical analysis

We used Excel 2010 for Windows to store the data and we performed the statistical analysis with SPSS version 17.0 (SPSS Inc., Chicago, United States of America). The data are presented in **Table 1** as count (percentage), mean \pm standard deviation (SD) and median followed by its interquartile range. The costs are presented as means with their 95% confidence intervals (CIs). We log-transformed the non-normally distributed variables and compared means using *t*-tests or ANOVA.

Results

Of the 3591 patients initially evaluated, 3180 were included in this study. The study population consisted of 56.3% females and 57.4% Caucasians. The average age was 22 years (SD: \pm 11.8) and average disease duration was 10.3 years (SD: \pm 8.0). **Table 1** shows the demographic and economic data pertaining to the study population.

The overall direct medical cost per capita was US\$ 1319.15. The expenditure related to treatment – US\$ 1216.33 per patient per year – represented 92.20% of this total direct medical cost. Insulin administration supplies and SMBG – US\$ 696.78 per patient per year – accounted for 52.82% of total direct medical costs. The expenditure on insulin pump and its supplies represented 5.5% of the total direct cost. Only 38 (1.2%) patients used this treatment modality, at an average cost per patient of US\$ 6069.26. Medical procedures and haemodialysis accounted for 5.73% – US\$ 75.64 per patient per year – of the direct medical costs. The cost of consultations – US\$ 25.62 per patient per year – accounted for 1.94% of direct medical costs. The data are presented in **Table 2**.

The direct medical costs associated with T1DM, stratified by patients' demographic characteristics, are presented in **Table 3**. We found no significant differences in costs by sex and age range. However, the longer the duration of the diabetes and the higher the socioeconomic status, the higher the costs. Costs showed a significant 1.56-fold increase between diabetes of less than 5 years' duration and diabetes whose duration was 15 years or longer. Similarly, costs

Table 1. **Clinical and demographic characteristics of patients with type 1 diabetes mellitus (*n* = 3180), Brazil, 2008–2010**

Characteristic	Value
Female sex, no. (%)	1791 (56.3)
Mean age, years (SD)	22 (11.8)
Age range, years (%)	
0–4	51 (1.6)
5–9	308 (9.7)
10–14	604 (19)
15–29	1471 (46.3)
≥ 30	746 (23.5)
Ethnicity, no. (%)	
Caucasian	1824 (57.4)
Non-Caucasian ^a	1356 (42.6)
Socioeconomic status,^b no. (%)	
High	222 (7.2)
Medium	710 (22.3)
Low	1052 (33.1)
Very low	1102 (34.7)
Occupation, no. (%)	
Current worker	997 (31.4)
Unemployed	232 (7.3)
Temporarily medically disabled by NISS	52 (1.6)
Retired because of diabetes	85 (2.7)
Student	1483 (46.6)
Other ^c	331 (10.4)
Level of care, no. (%)	
Secondary	897 (28.2)
Tertiary	2283 (71.8)
Mean diabetes duration,^d years (SD)	10.3 (8.04)
HbA1c, % (SD)	9.34 (2.34)
With microvascular complications,^e no. (%)	635 (27.4)
With macrovascular complications,^e no. (%)	119 (5.1)

HbA1c, glycated haemoglobin; NISS, National Institute of Social Security; SD, standard deviation.

^a Afro-Brazilians, Mulattos, Asians, native Indians.

^b Data missing for 87 participants.

^c Includes preschool children, homemakers, volunteers and those who retired for reasons unrelated to diabetes.

^d Defined as the time elapsed since diagnosis.

^e Excludes patients without criteria for the screening for diabetic complications (*n* = 863).

were a significant 1.65 times higher among patients in the high socioeconomic stratum than among patients in the socioeconomic stratum classified as very low.

Discussion

This study is the first to estimate the direct medical costs of T1DM in a Brazilian sample of patients. T1DM represents an average cost of US\$ 1319.15 per patient for the NBHCS. Importantly, most expenditures were related to therapy, largely insulin, and to SMBG supplies, which are items that all patients with T1DM require. These requirements may explain why the per capita medical

costs calculated in this study are higher than the costs found in studies that have mostly⁷ or exclusively included T2DM patients,¹³ who use insulin far less often than patients with T1DM. In 2007 in the United States, young insulin-treated patients in the private health-care system faced costs that were 1.64 times higher than those faced by patients who were not treated with insulin. The expenditure on diabetes supplies was 10 times higher among insulin-treated patients than among patients not treated with insulin. Regardless of the treatment modality, outpatient expenditures constituted the largest total expenditure (43 and 58% for insulin-treated and non-insulin-treated youths with diabetes,

respectively), followed by prescription drugs other than insulin (39 and 26%, respectively) and inpatient expenditures (18 and 17%, respectively).¹⁷ These findings are consistent with ours because medications and blood glucose monitoring accounted for the largest fraction of the direct costs in our study.

As shown, treatment technologies accounted for most public expenditure; human resources accounted for little expenditure. These differences in the apportionment of Brazilian public health resources must be carefully examined because more money is being spent on SMBG supplies than on physician and dietitian consultations and nurse counselling. These findings point to the need to pay greater, more logistical and financial attention to the integral health assistance model, which involves investing in a multidisciplinary team and focusing on health education and on the rational and effective use of the procedures and technologies available. The complex treatment of T1DM, which requires vigilance and frequent monitoring, underscores the importance of the physician–patient relationship in establishing a partnership conducive to better treatment adherence. In fact, despite the high cost of SMBG, most patients in our sample had inadequate metabolic control, as found in previous studies.^{11,18} Factors other than effective SMBG are known to influence metabolic control, but it is clear that access to a given technology does not guarantee its correct use by the patient or good adherence to recommendations. Continued education is helpful but depends on the availability of capable staff trained for this purpose.

In a study of the costs associated with diabetes in Latin America, approximately US\$ 607 were spent per patient annually, on average, in Chile and Mexico, whose gross national products are roughly equal to that of Brazil.⁷ In this study, however, cost estimates were based on a standard generalized protocol that included three visits to a general practitioner, one visit to an ophthalmologist, one HbA1c test, one lipid profile, one electrocardiogram, one urine test (for proteinuria), and treatment with insulin or oral drugs. Thus, the results do not reflect actual individualized clinical expenditures, and costs may have been underestimated. In Brazil, the direct costs per capita and the overall health expenditure associated

Table 2. Average annual direct medical costs of inpatient and outpatient treatment of type 1 diabetes mellitus, Brazil, 2008–2010

	Average annual cost (US\$)	Percentage of total cost	Average annual cost per capita (US\$)
Consultations	81 473.67	1.94	25.62
Tests	161 817.64	3.86	50.89
Outpatient treatment	3 867 915.66	92.20	1216.33
Insulin	1 093 215.69	26.06	343.78
Oral drugs	87 782.17	2.09	27.60
Supplies for self-monitoring of blood glucose	2 215 749.68	52.82	696.78
Insulin pump and supplies	230 631.80	5.50	72.53
Medical procedures/haemodialysis	240 536.32	5.73	75.64
Hospitalizations	83 685.41	2.00	26.32
Total direct medical costs	4 194 892.39	100.00	1319.15

US\$, United States dollar.

Table 3. Direct medical costs associated with type 1 diabetes mellitus, by patients' demographic characteristics, Brazil, 2008–2010

Characteristic	Mean (95% CI) direct medical cost (US\$)	P-value
Sex		0.294
Male	1288.23 (1 214.20–1362.25)	
Female	1343.13 (1 273.41–1412.85)	
Ethnicity		0.013
Caucasian	1374.85 (1 309.26–1440.43)	
Non-Caucasian ^a	1244.23 (1 164.07–1324.39)	
Age (years)		0.223
0–4	1145.00 (914.59–1375.41)	
5–9	1047.83 (963.31–1132.36)	
10–14	1198.92 (1 127.20–1270.64)	
15–29	1306.83 (1 233.62–1380.03)	
≥ 30	1564.72 (1 420.11–1709.34)	
Diabetes duration^b (years)		0.000 ^c
< 5	1086.89 (1 023.51–1150.28)	
≥ 5 but < 10	1220.69 (1 146.55–1294.82)	
≥ 10 but < 15	1301.80 (1 194.11–1409.50)	
≥ 15	1696.60 (1 549.52–1843.68)	
Socioeconomic status		0.000 ^d
High	1806.44 (1 565.34–2047.55)	
Medium	1561.45 (1 437.53–1685.37)	
Low	1302.24 (1 219.04–1385.45)	
Very low	1098.12 (1 022.02–1174.23)	

CI, confidence interval; US\$, United States dollar.

^a Afro-Brazilians, Mulattos, Asians, native Indians.

^b Defined as the time elapsed since diagnosis.

^c P-value is for the following age comparisons: ≥ 15 years versus < 5 years; ≥ 15 years versus ≥ 5 but < 10 years; ≥ 15 years versus ≥ 10 but < 15 years. Other comparisons were not statistically significant.

^d P-value is for the following comparisons of socioeconomic status: high versus low; high versus very low; medium versus low; medium versus very low. The comparison between high and medium socioeconomic status was not statistically significant.

with diabetes per capita were US\$ 872 and US\$ 270, respectively.⁷

In Brazil, the costs of certain drugs for diabetes and hypertension are fully

subsidized by the public sector; the federal government co-subsidizes private sector expenses through the Programa Farmácia Popular do Brasil (Brazilian

Popular Pharmacy Programme), developed by the health ministry. The public system also provides SMBG supplies, but not always in the amount needed or recommended for optimal patient monitoring and seldom uniformly across cities. Moreover, because the medications available through this programme do not always meet the patient's needs, some treatment costs must be paid by the patient or his family. Therefore, diabetes drugs and supplies can take up a substantial fraction of a family's income. Given that in 2009 the average Brazilian household had 3.1 members (4.2 if in the poorest socioeconomic category), any increase in household expenditures could undermine a family's quality of life.¹⁹ Approximately 68% of the participants in our study were of low or very low economic status. To save money, these individuals may use their supplies inappropriately (e.g. they may reuse disposable supplies, use lower doses of medication or perform SMBG less often than recommended by clinical diabetes monitoring and treatment guidelines). As our results showed, the costs associated with diabetes are greater among patients of higher economic status. For patients of very low and low economic status, costs are 65% and 39% lower than for patients of high economic status. This may be because people of a higher educational level may seek and adhere to more complex and expensive therapeutic regimens.

A study conducted in Israel in the 1990s projected the estimated costs of T1DM over a 35-year period.²⁰ The results indicated that early in the disease, basic treatment accounts for approximately 70% of total expenditures. However, in the later stages the costs associated with the complications of diabetes increase substantially.²⁰ In the present study, the per capita costs rose with the duration of the diabetes. Patients who had had diabetes longer than 15 years had costs about 56% higher than those who had had the disease for less than 5 years. It is reasonable to assume that disease-related expenditures will rise in future years since costs increase in proportion to the duration of the diabetes and the incidence of T1DM is increasing among younger age groups.³ To date, no national multicentre epidemiological studies on the prevalence or incidence of T1DM have been conducted and the actual and future impact of the disease

on the health-care system remains undetermined.

Evaluating the costs associated with diabetes becomes increasingly important in light of the expected increase in the prevalence of the disease and its complications. In the present study, the costs of type 1 diabetes increased in proportion to the duration of the diabetes. This increase may have an impact on health spending in the future because chronic complications become more prevalent as diabetes progresses. In a Canadian study,²¹ the impact of diabetes was projected over a 16-year period. It found a projected increase in the number of diabetes patients from 1.4 to 2.4 million and a projected 75% increase in health-care costs. However, the expected prevalence of diabetes and the costs associated with the disease increased in parallel with the ageing of the population; the overall health-care costs for the youngest members of the population are not expected to increase substantially. Despite this projection, data from the Centers for Disease Control and Prevention in Atlanta, United States, indicate that annual health-care costs among youths with diabetes are six times higher than among youths without diabetes.²²

Intervention studies, such as the DCCT, have shown that intensive treatment during the early stages of T1DM

reduces the risk of microvascular and macrovascular complications.² Clinical and economic trials can furnish data that can guide economic policy decisions aiming to reduce direct costs by reallocating resources towards the prevention of acute and chronic complications.

To our knowledge, this study is the first one in Latin America to estimate the costs associated with T1DM using data obtained from medical records. It is representative of the distribution of T1DM in Brazil and included different ethnic and socioeconomic groups from all parts of the country.

Some limitations must be addressed. The data used in this study were acquired from medical record reviews; thus, if any data were missing from the records, a data collection bias would have led to an underestimation of the costs. Also, comparisons with studies conducted in other countries are hampered by the use of different currencies. Indeed, inflation and exchange rate differences may account for some of the discrepancies. Furthermore, the real costs of hospitalization for hyperglycaemia or diabetic ketoacidosis exceed the amount paid by the NBHCS, which probably reimburses little more than the costs of medications and laboratory tests and excludes daily hospital stay and staff labour costs (data not shown). This,

plus the fact that reimbursement by the NBHCS for medical and non-medical visits and procedures is low, could have led to an underestimation of the direct medical costs associated with diabetes from the perspective of the public health-care system in Brazil.

In conclusion, T1DM has an important economic and social impact on the health-care system in Brazil. The direct costs associated with the disease are high, especially those associated with drug treatment and supplies for insulin administration and SMBG. These findings should encourage a reassessment of the distribution of resources for managing T1DM and trigger cost-effectiveness studies to optimize the long-term treatment of T1DM in Brazil. ■

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Competing interests: None declared.

ملخص

تكلفة داء السكري من النمط الأول: دراسة متعددة المراكز على الصعيد الوطني في البرازيل
الغرض تحديد التكاليف الطبية المباشرة لداء السكري من النمط الأول (T1DM) للنظام الوطني للرعاية الصحية في البرازيل (NBHCS) وتحديد نوعية إسهام كل مكون في التكلفة الإجمالية على نحو فردي.

الطريقة تم إجراء دراسة استرجاعية متعددة القطاعات على الصعيد الوطني في الفترة من 2008 إلى 2010 في 28 عيادة عمومية في 20 مدينة برازيلية. واشتملت الدراسة على 3180 مريضاً بداء السكري من النمط الأول (متوسط العمر 22 سنة ± 11.8) حيث تم إخضاعهم للدراسة الاستقصائية عند تلقيهم الرعاية الصحية من النظام الوطني للرعاية الصحية في البرازيل. وكان متوسط مدة داء السكري لديهم 10.3 سنة (± 8.0). وتم الحصول على تكاليف الاختبارات والإجراءات الطبية ومضخات الأنسولين وإمدادات تناول الدواء والإمدادات والمحاقن والإبر من أجل الرصد الذاتي لمستوى الغلوكوز في الدم (SMBG) من مصادر نظام الصحة الوطني والمحلي للفترة من 2010 إلى 2011. وتم استخلاص التكاليف الطبية السنوية المباشرة بإضافة تكاليف الأدوية والإمدادات والاختبارات والاستشارات الطبية

الإجراءات ومرات الدخول إلى المستشفيات على مدار العام السابق للمقابلة. النتائج بلغ متوسط التكلفة الطبية السنوية المباشرة للفرد 1319.15 دولاراً أمريكياً. ومثل الإنفاق المتصل بالعلاج - 1216.33 دولاراً أمريكياً للمريض سنوياً - 92.20٪ من إجمالي التكاليف الطبية المباشرة. وتعزى نسبة 52.82٪ من إجمالي هذه التكاليف إلى إمدادات إدارة تناول الأنسولين والرصد الذاتي لمستوى الغلوكوز في الدم (696.78 دولاراً أمريكياً للمريض سنوياً). وتعزى نسبة 5.73٪ من التكاليف الطبية المباشرة (75.64 دولاراً أمريكياً للمريض سنوياً) إلى الإجراءات الطبية وغسل الدم معاً. وتعزى نسبة 1.94٪ من التكاليف الطبية المباشرة (25.62 دولاراً أمريكياً للمريض سنوياً) إلى الاستشارات.

الاستنتاج تعزى التكاليف الطبية الأكثر مباشرة لداء السكري من النمط الأول إلى التكنولوجيات الصحية. ومن الممكن أن تساعد هذه البيانات في إعادة تقييم توزيع الموارد للسيطرة على السكري من النمط الأول في نظام الرعاية الصحية العمومية في البرازيل.

摘要**I型糖尿病的成本：巴西的全国多中心研究**

目的 确定巴西国家医疗保健系统 (NBHCS) I型糖尿病 (T1DM) 的直接医疗成本并量化每个组成部分对总成本的贡献。

方法 2008 至 2010 年间, 在巴西 20 个城市中的 28 个公立诊所执行全国范围内多中心的回顾式横断面研究。研究纳入 3180 名 I 型糖尿病 (平均年龄 22 ± 11.8 岁) 患者, 他们在接受 NBHCS 的医疗保健过程中接受调查。糖尿病患者的平均患病期为 10.3 年 (± 8.0)。从国家和地方卫生系统来源收集 2010-2011 年的检测和医疗流程、胰岛素泵和用药、以及自我血糖检测 (SMBG) 的耗材、注射器和针头的成本。通过增加调查前一年的药物、耗材、检测、诊疗、流

程和住院的成本, 推导年度直接医疗费用。

结果 人均平均年度直接医疗成本是 1319.15 美元。治疗相关费用 (每年每个病人 1216.33 美元) 占总直接医疗成本的 92.20%。胰岛素用药和 SMBG (每年每个病人 696.78 美元) 占总成本的 52.82%。医疗流程和血液透析合计占直接医疗成本的 5.73% (每年每个病人 75.64 美元)。诊疗占直接医疗成本的 1.94% (每年每个病人 25.62 美元)。

结论 卫生技术占绝大多数的 T1DM 直接医疗成本。这些数据可用于对资源分配作出重新评估, 进行巴西公共卫生保健系统的 I 型糖尿病管理。

Résumé**Coût du diabète de type 1: une étude multicentrique à l'échelle nationale réalisée au Brésil**

Objectif Déterminer les coûts médicaux directs du diabète gras de type 1 (DT1) pour le système de santé national brésilien (SSNB) et quantifier la contribution de chaque composante individuelle au coût total.

Méthodes Une étude rétrospective, transversale, multicentrique et à l'échelle nationale a été menée entre 2008 et 2010 dans 28 cliniques publiques de 20 villes brésiliennes. Cette étude incluait 3180 patients atteints de DT1 (moyenne d'âge de 22 ans ± 11,8) qui ont été interrogés alors qu'ils étaient pris en charge par le SSNB. En moyenne, ils étaient atteints par la maladie depuis 10,3 ans (± 8). Les coûts des tests et des interventions médicales, des pompes à insuline et des équipements pour son administration, ainsi que des fournitures pour l'autosurveillance du taux de glycémie (ASTG) ont été obtenus à partir de sources provenant du système de santé national et local sur 2010-2011. Les coûts médicaux directs annuels ont été calculés en ajoutant les coûts des médicaments, des fournitures, des consultations médicales, des interventions et des

hospitalisations au cours de l'année précédant l'enquête.

Résultats La moyenne du coût médical direct annuel par habitant s'élevait à 1319,15 dollars. Les dépenses liées au traitement – 1216,33 dollars par patient et par an – ont représenté 92,20% du total des coûts médicaux directs. L'équipement nécessaire à l'administration d'insuline et à l'ASTG (696,78 dollars par patient et par an) a totalisé 52,82% du total de ces coûts. Dans l'ensemble, les interventions médicales et l'hémodialyse ont représenté 5,73% (75,64 dollars par patient et par an) des coûts médicaux directs, et les consultations ont représenté 1,94% de ces mêmes coûts (25,62 dollars par patient et par an).

Conclusion Les technologies de la santé ont constitué la majeure partie des coûts médicaux directs du DT1. Ces données peuvent être utilisées pour réévaluer la distribution des ressources pour la prise en charge du DT1 par le système de santé publique brésilien.

Резюме**Расходы на лечение сахарного диабета 1-го типа: национальное многоцентровое исследование в Бразилии**

Цель Определить уровень прямых медицинских расходов, связанных с сахарным диабетом 1-го типа (T1DM), в Национальной системе здравоохранения Бразилии (NBHCS) и количественно определить долю каждого отдельного компонента в общей сумме расходов.

Методы В 2008-2010 гг. было проведено ретроспективное, перекрестное, национальное многоцентровое исследование в 28 государственных клиниках в 20 городах Бразилии. В исследовании участвовало 3180 пациентов с T1DM (средний возраст: 22 года ± 11,8), опрошенных во время прохождения лечения в Национальной системе здравоохранения Бразилии. Средняя продолжительность заболевания диабетом у этих пациентов составляла 10,3 лет (± 8,0). Данные по стоимости тестов и медицинских процедур, дозаторов инсулина и расходных материалов, а также материалов, шприцев и игл для самостоятельного контроля уровня глюкозы в крови (SMBG) были получены из национальных и местных источников системы здравоохранения в течение 2010-2011 гг. Ежегодные прямые медицинские расходы рассчитывались методом сложения стоимости медикаментов, расходных материалов, тестов,

медицинских консультаций, процедур и госпитализации за год, предшествующий опросу.

Результаты Среднегодовые прямые медицинские расходы на душу населения составили 1319,15 долларов США. Затраты на лечение – 1216,33 долларов США на пациента в год – составили 92,20% от общих прямых медицинских расходов. На самостоятельный контроль уровня глюкозы в крови и расходные материалы для ввода инсулина (696,78 долларов США на пациента в год) приходилось 52,82% от этой общей суммы расходов. Медицинские процедуры и гемодиализ в совокупности составили 5,73% (75,64 долларов США на пациента в год) от прямых медицинских расходов. На консультации приходилось 1,94% прямых медицинских расходов (25,62 долларов США на пациента в год).

Вывод Основная доля прямых медицинских расходов на лечение T1DM приходилась на медицинские технологии. Эти данные могут способствовать пересмотру распределения ресурсов для лечения T1DM в государственной системе здравоохранения Бразилии.

Resumen

El coste de la diabetes tipo 1: un estudio multicéntrico a nivel nacional en Brasil

Objetivo Determinar los costes médicos directos de la diabetes mellitus de tipo 1 (DMT1) para el sistema nacional brasileño de atención sanitaria (NBHCS, según sus siglas en inglés) y cuantificar la contribución de cada componente individual al coste total.

Métodos Se llevó a cabo un estudio multicéntrico retrospectivo transversal a nivel nacional entre los años 2008 y 2010 en 28 clínicas públicas de 20 ciudades brasileñas. El estudio incluyó 3180 pacientes con DMT1 (edad media de 22 años \pm 11,8), que fueron entrevistados mientras recibían atención sanitaria del NBHCS. La duración media de su diabetes fue de 10,3 años (\pm 8,0). Los costes de las pruebas y procedimientos médicos, las bombas de insulina y provisiones para la administración, así como suministros para la automonitorización de la glucosa en sangre (AMG) se obtuvieron de las fuentes de los sistemas de salud nacionales y locales para el periodo 2010-2011. Los costes médicos directos anuales se obtuvieron sumando los costes de

los medicamentos, suministros, pruebas, consultas y procedimientos médicos y hospitalizaciones durante el año anterior a la entrevista.

Resultados El coste medio directo anual por cápita fue de 1319,15 dólares americanos (US\$). Los gastos relacionados con el tratamiento, US\$ 1216,33 por paciente y año, representaron el 92,20% del total de los costes médicos directos. Los suministros para la administración de insulina y la AMG (US\$ 696,78 por paciente y año) significaron el 52,82% de esos costes totales. En conjunto, los procedimientos médicos y la hemodiálisis representaron el 5,73% (US\$ 75,64 por paciente y año) de los costes médicos directos. Las consultas fueron el 1,94% de los costes médicos directos (US\$ 25,62 por paciente y año).

Conclusión Las tecnologías sanitarias representaron la mayoría de los costes médicos directos de la DMT1. Estos datos pueden servir para volver a examinar la distribución de los recursos para la gestión de la diabetes de tipo 1 en el sistema de salud pública de Brasil.

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