

## Cost of diabetes mellitus type 1 treatment: difficulties of the families\*

*Custo do tratamento do diabetes mellitus tipo 1: dificuldades das famílias*

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### ABSTRACT

**Objectives:** To know the family income of diabetic patients and the places where they acquire/purchase the syringes, and to analyze the cost of treating the disease at home and the consequences of such costs. **Methods:** Descriptive, analytical, cross-section study, which interviewed 199 patients cared for at a large pediatric school hospital in São Paulo in 2004. **Results:** The predominant family income varied between one and two times the minimum wage (48.8%). Materials to apply insulin were acquired/purchased at the pharmacy (56.3%) and the Basic Healthcare Units (25.1%). The population would spend from R\$ 20.00 to R\$ 79.00 (US\$ 8 to US\$ 27) in syringes every month. **Conclusion:** Patients and guardians were forced to reuse the syringes in 76.8% of the cases to decrease their expenditure with the disease, making this a common practice in diabetes treatment.

**Keywords:** Cost of illness; Diabetes Mellitus/economics; Residential treatment/economics

### RESUMO

**Objetivos:** Conhecer a renda familiar dos pacientes diabéticos e os locais de aquisição das seringas e analisar o custo do tratamento da doença no domicílio e as conseqüências desses custos. **Métodos:** Estudo descritivo, analítico, transversal. Entrevistados 199 pacientes atendidos em ambulatório de hospital escola, pediátrico de grande porte em São Paulo durante o ano 2004. **Resultados:** A renda familiar predominante foi de um a dois salários mínimos (48,8%). A aquisição dos materiais para aplicar insulina era feita na farmácia (65,3%) e nas Unidades Básicas de Saúde (25,1%). A população gastava de R\$ 20,00 a R\$ 79,00 mensais com a compra de seringas (US\$ 8 a US\$ 27). **Conclusão:** Para minimizar os gastos com a doença, pacientes e responsáveis eram obrigados a reutilizar as seringas em (76,8%), constituindo uma prática comum no tratamento do diabetes.

**Descritores:** Custo da doença para o paciente; Diabetes Mellitus/economia; Tratamento domiciliar/economia

### RESUMEN

**Objetivos:** Conocer el ingreso familiar de los pacientes diabéticos y los locales de adquisición de las jeringas y analizar el costo del tratamiento de la enfermedad en el domicilio y las consecuencias de esos costos. **Métodos:** Estudio descriptivo, analítico, transversal. Fueron entrevistados 199 pacientes atendidos en el servicio de emergencia de un hospital docente, pediátrico de gran porte situado en la ciudad de Sao Paulo durante el año 2004. **Resultados:** El ingresofamiliar predominante fue de uno a dos salarios mínimos (48,8%). La adquisición de los materiales para aplicar la insulina era realizada en la farmacia (65,3%) y en las Unidades Básicas de Salud (25,1%). La población gastaba de R\$ 20,00 a R\$ 79,00 mensuales con la compra de jeringas (US\$ 8 a US\$ 27). **Conclusión:** Para disminuir los gastos ocasionados por la enfermedad, los pacientes y responsables eran obligados a reutilizar las jeringas en el 76,8% de los casos, constituyendo una práctica común en el tratamiento de la diabetes.

**Descriptores:** Costo de enfermedad; Diabetes Mellitus/economia; Tratamiento domiciliário/economía

\* Study performed at Instituto da Criança do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo – USP – São Paulo (SP), Brazil.  
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## INTRODUCTION

The intensive therapy between type 1 diabetes patients proposed by the Diabetes Control and Complication Trials<sup>(1)</sup> includes multiple-dose insulin therapy and capillary glucose monitoring. This implies a monthly consumption of 120 reacting tapes for capillary glucose, totaling an approximate value of R\$360.00 for four daily tests<sup>(2)</sup>. In addition to the tape costs, there is also the cost with disposable syringes and other disinfection material for the flask and skin cleansing, as recommended for preparing and applying the injections<sup>(3)</sup>. These costs have a direct effect on low-income families, which often spend 56% more than families without diabetic individuals<sup>(4)</sup>.

The international literature also has references that emphasize the high cost of diabetes management, including materials and medication, which is the case of American families, that spend approximately US\$2,500 per year<sup>(4)</sup>. This cost is similar to the US\$ 2770 that Australian families with diabetic adolescents spend every year<sup>(5)</sup>.

As a consequence of the high costs and financial difficulties, patients and their family members adopt some strategies to comply with the treatment required by the disease, like reusing disposable materials (syringes, lancets, and needles). When disposable syringes were introduced in the 1960s, the practice of reutilization imitates what happens with glass syringes<sup>(6)</sup>. It is observed there is a rapidly growing behavior of reusing disposable material in the diabetes treatment, including in developed countries like the United States, where studies have shown that 49% of diabetic patients reuse disposable materials like lancets and syringes<sup>(7)</sup>.

It should be reinforced that the patient withdraws, every month, part of the family budget to treat the disease, which has great effect on their personal, social, and financial aspects. Hence, their live level is drastically reduced, and it is likely that a negative perception of the disease sets in, with expressions of sadness, stress, and anxiety<sup>(8-10)</sup>. Our reality shows that there is no frequent distribution of syringes, capillary glucose tapes, and insulin for the diabetic clientele, and this worsens the economic and emotional situation of patients and their families. This panorama becomes contradictory in view of the State Law, 10782/2001, which declares that the Brazilian Public Health System should provide comprehensive care to people with any form of diabetes, guided by universality, integrality, equity, decentralization of actions and health services, as well as the right to medication and to the tools and materials for self-administration and self-management, thus assuring there is enough material for self-management and treatment of diabetes and the necessary and comprehensive procedures<sup>(11)</sup>.

Considering the cost of diabetes treatment and its

repercussion in diabetic patients and their families, the present study was performed with the following objectives: know the family income of diabetic patients and the place where they obtain syringes, and analyze the cost of home treatment for the disease and the consequences of those costs.

## METHODS

This descriptive, cross-sectional study was performed at the Instituto da Criança do Hospital das Clínicas da Universidade de São Paulo. The population consisted of all children and adolescents with type 1 diabetes mellitus under treatment at that hospital, which corresponded to 199 patients. The following were considered to evaluate the costs: family income and the material and medications used every day by the diabetic patients to apply insulin.

The quantitative variable of the population were presented in tables of absolute and relative frequencies.

This population was enrolled and had regular appointments at the Diabetes Out-Patient Clinic, and met some inclusion criteria: the wish to participate in the study, perform insulin therapy with disposable syringes. The exclusion criteria included: being under the age of 18 and not accompanied by a responsible other, patients who did not attend consultations for over six months or abandoned the hospital treatment.

Data collection took place from April to November, 2004 by means of a specific form that permitted to obtain the data regarding family income, location where the material for insulin application was obtained, and the cost of those materials if they were purchased. With the purpose to compare the insulin prices as well as of the material used to prepare and apply the insulin, a price consultation was performed at three large scale drugstores in the city of São Paulo.

The research project was approved by the Research Ethics Committee at the Instituto da Criança at the Pediatrics Department at Faculdade de Medicina da Universidade de São Paulo in February 18, 2004 and by the Pediatrics Department Council at Faculdade de Medicina de São Paulo in March 12, 2004, and by the Ethics Commission for the Clinic Directory Project Analysis at Hospital das Clínicas da Universidade de São Paulo on June 16, 2004 under protocol 218/04.

## RESULTS

In terms of the study population's monthly family income, most ranged between one and two minimum salaries (48.8%), as seen in Table 1.

In order to compare the monthly income of the study population with the costs of the material and medication used every day by the diabetic patients to treat the disease,

three large scale drugstores in the city of São Paulo were consulted in March 2004, as to the prices of the material used every month by a child that performs three daily glucose tests, three applications of a mix of different typed of human insulin (NPH-Neutral Protamine Hagedorn + fast) and conditional applications of ultra-fast insulin in cases of hyperglycemia. These estimated costs are presented in Chart 1.

**Table 1** – Children and adolescents with diabetes mellitus, seen at a university hospital, according to the monthly family income. São Paulo, 2004.

Monthly income in minimum salaries*	n	%
Less than ½ minimum salary	3	1.5
More than ½ minimum salary	6	3.0
From 1 to 2 minimum salaries	97	48.8
From 3 to 5 minimum salaries	47	23.6
From 6 to 9 minimum salaries	25	12.6
From 10 to 20 minimum salaries	9	4.5
More than 20 minimum salaries	5	2.5
No income	6	3.0
Not reported	1	0.5
<b>Total</b>	<b>199</b>	<b>100.0</b>

\*Minimum salary + R\$ 260.00

As to the location where the syringes were obtained, 65.3% purchased them at a drugstore, and 25.1% obtained them at the Basic Health Unit (Table 2).

**Table 2** - Children and adolescents with diabetes mellitus seen at a university hospital, according to the location where they obtained the disposable syringes for insulin application. São Paulo, 2004

Location where syringes were obtained	n	%
Drugstore	130	65.3
Basic Health Unit	50	25.1
Donation	7	3.6
Other	12	6.0
<b>Total</b>	<b>199</b>	<b>100.0</b>

**Chart 1** – Children and adolescents with diabetes mellitus seen at a university hospital, according to the prices of the material and insulin used to treat diabetes from three large scale drugstores. São Paulo, 2006

Material and insulin	Drugstores (prices in reais in 2004)			
	A	B	C	Average cost
Syringe with coupled needle (10 unit package)	138.6 (90 syringes)	134.91 (90 syringes)	110.97 (90 syringes)	128.16
Capillary glucose tape (box with 50 stripes)	109.61	82.07	75.40	89.02
Lancets (box with 100 units)	14.84	19.09	12.62	15.52
NPH Human insulin*	31.29	34.15	27.20	30.88
Regular insulin	30.03	34.15	27.22	34.46
Ultra-fast	46.28	75.66	54.07	58.67
Alcohol at 70% (30 ml flask)	5.67	3.49	2.26	3.80
Cotton balls (50g package)	2.65	3.47	1.37	2.16
<b>Total</b>	<b>378.97</b>	<b>392.97</b>	<b>311.11</b>	<b>362.67</b>

NPH-Neutral Protamine Hagedorn

The population's monthly cost with disposable syringes was between R\$ 20.00 and R\$ 79.00, as shown in Table 3.

**Table 3** - Children and adolescents with diabetes mellitus seen at a university hospital, according to the monthly cost with disposable syringes for insulin application. São Paulo, 2004

Cost in reais/month	N	%
8 ↓ 20	16	12.3
20 ↓ 40	74	57.0
40 ↓ 80	33	25.4
80 ↓ 100	4	3.0
100 ↓ 200	3	2.3
<b>Total</b>	<b>130</b>	<b>100.0</b>

## DISCUSSION

Regarding family income, the data found in this study are similar to those of another that involved 113 diabetic patients<sup>(12)</sup>. The prevailing income range between 1 and 2 minimum salaries (48.8%) is the evidence of the low purchasing power of the study population. There was a monthly cost of R\$20.00 to R\$79.00 with the syringes, against a family income of R\$390.00. This means that the expense is of about 13% the minimum salary. This amount is greater than that of developed countries like the United States, where the cost with syringes is 10% of the family income<sup>(4)</sup>.

When the minimum salary value, in March 2004 (R\$260.00), is compared to the average monthly expenses with syringes for three daily insulin shots, R\$113.30, it is observed that this cost represents 43.6% of the minimum salary. In addition, when this cost is related with the mean family income range prevailing in the study population (R\$390.00), it represents an expense of 29%. Nevertheless, it should be observed that for the metabolic control of the disease, the patient must buy, besides the syringes and insulin, some daily accessories, like capillary glucose tapes, lancets, and there is also the cost with the

appropriate diet and transportation to the health unit, for follow-up.

The comparison of prices for materials and insulin in different drugstores permits to analyze that the costs with diabetes treatment are high. This situation takes a serious toll on the family budget, considering that the average monthly cost is R\$362.67, which corresponds to 120% of the minimum wage in March 2006, which corresponds to R\$300.00<sup>(13)</sup>.

Similar difficulties are well stated in the retrospective study developed with 144 patients<sup>(14)</sup>, about the cost of out-patient clinic diabetes treatment. These patients had a cost with self-care of approximately 70% the minimum salary at the time of the study (US\$58, in July 1986), including the purchase of capillary glucose reagent tapes, insulin, syringes, and needles.

The above data agree with the results regarding the experience of an education program with 26 diabetes patients, who had a low socioeconomic level. The program was carried out in Rio de Janeiro<sup>(15)</sup>, and it was found that the cost for the diabetes treatment was incompatible with the family budget of that population, since the monthly income of those families was about R\$ 50.00 to R\$ 100.00. To purchase the material for their treatment and control with their own resources, patients would have to spend about R\$140.00, and this value is above the current salary at the moment of the study.

The study performed in the city of Ribeirão Preto<sup>(12)</sup> shows that, for a monthly income predominantly of one to two minimum salaries (R\$ 130.00 in May, 1999) the costs with syringes and insulin represent an average cost of R\$46.35 per month, i.e., 35.6% the minimum salary at that time.

It is observed only a few patients receive the syringes from the governmental program for the distribution of syringes, insulin and capillary glucose reagent tapes to diabetic patients. The delivery of these materials and medication often fails in spite of being ruled by law 10782/2001<sup>(11)</sup>.

The poor distribution of materials and medications can be associated with the public deficit due to the growing and uncontrollable increase in health expenses and costs related to health services<sup>(16)</sup>.

On the other hand, the health sector is going through expressive structural and conjectural reforms, which are affected by the continuous global financial changes. Hence, it demands from nurses a broader view about care<sup>(17)</sup>.

Without a standardized norm for a regular and sufficient supply of material and medication for diabetes self-management, the patients are forced to purchase the material, indispensable for the treatment, with their own money. Hence, the irregular delivery of disposable syringes favors reuse, thus encouraging the increase of this behavior among the diabetic population.

This study showed the poor distribution of syringes

in the basic health unit is due to the patients' choice to purchase adequate syringes of better quality, since the ones that are distributed for free do not guarantee a correct dose when there is the need to mix two types of insulin, their needles are as long as the rod and have larger internal calibers, which make the shots more painful.

A calculation of the expenses with syringes, estimates that the studied population makes two daily insulin applications (45.2%), which means they would use 60 syringes, and a cost of approximately R\$85.00 per month. This cost corresponds to 21.8% the average family income (R\$390.00) of the studied population. In addition, if the calculation were to estimate that there were three insulin applications per day (36.7%), 90 syringes would be used and the cost would be R\$128.00 per month. That equals 33% of the average family income of R\$390.00.

Better materials mean higher costs, and this is also true for the syringes chosen for insulin application. This preference can be related with easy handling and the range of sizes of syringes and needles. Although the manufacturers do not guarantee a price that fits all, there are various reasons that can be taken into consideration when choosing syringes with coupled needles, which does not have a dead space, and thus avoids losing insulin at every aspiration. This type of syringe permits mixing two types of insulin with the correct dose and clear volumetric capacity, with a scale that is adequate for individual insulin needs. Some other features of the coupled syringes are: easy handling, shorter and firmer needle, the presence of two protective lids, and a more resistant needle<sup>(12,18-19)</sup>.

In addition, patients who use syringes without coupled needles make this choice due to the better price, obtaining it at the basic health unit and easiness to change the needle. These factors have already been stated in previous studies<sup>(6,12,18)</sup>.

The technological advancement in syringe and needle production has made them more reliable and safer, and this has favored treatment compliance<sup>(19)</sup>. On the other hand, in terms of the inadequacy of needles distributed in BHU for mixing types of insulin, it is important to reflect about the lack of material and medication distribution by governmental departments.

A reflection about the lack of statistical difference regarding the income among the group that does not reuse disposable needles shows that economic troubles is not the reason for this behavior. The group that reuses needles appears to organize family income with other expenses that may be important to handle diabetes, which suggests the interference of other causes to start reusing disposable syringes.

## CONCLUSION

Most families in the study population had a income

ranging between 1 and 2 minimum salaries(48.8%). Buying syringes at a drugstore was the choice of 130 patients (65.3%), while 50 (25.1%) acquired theirs at the basic health unit. Most patients (82.4%) spent patients (65.3%), while 50 (25.1%) acquired theirs at the basic health unit. Most patients (82.4%) spent R\$20.00 to R\$79.00 per month in materials to prepare and administrate insulin, i.e., US\$8 to US\$27, and they preferred using syringes with couples needles (75.9%). The costs with diabetes treatment were high, since the average monthly expenses with material and medication was R\$362.67, which corresponds to 120% of the minimum salary (R\$300.00) in March 2006.

## FINAL CONSIDERATIONS

By recognizing the costs of Diabetes Mellitus (DM) treatment and considering the experience with DN1 patients, it can be affirmed that intensive therapy is costly, and makes buying the adequate amount of material and medication for daily use by diabetes patients and impossible task.

Hence, it is difficult to effectively implement the intensive therapy to manage diabetes. This leads to a

reflection about the serious economic difficulties that diabetic patients deal with every month, especially if they do not obtain sufficient medication and material to administrate insulin. It is observed that many families have none or insufficient income to keep up with the disease costs; therefore, this study agrees with the criteria of other authors<sup>(20-21)</sup>, who consider it is essential to find alternative strategies and forms of health care to control diabetes, and they should consider the personal difficulties that diabetic patients have to control the disease effectively.

Using alternative care and techniques that improve and adapt the diabetic patients' problems is the best option, if compared to the cost-effectiveness of maintaining the referred disease<sup>(22)</sup>. This analysis permits to consider the financial difficulties that the diabetic patient deals with and how hard it is be diabetic in our environment. On the other hand, it is known that since 2005 diabetic patients started to receive, sufficient and periodically, the necessary medication and material for insulin application. It is expected that this distribution remains constant and regular so as to avoid any difficulties for the families and patients, who will have to deal with this chronic disease for the rest of their lives.

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