Original Article

Patients' knowledge regarding medication therapy to treat diabetes: a challenge for health care services*

Conhecimento sobre terapêutica medicamentosa em diabetes: um desafio na atenção à saúde

Conocimiento sobre la terapéutica medicamentosa en diabetes: un desafío en la atención a la salud

Heloisa Turcatto Gimenes Faria[1], Maria Lúcia Zanetti[2], Manoel Antônio dos Santos[3], Carla Regina de Souza Teixeira[4]

ABSTRACT

Objective: To assess and describe patients' knowledge regarding medication therapy to treat diabetes mellitus. **Methods:** This descriptive cross-sectional study was conducted in 2007 at a university center in the interior of São Paulo State, Brazil. Forty-six patients with diabetes were interviewed using a structured questionnaire to gather sociodemographic, clinical, and medication information. Data analysis consisted of univariate statistics and measures of central tendency. **Results:** The majority of participants **(**89.1%) used oral hypoglycemic agents, 41.3% used insulin injections, and 30.4% used a combination therapy oral hypoglycemic agents and insulin injections. A large number of participants (56.5%) had knowledge deficit regarding their medication regimen. **Conclusion:** The findings suggest the need to develop a more effective patient orientation process in the health care services. It is not enough to offer the medication; one must also comprehensively assess patients' knowledge and use of the medication.

Keywords: Nursing; Diabetes mellitus; Evaluation; Patient education as topic

RESUMO

Objetivo: Avaliar o conhecimento dos pacientes acerca da terapia medicamentosa em uso para o controle do diabetes mellitus. **Métodos:** Estudo descritivo transversal realizado em um centro universitário do interior paulista, em 2007. Foram entrevistados 46 pacientes com diabetes, mediante questionário que investigou variáveis sociodemográficas, clínicas e referentes à terapia medicamentosa. Foi realizada análise univariada dos dados e cálculo de medidas de tendência central. **Resultados:** Dos participantes, 89,1% utilizavam antidiabéticos orais, 41,3% insulina e 30,4% terapia combinada com antidiabéticos orais e insulina. Dos 46 investigados, 56,5% apresentaram déficit no conhecimento acerca da terapia medicamentosa para o controle do diabetes mellitus. **Conclusão:** A maioria dos pacientes apresentou déficit de conhecimento em relação ao medicamento em uso. Os resultados apontam a necessidade de construção de um processo de reorientação da atenção ao paciente nos serviços de saúde, pois não basta oferecer os medicamentos, mas é preciso avaliar a forma como vêm sendo utilizados.

Descritores: Enfermagem; Diabetes mellitus; Avaliação; Educação do paciente como assunto

RESUMEN

Objetivo: Evaluar el conocimiento de los pacientes respecto a la terapia medicamentosa usada para el control de la diabetes mellitus. **Métodos:** Se trata de un estudio descriptivo transversal realizado en un centro universitario del interior de São Paulo, en el 2007. Fueron entrevistados 46 pacientes con diabetes, mediante un cuestionario que permitió investigar variables sociodemográficas, clínicas y referentes a la terapia medicamentosa. Fue realizado el análisis univariado de los datos y cálculo de medidas de tendencia central. **Resultados:** De los participantes, el 89,1% utilizaban antidiabéticos orales, el 41,3% insulina y el 30,4% terapia combinada con antidiabéticos orales e insulina. De los 46 investigados, el 56,5% presentó déficit en el conocimiento respecto a la terapia medicamentosa para el control de la diabetes mellitus. **Conclusión:** La mayoría de los pacientes presentó déficit de conocimiento con relación al medicamento en uso. Los resultados indican la necesidad de construir un proceso de reorientación de la atención al paciente en los servicios de salud, pues no sólo basta ofrecer los medicamentos, sino también evaluar la forma cómo están siendo utilizados.

Descriptores: Enfermería; Diabetes mellitus; Evaluación; Educación del paciente como asunto

---

* *Study taken from the Master Thesis presented at Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo - USP, Ribeirão Preto (SP), Brazil.*

[1] *Master in Fundamental Nursing. PhD student at the Fundamental Nursing Program at Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo - USP, São Paulo (SP), Brazil.*

[2] *Associate Professor at the General and Specialized Nursing Department, Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo - USP, Ribeirão Preto (SP), Brazil.*

[3] *PhD, Professor at the Psychology and Education Department, Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto, Universidade de São Paulo - USP, Ribeirão Preto (SP), Brazil.*

[4] *PhD Professor at the General and Specialized Nursing Department, Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo - USP, Ribeirão Preto (SP), Brazil.*

Corresponding Author: **Maria Lúcia Zanetti**
Av. Bandeirantes, 3900 - Monte Alegre - Ribeirão Preto - SP - Brazil
Cep: 14040-902 E-mail: zanetti@eerp.usp.br

Received article **26/06/2008** and accepted **20/10/2008**

INTRODUCTION

Diabetes mellitus (DM) is considered an important public health problem both nationally and internationally, due to the increase in its prevalence and its social and economic results, such as impairment in productivity, quality of life and survival of individuals, early retirement, high treatment costs and complications[1-2].

In Brazil and in Ribeirão Preto-SP, multi-center studies on diabetes mellitus showed a prevalence of 7.6% to 12.1% in the population from 30 to 69 years old, respectively[3-4]. This picture led the Ministry of Health to make partnerships with many public institutions and scientific societies in 2002 to design the *Plano de Reorganização da Atenção à Hipertensão Arterial e ao Diabetes Mellitus* (Plan to Reorganize Care to Hypertension and Diabetes Mellitus)[5]. This Plan, implemented from 2003 onwards, is a strategy to increase prevention, diagnoses, treatment, and control of hypertension and DM through the reorganization of the basic health service network giving them effectiveness and quality in care.

This Plan was subdivided to be implemented in five stages. One of them corresponds to diagnostic confirmation and start of drug therapy. In this sense, Regulation # 371/GM/2002, published in the Country's Official Gazette, created the National Program on Pharmaceutical Care, which granted the necessary medications to control hypertension and DM, through the Ministry of Health, after enrollment of hypertensive and diabetic patients[6].

The implementation of this stage enabled enrolled patients to have access to medication especially for DM control. On the other hand, new challenges are presented with it.

One of the challenges in the acquisition of knowledge, by DM patients, on their drug therapy, such as adequate use of prescribed medication for disease control to avoid acute and chronic complications[7]. A proper metabolic condition is a result of several factors such as patients awareness on pathophysiological aspects and those concerned with disease treatment, nutritional reeducation, increase in physical activity, regular foot assessment, self-monitoring of capillary glucose, signs and symptoms of hypoglycemia, and prevention of chronic diseases, disease management in special situations and family support[1,5,7-8].

The present study focuses on patients' knowledge on the use of medication, regarding the dose, time, number of pills, and how many times a day. This knowledge may be directly correlated with patients' understanding of the importance and need of medication. Thus, understanding the knowledge on the use of medications prescribed may lead to its proper use, optimizing diabetes mellitus control.

There is a significant deficit in knowledge and skill in 50% to 80% of individuals with DM[8]. Glucose control assessed through glycated hemoglobin test (HbA1c) is reached in less than half the patients with type 2 DM[9].

Prevention of complications with self-control of the disease and proper use of medications require the development of teaching activities or health education practices directed to diabetic patients and their families, enabling patients to live better with their chronic condition[10-11].

However, there are knowledge gaps in the DM education process. Adults present complex learning characteristics which are challenges to the projection of future studies. Therefore, effective long-term interventions should be planned and implemented so that changes in health care can be achieved[12].

Acknowledging that education for the rational use of drug therapy is an essential component for the treatment of diabetic patients, so that the resources applied by the Ministry of Health can be optimized, the present study aims to assess patients' knowledge on the drug therapy used to control diabetes mellitus.

METHODS

Descriptive, cross-sectional study carried out in 2007 in a Research and University Extension Center of the countryside of the state of São Paulo. Patients enrolled at this center go spontaneously to this place through announcements on the media. Enrollment occurs in the beginning of each year to form new groups. The study population was formed by 55 patients with diabetes enrolled in the Education Group in Diabetes of the center mentioned. To recruit patients, the following inclusion criteria were adopted: being enrolled in the service, taking medication to control DM and agree to take part in the study.

Of the 55 patients enrolled, nine were excluded, two because they were not using medication to control DM and seven because they gave up taking part in the Education Group. The convenience sample was formed by 46 patients with DM types 1 and 2, diagnosed before the Group started.

The project has been approved by the Research Ethics Committee at Escola de Enfermagem de Ribeirão Preto, protocol # 0541/2005. For data collection we have used a questionnaire with 48 closed questions encompassing sociodemographic and clinical variables and those related to drug therapy. To evaluate clarity of the items, if they were easy to read and understand and the way they were presented, three diabetes experts were requested to collaborate.

To assess patients' knowledge on medication to control DM we have asked patients the name of medication(s) being used, the dose(s), time of intake, and the number of times they took them every day. Additionally, the

medical prescription was verified to compare data mentioned, which enabled to identify if the patient really had knowledge on the items investigated. We privileged the comparison between patients' report and medical prescription. We understand that the agreement or disagreement between what is reported and what is prescribed reflects an important dimension, but not the only, of patients' knowledge on drug therapy.

Data were collected after patients' written consent was obtained in the place study was carried out, through individual face to face interview in a private room in the Center. Each interview lasted approximately 30 minutes.

For the analysis, a data base was designed at Excel for Windows. Data were, later, transported by Program SPSS 11.5. A univariate analysis of the data was performed. Results were organized in tables with distribution of absolute and relative frequencies. Calculation of measures of central tendency such as median, mean maximum and minimum values was used. Data obtained concerning the doses, number of pills and number of times a day patients took medication for DM were compared to those in the medical prescription, through a spreadsheet made by the researcher. An answer was considered correct when the dose, time, number of times and the number of pills mentioned by users were in agreement with the medical prescription, partially correct when one or more items referred by patients were not in agreement, and incorrect when all items disagreed with the medical prescription.

After this stage, data were dichotomized in: overall knowledge on the medication prescribed and knowledge deficit regarding drug therapy. For those that answer all categories assessed correctly when compared to the medical prescription, we have considered them as having acquired knowledge on medications used and for those that answered partially correct and /or incorrect we have considered them as presenting knowledge deficit.

In the present study, for oral anti-diabetics, we have considered the dose referring to each prescribed pill for DM, that is, the dose printed on the pack of the medication rather than the total dose used by patients. As for insulin, we have considered total dose of insulin used by patients a day. When time of DM medication intake was considered, it varies for each therapy class; we have considered the right time for insulin secretors, such as Sulfonylurea and Glinides, before the meals; insulin sensitizers such as Biguanides and Thiazolidinediones during and right after the meals and alpha-glucosidase inhibitors such as Acarbose during the meals.

RESULTS

In the 46 diabetic users investigated in the present study age ranged from 31 to 80 years old, median was 57, 69.6% were females, and 78.3% were married. As for schooling, median was 8 years and family income was 4.5 minimum wages. Regarding the type of DM, 82.6% were type 2; median for time of diagnoses was 12.5 years. Median HbA1c was 8.5. The main comorbidities presented were: hypertension (56.5%); dyslipidemia (43.5%) and obesity (41.3%).

As for the type of drug therapy used for DM control, Table 1 shows that 41.3% used insulin, 39.1% intermediate-acting insulin (NPH), 2.2% associated NPH with rapid-acting insulin and only 2.2% used analogue long-acting insulin. It is important to highlight that 30.4% received combined therapy with oral anti-diabetics and insulin.

Table 1 – Users seen by the Research and University Extension Center according to diabetes mellitus medication. Ribeirão Preto, São Paulo, 2007

Medication	n	%
Biguanide	12	26.1
Biguanide + Sulfonylurea	12	26.1
Biguanide + NPH Insulin	9	19.6
NPH Insulin	4	8.7
Sulfonylurea	2	4.3
Sulfonylurea + NPH Insulin	2	4.3
Sulfonylurea + Biguanide + NPH Insulin	2	4.3
NPH Insulin + Rapid-acting	1	2.2
Biguanide + Acarbose	1	2.2
Biguanide + Glitazone + Glargine (Insulin analogue)	1	2.2
Total	46	100

Table 2 shows that factors related with awareness patients have on medication use regarding doses, time, number of pills and number of times a day.

Table 2 – Users seen in the Research and University Center, according to use of medication regarding dose, time, number of pills and number of times diabetes medication was taken. Ribeirão Preto, São Paulo, 2007

Medication	Correct		Partially Correct		Incorrect	
	n	%	n	%	n	%
Dose*	18	39.1	14	30.4	12	26.1
Time*	22	47.8	13	28.3	9	19.6
# of pills**	21	45.7	5	10.9	8	17.4
Number of times a day***	25	54.3	11	23.9	2	4.3

*Total=44: two users used only insulin did not present medical prescription.
** Total=34: seven users did not present medical prescription and five used only insulin.
*** Total=38: seven users did not present medical prescription and one presented only medical prescription where there was only the prescription for oral antidiabetics.

Regarding dose, 39.1% of the participants mentioned dose of the medications correctly, 30.4% reported it partially correct and 26.1% incorrectly. As for time of medication intake, 47.8% referred taking the medication at the right time; 28.3% at partially correct times and only 19.6% at incorrect times. As for the number of pills taken, 45.7% reported correctly, 10.9% partially correct and 17.4% incorrectly. As for the number of times they took medications, 54.3% answered correctly; 23.9% partially correct and 4.3% incorrectly.

Table 3 shows that 56.5% of participants presented knowledge deficit on the medication to control diabetes mellitus.

Table 3 – Patients seen at the Research and University Extension Center according to the overall knowledge regarding drug therapy to control diabetes. Ribeirão Preto, São Paulo, 2007

Knowledge	n	%
Yes	11	23.9
No	26	56.5
Non-obtained data*	9	19.6
Total	46	100

*Total of patients that did not present medical prescription

DISCUSSION

When the specific drug therapy for DM was assessed, 89.1% of the participants used oral antidiabetics, confirmed by the medical prescription and 26.1% used oral drugs from the class of Biguanides and Biguanides associated with Sulfonylurea, and only 4.3% used only Sulfonylurea. As for insulin, 8.7% of the patients used only it, and 30.4% used insulin associated with oral antidiabetics.

These data are in disagreement with the findings from a study investigating the adherence and persistence in the use of anti-hyperglycemic medications in patients with type 2 diabetes during one and two years of follow-up[13]. In the first year of follow-up, most patients (85.3%) used Sulfonylurea class drugs, 14% Biguanides class drugs, and only 3.9% used association between Sulfonylurea and Biguanide, 14.4% used only insulin and 2.1% insulin associated with oral antidiabetics. After two years of follow-up, despite small changes, these values remained relatively similar[13].

When data from the present study were compared to those obtained in the investigation mentioned, a greater prevalence was observed of individuals using oral antidiabetics from the class of Sulfonylurea and insulin, and a lower number of individuals using combined therapies[13].

Another study investigated a ten-year-follow-up of medication therapy of patients with type 2 diabetes, demonstrating decrease in the percentage of patients using Sulfonylurea, from 79.2% to 20.5%. Regarding insulin, there was an increase from 7.1% to 14.7%, and the same thing occurred when insulin associated with oral antidiabetics, from 1.9% to 2.6%. As for Biguanides, in the beginning of the study, there were no patients taking them, but, in the end of the study their use was seen in 9.8% of patients[11].

For the Ministry of Health, Metformin, oral antidiabetics from the Biguanides class, is the medication of choice for most type 2 diabetic patients. This choice is based on the results of the study, published in 1998, called UK Prospective Diabetes Study Group. This study demonstrated that treatment intensified with Metformin reduces by 29% microvascular complications, whereas insulin and medications of Sulfonylurea class decreased only 25% to 12%, respectively. Another factor to be considered refers to the absence of side effects of Metformin regarding hypoglycemia and body weight gain and also because it is considered a safe medication in the long term[14-15].

On the other hand, for many type 2 diabetic patients, monotherapy with metformin is not enough to reach the desired glucose control, especially during treatment and it is necessary to add a medication from Sulfonylurea class or even insulin[14].

Regarding DM type 2, in the clinical practice, patients may come to the first appointment in the onset of the disease when there is predominance of insulin-resistance, or after several years of evolvement of the disease which is characterized by insulinopenia. The best therapy indicated will depend on the secretory capacity of the pancreas[1].

Medication therapy in the treatment of DM depends on several factors such as individual characteristics, values of glycated hemoglobin, fastening and postprandial glycemia, presence of obesity, age, socioeconomic level, complications and comorbidities, antihyperglycemic action of the medication, among others. Therefore, consensus on the ideal medical treatment depends on a combination of these factors. There are pre-established protocols with specific treatment guidelines, however, all guidelines recommend considering the individuality of each patient to design therapy plan[1].

DM patients' awareness about the medication they take as well as its dose, time, number of pills and how many times a day, present direct correlation with understanding the importance and need for treatment.

When data obtained were assessed regarding dose, number of pills and times a day, despite all the recommendations and protocols established, participants of the present study still lack effective orientations. These

data are in agreement with findings from a study showing that patients who received little orientation on oral antidiabetics took them inadequately which is harmful to their glucose control[16].

Another study assessing the five factors more commonly related to knowledge and use of medications found that taking medications the wrong dose of medications at the wrong time were the most prevalent[17].

A study carried out in patients with diabetes admitted in a big hospital from the countryside of São Paulo, Brazil, showed that over one third of the patients could not say the name of the medication they took to control diabetes, 51.6% of patients took oral antidiabetics at the wrong time, and 71.0% gave unsatisfactory answers regarding the end and purpose of medications used. These results show that lack of knowledge on the rational use of medications is one of the components that may be strengthened by education programs to control diabetes[18].

Lack of knowledge on the medication has had a strong impact in health and quality of life of people especially those with one or more chronic health conditions. The number of hospital admissions and early death has increased and is partially associated with knowledge deficit[19].

Clear and accurate information to patients regarding the use of medications to control DM provided by qualified health professionals may encourage patients to self care and adherence to medication therapy. Lack of knowledge concerning the name of medication they use, dose prescribed by physicians, correct time of intake, number of times medication should be taken a day make patients take medication incorrectly. A shared approach between patients and health professionals may fill the gaps in knowledge of people with diabetes mellitus[20-21].

In a systematic review on DM education and health impact, it was seen that 50 to 80% of individuals presented knowledge deficit and that, on average, education actions reduced the levels of glycated hemoglobin in 0.76% in three months of follow-up[9]. Education DM programs should emphasize the importance of using medications for suitable control to minimize administration errors and thus obtain the benefits expected.

A DM education program should initially go through the reorganization of the basic network of health services, optimizing effectiveness and quality of care. This reorganization should include capacity building of health professionals so that the fifth stage of the Plan can be totally fulfilled. Currently, in the basic network of health services, medications are available for patients enrolled with DM. However, it is still difficult to enroll all patients and care is not organized for the rational use of medication.

The rational use of medication goes through professional qualification to establish the main needs of people with DM before the therapy with medication starts. These needs include enhancing patients' knowledge, developing attitudes that lead to changes in behavior, improvement in clinical and metabolic parameters, of the health state and quality of life to reduce or prevent chronic complications[1].

Incorrect use of medication can be due to, among other factors, lack of knowledge regarding medication therapy, that is, not knowing the name of the medication used, the dose prescribed, the correct time of intake, the correct number of pills and how many times they should be taken a day. Thus, patients that understand and know their medication treatment may use it correctly although it does not ensure correct use. Knowing how a drug should be used does not guarantee patients to choose it correctly, since adequate use entails several other factors[18,20-21].

CONCLUSION

Results from the present study showed that most patients with DM presented knowledge deficit regarding the medication in use during the disease treatment.

This lack of knowledge may worsen the health state of people with DM and, consequently be a significant increase in direct and indirect health costs.

We expect that results presented in the study are subsidies to rethink interventions strategies used in primary health care services for the rational use of medication during treatment to control diabetes mellitus. We must advance in the construction of a reorientation process for patient care, it is not enough to offer medications, we should systematically assess the way these medications are used by the population, and the results of the huge investments of the Ministry of Health to consolidate public policies adopted regarding access to medications.

Other factors should also be mentioned, such as side effects, improvement in signs and symptoms, motivations, among others, which are related with the phenomenon studied, and that are limitations to understanding the results obtained in the present study. In this sense, further studies should be carried out to investigate the contribution of these variables to understand better this issue.

REFERENCES

1. Sociedade Brasileira de Diabetes. Tratamento e acompanhamento do diabetes mellitus: diretrizes da Sociedade Brasileira de Diabetes. Rio de Janeiro: Diagraphic; 2006.

2. White paper on the prevention of type 2 diabetes and the role of the diabetes educator. Diabetes Educ. 2002;28(6):964-8, 970-1.
3. Malerbi DA, Franco LJ. Multicenter study of the prevalence of diabetes mellitus and impaired glucose tolerance in the urban Brazilian population aged 30-69 yr. The Brazilian Cooperative Group on the Study of Diabetes Prevalence. Diabetes Care. 1992;15(11):1509-16.
4. Torquato MT, Montenegro Júnior RM, Viana LA, de Souza RA, Lanna CM, Lucas JC, et al. Prevalence of diabetes mellitus and impaired glucose tolerance in urban population aged 30-69 years in Ribeirão Preto (Sao Paulo), Brazil. Sao Paulo Med J. 2003;121(6):224-30.
5. Brasil. Ministério da Saúde. Secretaria de Políticas da Saúde. Departamentos de Ações Programáticas Estratégicas. Plano de reorganização da atenção à hipertensão arterial e ao diabetes mellitus: manual de hipertensão arterial e diabetes mellitus. Brasília: Ministério da Saúde; 2002.
6. Brasil. Ministério da Saúde. Portaria nº 371/GM, de 04 de março de 2002. Dispõe sobre o Programa Nacional de Assistência Farmacêutica para Hipertensão Arterial e Diabetes Mellitus. Diário Oficial da União nº 44, Brasília (DF) 2002; 06 mar. Seção 1, p.88.
7. Takahashi OC, Haddad MCL, Guariente MHDM, Almeida HGG, Scarinci IC, Takahashi I. Atendimento ambulatorial interdisciplinar ao paciente diabético. Acta Paul Enferm. 1993;6(1/4):43-7.
8. Clement S. Diabetes self-management education. Diabetes Care. 1995;18(8):1204-14.
9. Norris SL, Lau J, Smith SJ, Schmid CH, Engelgau MM. Self-management education for adults with type 2 diabetes: a meta-analysis of the effect on glycemic control. Diabetes Care. 2002;25(7):1159-71. Comment in: Diabetes Care. 2002;25(11):2115-6. Diabetes Care. 2002;25(11):2116.
10. Brown JB, Nichols GA, Glauber HS, Bakst A. Ten-year follow-up of antidiabetic drug use, nonadherence, and mortality in a defined population with type 2 diabetes mellitus. Clin Ther. 1999;21(6):1045-57.
11. Roter DL, Hall JA, Merisca R, Nordstrom B, Cretin D, Svarstad B. Effectiveness of interventions to improve patient compliance: a meta-analysis. Med Care. 1998;36(8):1138-61.
12. Walker EA. Characteristics of the adult learner. Diabetes Educ. 1999;25(6 Suppl):16-24. Review.
13. Dailey G, Kim MS, Lian JF. Patient compliance and persistence with antihyperglycemic drug regimens: evaluation of a medicaid patient population with type 2 diabetes mellitus. Clin Ther. 2001;23(8):1311-20.
14. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Diabetes mellitus. Brasília: Ministério da Saúde; 2006. (Série Cadernos de atenção básica; 16; Série A. Normas e manuais técnicos).
15. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. UK Prospective Diabetes Study Group. BMJ. 1998; 317(7160):703-13. Erratum in: BMJ 1999;318(7175):29. Comment in: BMJ. 1998;317(7160):691-2. BMJ. 1998;317(7160):693-4. BMJ. 1999;318(7184):666-7; author reply 668. BMJ. 2000;320(7237):732. BMJ. 2002;324(7341):849; author reply 849-50.
16. Sociedade Brasileira de Diabetes. Consenso brasileiro sobre diabetes 2002: diagnóstico e classificação do diabetes mellitus e tratamento do diabetes mellitus tipo 2. Rio de Janeiro: Diagraphic; 2003.
17. Miller NH. Compliance with treatment regimens in chronic asymptomatic diseases. Am J Med. 1997;102(2A):43-9.
18. Gimenes HT, Teixeira CRS, Zanetti ML, Otero LM. O conhecimento do paciente diabético tipo 2 acerca dos antidiabéticos orais. Ciênc Cuid Saúde. 2006;5(3):317-25.
19. Williams B. Medication education. Nurs Times. 1991;87(29):50-2.
20. Otero LM, Zanetti ML, Ogrízio MD. Knowledge of diabetic patients about their disease before and after implementing a diabetes education program. Rev Latinoam Enferm. 2008;16(2):231-7.
21. Zanetti ML, Otero LM, Peres DS, Santos MA, Guimarães FPM, Freitas MCF. Progress of the patients with diabetes mellitus who were managed with the staged diabetes management framework. Acta Paul Enferm. 2007;20(3): 338-44.