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Factors related to the self-application of insulin in subjects with diabetes mellitus

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Fatores relacionados à autoaplicação de insulina em indivíduos com diabetes mellitus

Factores relacionados con la autoadministración de insulina en sujetos con diabetes mellitus

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ABSTRACT

Objective: To identify the factors associated with the self-application of insulin in adult individuals with Diabetes Mellitus.
Method: A cross-sectional study developed in the city of Viçosa-MG, which assessed 142 patients. The data collection was performed between April and July 2013 through an interview at the participant's home. Multiple logistic regression was used.
Results: The prevalence of the self-administration of insulin was of 67.6%, and it was associated with ages between 57 and 68 years old (OR = 0.3, 95% CI: 0.1-0.9), living with a partner and children (OR = 2.5, 95% CI: 1.1-5.0), 9 years or more of study (OR = 8.4, 95% CI: 1.9-37.9), living in an area not covered by the Family Health Strategy (FHS) (OR = 2.8, 95% CI: 1.1 - 7.0).
Conclusion: The self-application of insulin was associated with age, schooling, marital status, and the FHS coverage. The recognition of these factors may contribute to the adherence to the self-application of insulin.
Keywords: Diabetes mellitus. Insulin. Self care. Medication adherence.

RESUMO

Objetivo: Identificar os fatores associados à autoaplicação de insulina em adultos com diabetes mellitus.
Método: Estudo transversal desenvolvido no município de Viçosa-MG, que avaliou 142 pacientes. A coleta de dados foi realizada entre abril e julho de 2013, mediante entrevista no domicílio do participante. Regressão logística múltipla foi utilizada.
Resultado: A prevalência de autoaplicação de insulina foi de 67,6%, apresentando associação com idade entre 57 e 68 anos (OR = 0,3; IC95%: 0,1 - 0,9), conviver com companheiro e filhos (OR = 2,5; IC95%: 1,1 – 5,0), ter 9 anos ou mais de estudo (OR = 8,4; IC95%: 1,9 - 37,9), morar em área não coberta pela Estratégia Saúde da Família (ESF) (OR = 2,8; IC95%: 1,1 - 7,0).
Conclusão: Autoaplicação de insulina mostrou-se associada à idade, escolaridade, situação conjugal e cobertura da ESF. O reconhecimento desses fatores pode contribuir para o desenvolvimento de estratégias para adesão à autoaplicação de insulina.
Palavras-chave: Diabetes mellitus. Insulina. Autocuidado. Adesão à medicação.

RESUMEN

Objetivo: identificar los factores asociados con la autoadministración de insulina en adultos con diabetes mellitus.
Métodos: se trata de un estudio transversal, desarrollado en el municipio de Viçosa-MG, en el que se evaluaron 142 pacientes. La recolección de datos se llevó a cabo entre abril y julio de 2013, mediante entrevistas en el hogar del participante. Se aplicó la regresión logística múltiple.
Resultados: la prevalencia de la autoadministración de insulina fue de 67,6% y se asoció con edad de entre 57 y 68 años (OR = 0,3; IC del 95%: 0,1 - 0,9), que viven con una pareja e hijos (OR = 2,5; IC del 95%: 1.1 5,0), con 9 o más años de educación (OR = 8,4; IC del 95%: no 1,9-37,9), que viven en un área cubierta por la Estrategia de Salud de la familia (ESF) (OR = 2,8; IC del 95%: 1.1 7.0).
Conclusión: la autoadministración de insulina se asoció con la edad, la educación, el estado civil y la cobertura del ESF. El reconocimiento de estos factores puede contribuir para la adhesión a la autoadministración de insulina.
Palabras clave: Diabetes mellitus. Insulina. Autocuidado. Cumplimiento de la medicación.

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INTRODUCTION

The Diabetes Mellitus (DM) is considered as a group of metabolic disorders that has hyperglycemia in common. Due to its high incidence and the development of acute and chronic complications, it is configured as one of the main public health problems in the world. Currently, the world population with diabetes is estimated in in about 387 million, reaching 471 million in 2035[1].

The current classification of diabetes, proposed by The American Diabetes Association (ADA), includes the patients in four clinical classes, as DM type 1 (DM1), DM type 2 (DM2), other speciffic types of diabetes and gestational diabetes. In the clinical practice, about 90% of the patients present DM2, while 10% have the type 1[1]. It is known that DM is one of the main causes of chronic diseases, such as kidney diseases, amputation of lower members, blindness and cardiovascular disease, the treatment of this morbidity and its complications is a priority in the scope of public health[2].

Among the therapeutic modalities indicated with the objective of achieving an effective metabolic control among the patients with diabetes, the insulin therapy is indispensable to the treatment of the patients with DM1. For patients with DM2, its use is recommended if the hyperglycemia is >300mg/dl associated to the symptoms, or due to a fail in the treatment with the oral hypoglycemic agents[3].

The early use of insulin in DM2 cases results in long-term improvements in the glycemic control and in the functions of the beta cells, in comparison to the use of oral hypoglycemic agents[4]. However, for the effectiveness of the treatment over the glicemic control, it is necessary that the patient develops skills for its execution. The self-application of insulin is included in the list os self-care of the diabetic patient, and it is a procedure that requires routine changes in the life of the patients, especially due the need of multiple dialy applications of the medicine[5].

The adherence to the self-application of insulin is a challenge for many patients, being a problem of multifactorial origin. The difficulties begin when the patient needs to overcome the fear of piercing his/her own skin to execute the procedure[5]. In addition, the little knowledge and the negative attitudes regarding the disease are related to the metabolic control and adherence to the treatment[6]. A research carried out with 151 users affected by DM linked to Family Health Strategy (FHS) in Belo Horizonte revealed that the capabilities for the disease control can be improved by increasing the contact time of the user with the educational practices[7].

The non-adherence to the treatment of diabetes is a a nationally and internationally well-known problem, associated to the increase of the morbidity of the patients[6,8-9]. Althought previous studies identified the low adherence to the insulin therapy, a few factors or barriers perceived by the patients was consistently identified as predictive to the non-adherence[9-10]. Despite the existence of studies adressing the adherence related factors, they are, mostly, restricted to developed countries[10]. Besides that, it is possible to notice a lack of national research including a joint analysis of the clinical and sociodemographic variables related to the self-application of insulin[8,11].

Based on these concerns, this study is justified, because recognizing the different factors that exert influence on the adherence to insulin self-application may help in the nurse's activities, serving as a subsidy for the development of innovative strategies, specifically for the care of the patients with DM, in order to improve the adherence to the insulin therapy[6,8-11].

Given this context, the guiding question of this research was outlined: What factors interfere in the self-application of insulin by individuals with Diabetes mellitus? The objective of this study is to identify the factors associated to the self-application of insulin in adult individuals with Diabetes mellitus.

METHODS

It is a cross-sectional study developed in the city of Viçosa, Minas Gerais, from April to July 2013. Viçosa is located in Zona da Mata Mineira, with a population of 77.863 inhabitants, as well as a floating population of about 20.000 people, composed mainly by college students from a public federal university and other institutions. The coverage of the FHS reaches 62.8% of the population, divided into 14 units, with 15 teams caring for the urban and rural population.

The target-population of this study consisted of individuals with the diagnosis of DM, who were 18 years old or over, users of insulin in their treatment and using syringes for the application of insulin, they were also registered in the Public Central Drugstore of the Municipal Health Department, where this study was developed. It should be highlighted that this drugstore was the only one in the city to distribute insulin to the users of SUS (Federal Health Care Program). Following these criteria, 235 patients were identified.

To calculate the sample, a prevalence of 62.8% of insulin self-application, a significance level of 95% and an accuracy of 5% were considered[11]. A simple random sampling was used to select the study participants. A total of 142 patients were selected.

The data colected was carried out through the application of a quiz in the residence of the selected patients. The home visits were not scheduled, but a previous telephone

contact was done in order to identify the usual timing of the application of insulin. The quiz was strutctured to contain socioeconomic, demographic, clinical, and health services related questions. The questionnaire was previously tested and applied to the patients by trained researchers. The patients received a copy of the questionnaire to follow its application.

The dependent variable of the present study was the self-application of the insulin. The self-application was considered when the patient himself/herself performed the procedure of insulin application always or most of time (more than 50% of the applications).

The explanatory variables were divided into three blocks: sociodemographic, clinical, and related to the health services. The sociodemographic characteristics of the individuals studied were: sex, age range (18-56, 57-68, 69-89), color/race (black, white and mixed race), marital status (living with a partner and children, living with other relatives) and years of schooling (illiterate, 1 to 8 years, 9 years or more). The clinical characteristics of the individual included were: type of diabetes (type 1, type 2, do not known) time of diagnosis of diabetes in years (0-10, 11-20, 21 or more), treatment time with insulin in years (0-4, 5-12, 13 or more), diagnosis of arterial hypertension (AH) (yes or no) and hospitalization in the last 12 months (yes or no). The characteristics related to the health service were: living in an area with the assistance of the FHS (yes or no), kind of service that the user attends for the treatment of diabetes (FHS, State Center for Specialized Care - CEAE [formerly known as HIPERDIA], private doctor) received guidance on insulin preparation and application technique (yes, no).

In order to certify that the study participant's residence belonged to the areas covered by the FHS, a survey was carried out with the Municipal Coordination of the selected region.

The initial data analysis included a description of the study population by means of frequency distribution, average and standard deviation. It was estimated the prevalence of insulin self-application and investigated its association with the characteristics of the individual using the Pearson's chi-square test with significance level of 5%, or the Fischer's Exact test when necessary. The strength of the association between the insulin self-application and the explanatory variables was evaluated using the odds ratio (OR) and their respective intervals, with 95% confidence using multivariate logistic regression.

Significant explanatory variables were included in the multivariate model at the level of 20% ($p<200$) in the univariate analysis. Considering the objectives of this research, the backward elimination method was used to select the final logistic regression model using the Wald test. This method started with the inclusion of all explanatory and significant variables ($p<0.20$ in the univariate analysis) in the model. The variables were then removed one at a time, starting with the one with the least significance in the Wald test (higher p value). The equation was reevaluated at each stage and the procedure was repeated until each variable maintained in the model explained a significant portion of the variation observed in the response. The final model was composed of variables that presented a significance level of 5% ($p<0.05$). The EpiInfo software version 7.0 was used for statistical analysis.

The present study was approved by the Municipal Health Department of Viçosa and the Ethics Committee for Researches with Humans Beings of the Federal University of Viçosa (UFV) (Opinion No. 068/2012/CEPH). All the paticipans signed a free and informed consent term.

RESULTS

Among the 142 participants of this study, more than a half were female, white, living with a partner and children, with 1 to 8 years of shooling. The average and standard deviation of age was of 60 ± 17 years.

With regards to the clinical characteristics, most of the patients reported a diagnosis of AH and diabetes type 2, more than 10 years of diagnosis of DM and more than four years of treatment with insulin. Other characteristics can be found in Table 1.

Among the participants, 67.61% reported self-application of insulin (Table 1). In the univariate analysis, a higher frequency was observed in self-application of insulin among individuals of a lower age, white, with higher schooling, with AH diagnosis and living in area not assisted by the FHS (Table 2).

Table 3 presents the factors associated with the self-application of insulin, after multiple logistic regression. From the nine variables that entered the multivariate model, (Model 1) only four remained significantly ($p <0.05$) associated with insulin self-application in the final model (Model 6): age, years of schooling, marital status and living in area covered by the FHS. The chance of self-application of insulin increased with the increase in schooling, it was higher among those who lived with their partners and children than among those who lived with other relatives, and it was lower in individuals aged between 57 and 68 years old, compared to individuals aged between 18 to 56 years old. The individuals who lived in the area not covered by the FHS had a 2.8 (95% CI: 1.1-7.0) higher chance of self-application of insulin in relation to those living in an area covered by the FHS.

Table 1 – Clinical and sociodemographic characteristics related to the health services of the patients using insulin, Viçosa, 2013

Variables	n(%)
Gender	
Female	78(54.93)
Male	64(45.07)
Age Range	
18-56	47(33.10)
57-68	47(33.10)
69-89	48(33.80)
Color/Race	
White	78(54.93)
Black	32(22.54)
Mixed race	32(22.54)
Marital Status	
Living with a partner and children	90(63.38)
Living with other relatives	52(36.62)
Years of schooling	
Illiterate	19(13.38)
1-8	80(56.34)
9 or +	43(30.28)
Type of diabetes	
Type 1	32(22.54)
Type 2	77(54.23)
Does not know	33(23.24)
Time of diabetes in years	
0-10	49(34.51)
11-20	47(33.10)
21 or +	46(32.39)
Time of insulin in years	
0-4	47(33.10)
5-12	49(34.51)
13 or +	46(32.39)
Hypertension	
Yes	95(6.90)
No	47(33.10)
Self-application of insulin	
Yes	96(67.61)
No	46(32.39)
Medical hospitalization in the last 12 months	
Yes	15(10.56)
No	127(89.44)
Living in area covered by the FHS	
Yes	95(66.90)
No	47(33.10)
Kind of Service used for the treatment of Diabetes	
ESF	26(18.31)
CEAE	96(67.61)
Private doctor	20(14.08)
Received guidance on insulin preparation and application technique	
Yes	107(75.35)
No	35(24.65)

Source: Research data, 2013.
FHS – Family Health Strategy; CEAE - State Center for Specialized Care.

Table 2 – Self-Application of insulin according to the sociodemographic, clinical and health services related characteristics of patients with diabetes, Viçosa, 2013

Variables	Self-Application of Insulin		p-value*
	No n(%)	Yes n(%)	
Gender			
Female	29(37.18)	49(62.82)	0.178
Male	17(26.56)	47(73.44)	
Age Range			
18-56	6(12.77)	41(87.23)	
57-68	19(40.43)	28(59.57)	0.002
69-89	21(43.75)	27(56.25)	
Color/Race			
White	18(23.08)	60(76.92)	
Black	15(46.88)	17(53.13)	0.028
Mixed race	13(40.63)	19(59.38)	
Marital Status			
Living with a partner and children	24(26.67)	66(73.33)	0.055
Living with other relatives	22(42.31)	30(57.69)	
Years of schooling			
Illiterate	12(63.16)	7(36.4)	
1-8	29(36.25)	51(63.75)	0.0002
9 or +	5(11.63)	38(88.37)	
Type of diabetes			
Type 1	6(18.75)	26(81.25)	
Type 2	27(35.06)	50(64.94)	0.156
Does not know	13(39.39)	20(60.61)	
Time of diabetes in years			
0-10	19(38.78)	30(61.22)	
11-20	12(25.53)	35(74.47)	0.382
21 or +	15(32.61)	31(67.39)	
Time of insulin in years			
0-4	19(40.43)	28(59.57)	
5-12	14(28.57)	35(71.43)	0.355
13 or +	13(28.26)	33(71.74)	
Hypertension			
Yes	36(37.89)	59(62.11)	0.046
No	10(21.28)	37(78.72)	
Medical hospitalization in the last 12 months			
Yes	8(53.33)	7(46.67)	0.082**
No	38(29.92)	89(70.08)	
Living in area covered by the FHS			
Yes	37(38.95)	58(61.05)	0.017
No	9(19.15)	38(80.85)	

Kind of Service used for the treatment of DM			
FHS	12(46.15)	14(53.85)	
CEAE	29(30.21)	67(69.79)	0.228
Private Doctor	5(25.00)	15(75.00)	
Received guidance on insulin preparation and application technique			
Yes	33(30.84)	74(69.16)	0.489
No	13(37.14)	22(62.86)	

Source: Research data, 2013.
FHS – Family Health Strategy; CEAE - State Center for Specialized Care.
*Chi-squared test ** Fischer's Exact test

Table 3 - Models of logistic regression of sociodemographic, clinical and health services related characteristics associated to the self-application of insulin in patients with diabetes, Viçosa, 2013

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	OR	IC 95%	OR	IC 95%	OR	IC 95%	OR	IC 95%	OR	IC 95%	OR	IC 95%
Gender												
Female	1		1		1							
Male	1	0.7-4.4	1.8	0.7-4.5	1.7	0.7-4.4						
Age Range												
18-56	1		1		1		1		1		1	
57-68	0.3	0.1-1.1	0.3	0.1-1.0	0.3	0.1-0.9	0.3	0.1-0.9	0.3	0.1-0.9	0.3	0.1-0.9
69-89	0.4	0.1-1.3	0.3	0.1-1.2	0.3	0.1-1.2	0.3	0.1-1.2	0.4	0.1-1.3	0.4	0.1-1.3
Color/Race												
White	1		1		1		1					
Black	0.4	0.1-1.2	0.4	0.2-1.2	0.4	0.2-1.2	0.5	0.2-1.3				
Mixed race	0.4	0.1-1.2	0.4	0.1-1.2	0.4	0.1-1.1	0.5	0.2-1.3				
Marital Status												
Living with a partner and children	2.0	0.8-5.0	2.0	0.8-5.0	2.0	0.8-5.0	2.5	1.0-5.0	2.5	0.9-5.0	2.5	1.1-5.0
Living with other relatives	1		1		1		1		1		1	
Years of schooling												
Illiterate	1		1		1		1		1		1	
1-8	2.2	0.7-7.2	2.2	0.7-7.1	2.3	0.7-7.2	2.5	0.8-8.0	2.5	0.8-7.6	2.3	0.7-6.9
9 ou +	5.3	1.1-27.5	5.4	1.1-28.3	6.6	1.3-32.8	7.8	1.6-38.3	9.2	2.0-42.7	8.4	1.9-37.9
Type of diabetes												
Type 1	1		1									
Type 2	0.59	0.2-2.2	0.6	0.2-2.1								
Does not know	0.50	0.1-2.1	0.5	0.1-2.1								
Hypertension												
Yes	1											
No	1.30	0.5-3.7										
Medical Hospitalization in the last 12 months												
Yes	1		1		1		1		1			
No	3.89	0.9-15.3	3.8	0.9-14.7	3.2	0.9-11.4	2.9	0.8-10.3	2.9	0.8-10.3		
Living in area covered by the FHS												
Yes	1		1		1		1		1		1	
No	2.87	1.1-7.8	2.94	1.1-8.0	2.9	1.1-7.9	2.78	1.1-7.4	2.86	1.1-7.5	2.8	1.1-7.0

Source: Research data, 2013.
FHS – Family Health Strategy.

DISCUSSION

The results of the present study showed that more than two-thirds of the individuals on insulin treatment performed the self-application of the drug. The patients who had the greatest chance of self-application of insulin were the youngest ones, with more schooling and who lived with companions and children. The research findings also revealed that those individuals who lived in a geographic area covered by the FHS teams had lower chances of self-application of insulin.

For patients with diabetes, the self-application of insulin is still a challenge to be faced, which requires the aquisition of knowledge and the development of skills for its correct execution. A Brazilian Research published in 2011 identified that only 27.54% of the users of insulin performed their self-application, and those responsible for the injections were relatives, friends/neighbors, nursing professionals or pharmacy professionals[12].

The adherence to the insulin therapy is generally low and influenced by factors that may or may not be related to the individual perception about the treatment. For most patients, the adherence barriers to the therapy with insulin are related to psychologic reasons, which includes concerns about safety and efficacy of the insulin[13]. A study showed that the age, the female gender and trips are the main factors for the adherence to the insulin treatment, which are not related to the individual perception[10].

Concerning the influence of the age in the self-application of insulin, the results found in this study were consistent with other studies performed with adult patients who use this medication, whose self-administration is less frequent among the elderly[11,14].

Studies demonstrate that physical and cognitive limitations increase at more advanced ages and may cause difficulties in the management of the instruments used in the application of insulin[5]. In fact, the functional limitations that come up with the aging process may put a lid on the autonomy of the users and, therefore, need to be investigated in order to be able to be managed by the health professionals[5].

From this perspective, patients who need insulin to achieve a glycemic control should be encouraged to do the self-administration, developing skills in the application through educational processes guided by health professionals[11]. The home use of insulin requires pratice, changes in daily habits, discipline and availability for learning and education[5]. Several studies show the positive influences of health education to engage patients in taking the responsibility for controlling their own condition, which contributes to the reduction of the high prevalence of complications and better conviviality with the disease[2].

American guidelines on education and self-management of DM point out the importance of the educational process driven to the educational needs of the population, and show a lack of knowledge and skills in the management of the disease in 50% to 80% of the individuals with diabetes, being the glicemic control reached by less than a half of the patients with the type 2 DM[9]. These data highlight the relevance of the implementation of health education actions directed to the self-control of DM.

In the present study, individuals with higher schooling presented a greater chance of self-application of insulin. Studies show that high schooling is a facilitating factor for adherence to the treatment, due to its relationship with the capability to acquire knowledge and readiness for self-care[6,11]. On the other hand, the low schooling can be seen as a factor that hinders the access to the information and, consequently, the performance of self-care[2,6]. In this way, interventions aimed at estimulating the self-administration of insulin should be taken in different ways to the patients with distinctive instructional levels.

The performance of the actions of self-care, including self-administration of insulin, may also be influenced by the environment in which the patients are surrounded and keep relations, especially in the family environment[15]. Evidences show that the higher levels of social support from family members can improve the adherence to the therapeutic routine. Reports from a focal group of diabetic patients showed that self-care behaviors became easier when there was a family member's awareness regarding the specific needs related to DM[16]. In this research, it was possible to notice the results of this influence by the fact that the users who lived with companions and/or children were, in most cases, considered as the ones responsible for the self-administration of insulin, demonstrating how the family support promoted by the partner represents an important strategy for facing the disease.

Concerning to the health services to the DM patients, the FHS has been seeking to redirect the healthcare model, adding fundamental principles such as the valorization of equity and comprehensiveness of the care[17]. However, in this study, it was identified that living in regions covered by the FHS teams was related with a lower chance of occurrence of a self-administration of insulin. This finding may be related to the interaction process between professional-patient, considered as one of the greatest challenges for improving the care of diabetics by teams that work in the primary health care (PHC)[18].

For the patient with diabetes, this commitment from the health professionals ends up reflecting on the quality of the care provided, which may make it easier or difficult the adherence of the patient to the proposed treatment[19]. Besides, it is important to highlight the fact that diabetic individuals who most performed the self-application of insulin do not live in regions covered by the FHS may be related to the more central location of their residences in the city of this study, higher purchasing power and higher schooling, factors that predispose a greater adherence to the insulin application.

In this sense, health professionals, with emphasis on the strategic performance of the nurses, must support the development or strenghtening of skills for the self-care, acting as facilitators in this process acquiring behavioral changes aimed to disease control[20].

To this end, the teaching about DM should gather educational strategies using dialogic, participative teaching techniques, such as workshops, dramatizations, experience reports, walks and others, in order to value the autonomy of individuals, promoting conscious decision making and encourage the process of self-management of the disease, making them self-managers of their health[2].

In order to do so, it is necessary a proper training of the family health teams, a deeper bond between professional and user and to ensure their access to services, so that quality care can be offered, where the priority is the prevention and control of diabetes[18].

CONCLUSION

The self-application of insulin is considered a self-care activity performed by patients who have diabetes and is seen as key to disease control. However, the adherence can be influenced by different factors related to individual and social issues. In this study, it was observed that the patients who presented the greatest chance of self-administration were the adults or young people, with a higher level of education and who lived with partners and children in areas not covered by the FHS teams.

Understanding the factors that influence the achievement of insulin self-application by health professionals is key for the planning of strategies for the suitable control of the diabetic patient. Issues related not only to the individual, but to the environment in which they live and to the healthcare actions, may make facilitate or not the adherence to the self-application of insulin. Thus, it is up to the professionals, with emphasis on the nurse, to provide personalized care to patients with diabetes, considering the particularities that may compromise the adherence to the insulin therapy and intervene in them.

A limitation of this study is related to the cross-sectional method, which evaluates a specific situation in a single moment and does not allow the establishment of causal relations. However, important associations between the characteristics of diabetic patients and adherence to insulin self-application have been observed. Another limitation refers to the precision of the results found in the present study. Some variables that are in the final model presented confidence intervals with large amplitude. A very large interval indicates that the calculated estimate is not as accurate as the one with a smaller interval, that means, the larger the range of the interval, the less the reliability of the estimate. In this sense, the results should be interpreted with caution and new research is indicated to elucidate the results found in this study.

It is expected that the results of the present study may contribute to the search for strategies directed to face the barriers that prevent the adherence to the insulin self-application, through the design of health education actions directed to the needs of individuals and their families, with focus on a comprehensive model of care. From a greater therapeutic adherence it will be possible to minimize the complications resulting from diabetes and, consequently, to improve the quality of life of this population.

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