Esc Anna Nery 2022;26:e20210313

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Effects of educational intervention on health literacy and knowledge about diabetes: a quasi-experimental study

Efeitos de intervenção educativa no letramento em saúde e no conhecimento sobre diabetes: estudo quase-experimental

Efectos de la intervención educativa en la alfabetización en salud y el conocimiento sobre la diabetes: estudio cuasiexperimental

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ABSTRACT

Objective: To analyze the effects of educational intervention on health literacy and knowledge about diabetes in adults assisted in primary health care. **Method**: This is a quasi-experimental study with educational intervention during the nursing consultation with 33 adults diagnosed with type 2 diabetes mellitus registered in a Family Health Strategy Unit in southern Brazil and involving group activity and telephone follow-up. Sociodemographic and clinical instruments were applied before and after the intervention; these instruments included the Spoken Knowledge in Low Literacy Patients with Diabetes and the Eight-Item Health Literacy Assessment Tool. Data were analyzed using the Wilcoxon, Spearman, and McNemar correlation coefficient tests. **Results**: Most participants were women (69.7%), with a mean age of 57.0 years, less than nine years of schooling (69.7%), and ≤10 years of diagnosis (51.5%). After the intervention, there was an increase in knowledge about diabetes ($p = 0.001$), correlated with health literacy ($r = 0.494$; $p = 0.001$) and the time of diagnosis ($r = 0.455$; $p = 0.001$). **Conclusion and implications for practice**: The instruments to measure health literacy and knowledge about diabetes enabled the construction of educational strategies aimed at existing gaps, increasing the knowledge, thereby favoring the development of skills for self-management.

Keywords: Knowledge; Office Nursing; Diabetes Mellitus Type 2; Health Education; Health Literacy.

RESUMO

Objetivo: Analisar os efeitos de intervenção educativa no letramento em saúde e no conhecimento sobre diabetes em adultos atendidos na atenção primária à saúde. **Método:** Trata-se de estudo quase-experimental com intervenção educativa durante a consulta de enfermagem, atividade em grupo e acompanhamento telefônico com 33 adultos diagnosticados com diabetes *mellitus* tipo 2, cadastrados em uma Unidade Estratégia Saúde da Família no Sul do Brasil. Aplicaram-se instrumentos sociodemográfico e clínico (*Spoken Knowledge in Low Literacy Patients with Diabetes* e *Eight-Item Health Literacy Assessment Tool*) antes e após a intervenção. Os dados foram analisados pelos testes de Wilcoxom, coeficiente de correlação de Spearman e McNemar. **Resultados:** A maioria dos participantes eram mulheres (69,7%), com idade média de 57,0 anos, tempo de escolaridade inferior a nove anos (69,7%) e tempo de diagnóstico ≤10 anos (51,5%). Após a intervenção, obteve-se aumento do conhecimento sobre a diabetes ($p = 0,001$), correlacionado ao letramento em saúde ($r = 0,494$; $p = 0,001$) e ao tempo do diagnóstico ($r = 0,455$; $p = 0,001$). **Conclusão e implicação para a prática:** A utilização de instrumentos para mensurar o letramento em saúde e o conhecimento sobre diabetes possibilitou a construção de estratégias educativas voltadas para as lacunas existentes, promovendo aumento do conhecimento, o qual favorece o desenvolvimento das habilidades para a autogestão.

Palavras-chave: Conhecimento; Consulta de Enfermagem; Diabetes *Mellitus* Tipo 2; Educação em Saúde; Letramento em Saúde.

RESUMEN

Objetivo: Analizar los efectos de la intervención educativa sobre la alfabetización en salud y el conocimiento sobre diabetes en adultos tratados en la Atención Primaria de Salud. **Método:** Se trata de un estudio cuasiexperimental, con intervención educativa, durante la consulta de enfermería en 33 adultos diagnosticados de Diabetes Mellitus tipo 2 registrados en una Unidad de Estrategia de Salud Familiar en el sur de Brasil, con actividades grupales y seguimiento telefónico. Antes y después de la intervención, se aplicaron instrumentos sociodemográficos y clínicos: *Spoken Knowledge in Low Literacy Patients with Diabetes* and *the Eight-Item Health Literacy Assessment Tool*. Los datos se analizaron mediante las pruebas de coeficiente de correlación de Wilcoxom, Spearman y McNemar. **Resultados:** La mayoría fueron mujeres (69,7%), con una edad media de 57,0 años, menos de nueve años de escolaridad (69,7%) y tiempo de diagnóstico ≤ 10 años (51,5%). Después de la intervención, hubo un aumento en el conocimiento sobre diabetes (p = 0,001), correlacionado con la alfabetización en salud (r = 0,494 p = 0,001) y el tiempo desde el diagnóstico (r = 0,455 p = 0,001). **Conclusión e implicaciones para la práctica:** El uso de instrumentos para medir la alfabetización en salud y el conocimiento sobre la diabetes permitieron la construcción de estrategias educativas orientadas a las brechas existentes, aumentando su conocimiento, lo que favorece el desarrollo de habilidades para el autocuidado.

Palabras clave: Conocimiento; Enfermería de Consulta; Diabetes Mellitus Tipo 2; Educación en Salud; Alfabetización en Salud.

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Submitted on 08/15/2021.
Accepted on 04/19/2022.

DOI:https://doi.org/10.1590/2177-9465-EAN-2021-0313en

INTRODUCTION

Diabetes mellitus (DM) is a chronic disease on the rise, affecting roughly 424.9 million people worldwide. Type 2 diabetes (DM2) is recognized as the most common form (90–95% of cases) and is responsible for high early morbidity and mortality rates. The complications of DM can be associated with the low problem-solving capacity of health systems and the little awareness of professionals for prevention,[1] factors that imply ignorance of the disease, poor treatment adherence, and impaired self-management of care.[2]

People with self-management skills (knowledge, monitoring, control, and appropriate decision-making for health) obtain a better quality of life and fewer complications. In this sense, health education programs must evaluate behavioral, psychosocial, and clinical aspects to adapt educational actions in different populations to develop this level of health management. The importance of respecting the race, belief, culture, and cognitive and health literacy (HL) levels of individuals is emphasized in order to increase the knowledge, skills, and motivation of people with DM.[3]

Health literacy is defined as a set of individual and social skills shared through public dialogue among lay people, professionals, users, and health systems, to develop capacities for daily decision-making.[4] It is emphasized that HL, together with knowledge about the disease, is a prerequisite for self-management.[5]

Many instruments measure HL levels, which are directed to functional health literacy, reading skills, decision making, health interactivity, and disease-specific knowledge. These assessments provide important information for building interventions aimed at empowerment, improving decision-making skills, and encouraging protagonism in treatment.[6]

In Brazil, in 2011, the Ministry of Health, according to the guidelines of the United Nations, formulated the Strategic Action Plan to Combat Chronic Noncommunicable Diseases to reduce and prevent the worsening of these diseases through educational actions, awareness, and access to information, especially for people with low income and education.[7] Such actions must be centered on the person, valuing their demands, encouraging autonomy, and reinforcing their potentialities to build critical thinking in the search for health rights and quality of life.[8]

Given this context, a randomized clinical trial was developed in southeastern Brazil; it conducted educational activities during group meetings and home visits for 238 users with DM2, obtaining a significant increase in self-care and empowerment after the intervention.[9] Notably, the educational activities directed at DM patients, when developed by primary health care professionals, have low costs and are effective measures in reducing the risk of complications,[10] hospitalizations, and deaths caused by the disease.[11]

Hence, people with little knowledge about this disease and with low levels of HL have more difficulty in controlling DM, requiring continuous educational monitoring by trained professionals and in programs adapted to different contexts.[3] Given the above, this study aimed to analyze the effects of educational intervention on the HL and knowledge about diabetes in adults treated in primary health care.

METHOD

This is a quasi-experimental study conducted from January to October 2020 with users of a Family Health Strategy Unit (FHS) with uncontrolled DM2 in Southern Brazil. The users were allocated to a single group with no comparison group. The educational intervention took place over nine months and was divided into three stages: nursing consultation, group activity, and telephone follow-up.

The FHS studied had 10,141 registered users, among whom 516 were diagnosed with DM and enrolled in the Ministry of Health's Hypertension and Diabetes Program (Hiperdia). Users with DM2 were also included in the study and were aged between 18 and 65 years, had glycated hemoglobin (HbA1c) levels ≥7.00%, and/or fasting glucose ≥126 mg/dL according to the 2019/2020 registries. Users who had communication difficulties and who did not answer one of three follow-up phone calls during the month were excluded. The selection and follow-up of participants are presented in the diagram adapted from the Consolidated Standards of Reporting Trials (CONSORT) (Figure 1).

The nursing consultation (first stage) occurred in January and February 2020, initially with anamnesis and the following sociodemographic and clinical instruments, following a single protocol: the Spoken Knowledge in Low Literacy Patients with Diabetes (SKILLD)[12,13] and the Eighth-Item Health Literacy Assessment Tool (HLAT-8).[14,15] Knowledge about DM was assessed by applying the SKILLD instrument, which is composed of ten questions with scores ranging from zero to 100%. Knowledge was considered adequate when scores were ≥60%.[12,13] To measure the HL levels, we adopted the HLAT-8, which is composed of eight questions with Likert-type answers, with a minimum score of zero and a maximum of 37.[14,15] In this case, the satisfactory level corresponded to ≥19 points.

During the consultation, the head-to-toe assessment was performed, and blood pressure, pulse rate, height, abdominal circumference (AC), and body mass index (BMI) were measured, in addition to assessing the risk of diabetic foot. The participants received guidance about the disease, treatment, complications, and the results of their physical examination. The importance of correctly using medication, regular physical activity, dietary control, moderate consumption of alcoholic beverages, and quitting smoking. The participants were invited to the group educational activity at the end of the consultation.

The activity (second stage) was performed at the FHS in the first week of March 2020, as previously scheduled, with the main theme being the normality values of the HbA1c test, as well as signs and symptoms of hyperglycemia and hypoglycemia, which were obtained by preliminary analysis of the lowest-scoring questions in the SKILLD. For this activity, an expository dialogical approach was used with posters to explore the pathophysiological aspects of DM, and later a question-and-answer game was performed.

The telephone follow-up (third stage) took place from the second half of March to October 2020 by exchanging messages via an app with the participants with access to this resource and preferred this type of communication (n = 19) and by phone calls with the others (n = 14). Communication with the participants took place every 30 days to clarify doubts regarding DM control and/or other demands, and the researchers remained freely available to the participants. In total, there were 60 communications via application and 58 by phone calls.

The last communication was made by phone and organized according to a previously established schedule with the participants; it took place between the second half of September and the first half of October, lasting an average of 25 min. During this contact, the participants were given the opportunity to ask questions, and the instruments SKILLD and HLAT-8 were applied to compare the scores before (initial time [T_0]) and after (final time [T_1]) the intervention, and the participants were informed about the end of the study and the maintenance of care with the FHS health team.

Numerical variables were analyzed by measures of central tendency (mean and standard deviation [SD]) and nominal variables with simple (n) and relative (%) frequency. The differences between T_0 and T_1 on the HLAT-8 scores were analyzed using the Wilcoxon test for paired samples. SKILLD errors and hits between times were analyzed using McNemar's test. Values were considered significant when $p < 0.05$. Spearman's correlation coefficient was used to verify the SKILLD scores with the HL and the time of diagnosis.

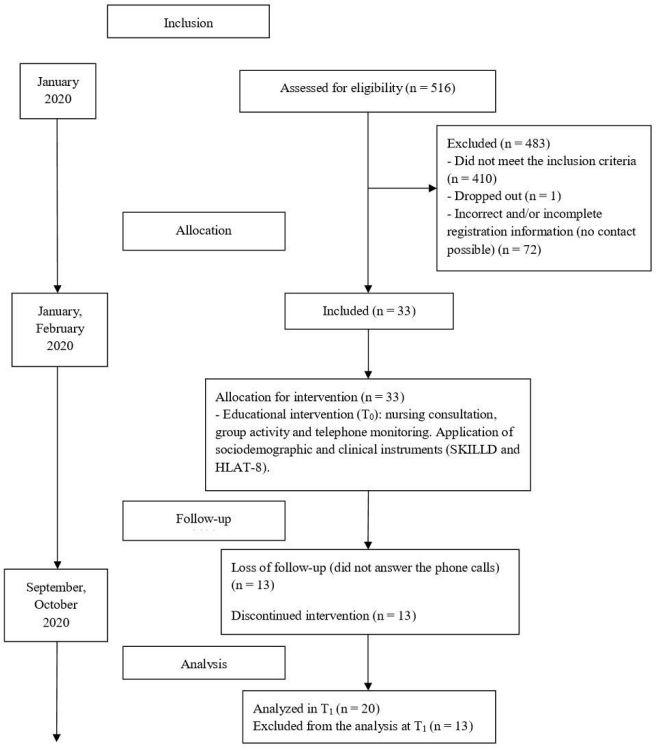


Figure 1. Methodological scheme for selection and follow-up based on the CONSORT model, southern Brazil, 2020.

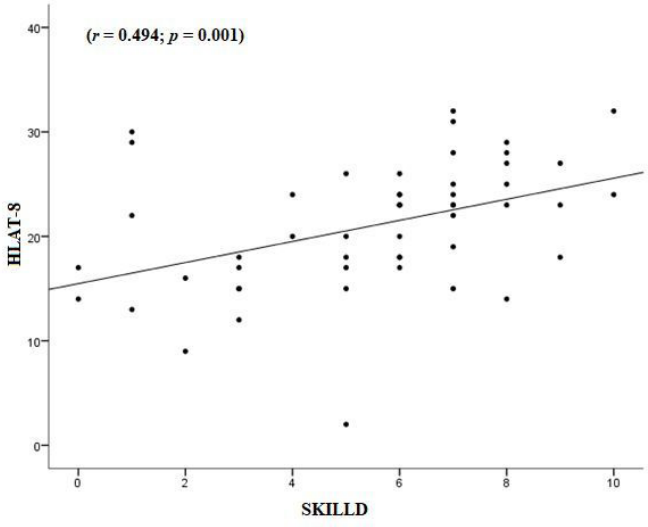
This study respected the recommendations of Resolution No. 466 of December 12, 2012 of the Brazilian National Health Council. It was also approved by the Ethics and Research with Human Beings Committee (opinion no. 3,752,041) and Certificate of Ethics Appreciation Presentation (CAAE) no. 20244119.3.0000.0102.

RESULTS

The sociodemographic and clinical characteristics of the 33 study participants are presented in Table 1. In the comparison between T_0 and the T_1 by applying the HLAT-8, we observed the questions regarding the ability to determine low- and high-quality health information on the internet, as well as the understanding of information on medication package leaflets, remained with the lowest averages in both times. Hence, we determined that there was no significant difference in HL after the educational intervention ($p = 0.868$) (Table 2). It is also noteworthy that only 61.0% (n = 20) of the participants answered the questionnaires at T_1.

By applying the SKILLD in T_0, we noted that the questions with the lowest number of correct answers were related to signs and symptoms of hyperglycemia and hypoglycemia, HbA1c normality value, and frequency of foot examination. After the educational intervention, there was an increase in the correct answers to questions about the disease's knowledge, with a statistical significance ($p = 0.001$) in the comparison between times. The comparative SKILLD correct and wrong answers are listed in Table 3.

The HLAT-8 scores were correlated with SKILLD scores in T_0 and T_1, and a moderate positive relationship ($r = 0.494$) with statistical significance ($p = 0.001$) was obtained. This correlation showed that when knowledge about the disease increased, there was also an increase in HL levels (Graph 1). As for the correlation between the time of diagnosis and SKILLD scores, a moderate



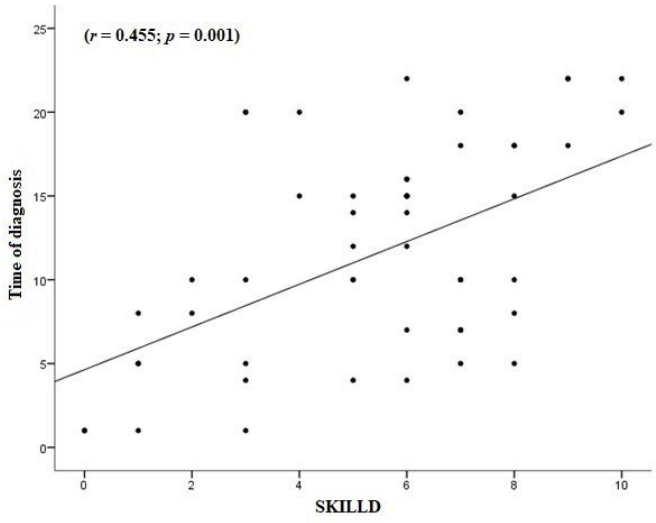
Graph 1. Correlation between the T_0 and T_1 scores of HLAT-8 and SKILLD, southern Brazil, 2020.

Table 1. Characterization of participants with type 2 diabetes mellitus according to sociodemographic and clinical variables, southern Brazil, 2020.

Sociodemographic and clinical variables	Mean ± SD	% (n)
BMI (kg/m²)	30.32 ± 5.58	-
Abdominal circumference (cm)		
Men	105.9 ± 12.3	-
Women	105.0 ± 14.7	-
Age (years)	57.0 ± 8.1	-
Sex		
Female	-	69.7 (23)
Male	-	30.3 (10)
Marital status		
Married or common-law marriage	-	78.8 (26)
Divorced	-	9.1 (3)
Singles	-	6.1 (2)
Widowers	-	6.1 (2)
Education		
<9 years old	-	69.7 (23)
9 to 12 years old	-	24.2 (8)
13 to 16 years old	-	6.1 (2)
Physical activity		
Regularly	-	9.0 (3)
Sporadically (<3 times a week)	-	21.2 (7)
Sedentary	-	69.7 (23)
Time of diagnosis (years)		
≤10	-	51.5 (17)
>10	-	48.5 (16)

Source: Research data.

positive relationship was obtained ($r = 0.455$), with significance among the variables analyzed ($p = 0.001$) (Graph 2).



Graph 2 . Correlation between SKILLD T_0 and T_1 scores and time of diagnosis, southern Brazil, 2020.

DISCUSSION

The educational intervention was used based on the analysis results of the questions with lower scores in T_0 in the SKILLD instrument. The themes of identifying signs and symptoms of hyperglycemia and hypoglycemia and the reference values of HbA1c tests were considered relevant. The educational actions aimed at self-management of DM are strategies that gradually facilitate knowledge about the disease, identify signs and symptoms of blood glucose abnormalities, develop self-monitoring skills, interpret results, achieve glycemic goals, and strengthen family and social support.[1]

There was a significant increase in knowledge about the disease after the intervention (Table 3). This result is consistent with the findings of two randomized clinical trials that used educational intervention and obtained a significant increase in knowledge about DM,[16,17] being associated with the decrease in fasting glucose (HbA1c, AC, and BMI).[17] It should be noted that it was not possible to make such an association in this study; nonetheless, it was possible to observe a decrease in errors in questions related to the signs and symptoms of hyperglycemia and hypoglycemia (questions 1 and 2) and an increase in errors in questions related to the normal values of fasting glucose and HbA1C (questions 7 and 8) between the times (Table 3). Collaborating with this finding, the SKILLD validation research for the Spanish language obtained fewer correct answers to the questions regarding the signs and symptoms of hyperglycemia and hypoglycemia and the normality value of HbA1c.[18]

It is inferred that the intervention provided recognition of signs and symptoms caused by changes in blood glucose levels, which may be associated with the participants' previous experiences, unlike the interpretation of the normality values of blood glucose levels, which socioeconomic and cultural variables can influence. It is known that many people with DM create a conception of the disease based on common sense, with ignorance of the real causes and negligence of the signs of complications.[19]

The sample of this study was composed of people who lacked control of the disease, obesity, increased AC, and sedentarism, factors that may result from not knowing some aspects of the disease and treatment. In this same sense, the low education presented in Table 1 can be understood as a preponderant factor in understanding the disease. These findings are similar to those found in Brazilian research with people diagnosed with

Table 2. Comparison of mean scores of users with type 2 diabetes mellitus by applying the HLAT-8 at T_0 and T_1, southern Brazil, 2020.

HLAT-8	Time		*p-value between times
	T_0	T_1	
	Mean ± SD	Mean ± SD	
Q1 - How much do you understand about the instructions on the medicine package inserts?	1.6 ± 1.7	1.5 ± 1.8	0.083
Q2 - How much do you understand the health information in leaflets/booklets?	2.2 ± 1.8	2.3 ± 1.9	0.821
Q3 - When I have questions about illnesses or complaints, I know where I can find that information.	2.7 ± 0.7	2.9 ± 0.7	0.999
Q4 - When I want to do something for my health without being sick, I know where I can find that information.	2.2 ± 1.1	2.3 ± 1.1	0.999
Q5 - How often were you able to help your relatives or a friend when they had questions about health problems?	3.7 ± 1.6	3.8 ± 1.6	0.530
Q6 - When you had questions about health problems and issues, how often were you able to get advice and information from other people (family and friends)?	3.3 ± 1.8	3.9 ± 1.4	0.393
Q7 - How do you believe you know how to choose the best advice and recommendations for your health?	3.6 ± 0.8	3.7 ± 1.0	0.999
Q8 - Regarding health information on the Internet, I am able to determine which sources are of high or low quality.	1.5 ± 1.5	1.4 ± 1.4	0.796
SCORE	**20.7 ± 5.4**	**21.4 ± 7.2**	**0.868**

Source: Research data.
Note: * *p*-value by Wilcoxon's paired test.

DM, whose characteristics were low levels of education[20-22] and increased BMI and AC averages.[23]

Low education may interfere with therapeutic adherence due to the difficulty in interpreting professional recommendations and understanding the complexity of the disease, caused by deficits in reading, writing, and speaking skills.[24] Such conditions are exemplified by the analysis of the results of the HLAT-8 (Table 2), which demonstrated the participants' low ability to select health information on the internet and the difficulty in understanding the texts on drug package leaflets. These data corroborate research validating the HLAT-8 for Brazilian Portuguese and Chinese,[15,25] which had the lowest mean scores on the questions concerning determining low- and high-quality sources on the internet. Nonetheless, in the Chinese study, the highest mean was for understanding the information in package leaflets,[25] thereby diverging from our findings.

Moreover, there were changes in HLAT-8 means between times, albeit without statistical significance (Table 2), diverging from the results of a systematic review from 1985 to 2009, in which, in 71% of the studies evaluated, there was an increase in HL levels after an intervention.[26] Increased HL levels are associated with developing decision-making skills, empowerment, and active participation in treatment, elements that group educational interventions can expand, printed reports, lectures, training, and remote monitoring.[6]

It is pivotal to highlight the importance of identifying facilitators and hindrances (social, cultural, and epidemiological) to create and implement educational strategies directed to the person's reality, delineating and re-signifying new modes of care.[27] Our findings showed increased HL levels in the questions of health interaction (questions 5 and 6 of Table 2), revealing that the participants helped and were helped by family and friends, always or often. The inclusion of the community and family members in educational activities is reinforced, given evidence of the positive impact of the support network on developing self-management skills.[28]

From the correlation of SKILLD and HLAT-8 scores in both times, we found that by increasing knowledge, there was also an increase in HL levels, which can be justified by the purpose of the educational intervention in arousing people's interest in managing their health. Knowledge plays a key role in preventing and detecting complications related to the disease, in addition to providing subsidies for people to assess health-related risks and seek information about treatment and appropriate care to controlling DM.[29]

Table 3. Comparison of mean scores of users with type 2 diabetes mellitus by applying SKILLD at T_0 and T_1, southern Brazil, 2020.

SKILLD		Time		*p-value between times
		T_0	T_1	
		% (n)	% (n)	
Q1 - What are the signs and symptoms of high blood glucose?	Error	84.8 (28)	75.0 (15)	0.500
	Hit	15.2 (5)	25.0 (5)	
Q2 - What are the signs and symptoms of low blood sugar?	Error	66.7 (22)	65.0 (13)	0.500
	Hit	33.3 (11)	35.0 (7)	
Q3 - How should low blood sugar be treated?	Error	24.2 (8)	10.0 (2)	0.250
	Hit	75.8 (25)	90.0 (18)	
Q4 - How often should a person who has diabetes have their feet examined?	Error	63.6 (21)	40.0 (8)	0.219
	Hit	36.4 (12)	60.0 (12)	
Q5. Why is a foot examination important for a person who has diabetes?	Error	39.4 (13)	20.0 (4)	0.063
	Hit	60.6 (20)	80.0 (16)	
Q6 - How often should a person with diabetes see an optician and why is this important?	Error	27.3 (9)	25.0 (5)	0.999
	Hit	72.7 (24)	75.0 (15)	
Q7 - What is the normal fasting blood glucose?	Error	24.2 (8)	25.0 (5)	0.999
	Hit	75.8 (25)	75.0 (15)	
Q8 - What is the normal value for glycated hemoglobin?	Error	63.6 (21)	75.0 (15)	0.999
	Hit	36.4 (12)	25.0 (5)	
Q9 - How many times a week should a person with diabetes exercise and how long?	Error	45.5 (15)	40.0 (8)	0.500
	Hit	54.5 (18)	60.0 (12)	
Q10 - What are the long-term complications of uncontrolled diabetes?	Error	51.5 (17)	30.0 (6)	0.016
	Hit	48.5 (16)	70.0 (14)	
Score		5.2 ± 2.6	6.0 ± 2.5	**0.001***

SOURCE: Research data.
NOTE: * *p*-value by McNemar's paired test.

The correlation of SKILLD scores in the T_0 and T_1 with the diagnosis time showed a moderate positive value and statistical significance (Graph 2). This result is similar to the findings of a cross-sectional study with 123 people with DM in southeastern Brazil, which showed a significant value between the levels of knowledge and time of disease progression.[24]

It is known that people with longer disease progression tend to experience clinical conditions such as hypoglycemia, which causes fear and requires knowledge and skills for monitoring and decision-making for control. For this reason, people with DM require monitoring and participation in health education programs to be motivated, supported, and empowered to manage symptoms appropriately to improve their quality of life and delay complications.[1]

The nursing consultation, in this context, is a strategy that provides interaction, bonding, trust, and comprehensive care and provides an opportunity to strengthen the person's autonomy and active participation in health care.[27,30] The educational activities with DM users applied during the nursing consultation must go beyond the normative model of knowledge transfer and meet holistic models that value the human dimensions and the person's choices in their treatment.[31]

In this study, the effects of the educational intervention were compared as a whole, not the forms in which this intervention took place (nursing consultation, group meeting, and telephone monitoring). The results of a meta-review of systematic reviews of randomized clinical trials showed no statistical difference in comparing usual educational actions with remote monitoring; however, the use of this strategy helped reduce the glycemic rates of participants with DM2. Creating and implementing remote monitoring using educational actions must be guided by an explicit theory of self-management in order to develop skills and emancipation for care.[32]

CONCLUSION AND IMPLICATIONS FOR PRACTICE

The educational intervention with the participants increased the knowledge of people with DM2 regarding their disease, consequently positively influencing the HL. Nevertheless, we verified that there was no direct intervention effect on the HL; by applying the HLAT-8, it was possible to observe that the highest averages were in the questions related to help from family and friends and the exchange of information with these people, providing clues to analyze the influence of the support network on health care. Therefore, we emphasize the need for educational interventions integrated with various sectors and professionals involving the community and family to strengthen social support networks and develop skills for self-management of DM.

Moreover, the use of instruments that evaluate the levels of HL and knowledge of the disease is encouraged, as they provide subsidies to create educational interventions focused on the needs of the person with DM, with the possibility of implementing this approach during the nursing consultation, group activity, and distance monitoring, especially for those with a lack of control of the disease.

The limitations of this study were the sample size and the participants' unavailability for telephone consultation and answering the instruments in the final time. Notably, this study was conducted during the COVID-19 pandemic, a factor that precluded other nursing consultations and group meetings.

FINANCIAL SUPPORT

This study was conducted with the support of the Coordination of Improvement of Personnel of Higher Education (Capes) as a master's scholarship (social demand, funding code 001) granted to Robson Giovani Paes. There was also the support of the National Council for Scientific and Technological Development (CNPq) through a research productivity scholarship (process no. 308685/2019-9) granted to Maria de Fátima Mantovani.

AUTHOR'S CONTRIBUTIONS

Study design. Robson Giovani Paes. Maria de Fatima Mantovani. Data collection or production. Robson Giovani Paes. Maria de Fatima Mantovani. Data Analysis. Robson Giovani Paes. Maria de Fatima Mantovani. Interpretation of results. Robson Giovani Paes. Maria de Fátima Mantovani. Luciana Puchalski Kalinke. Ricardo Castanho Moreira. Marta Cossetin Costa. Adriana Cordeiro Lopes Pereira. Writing and critical revision of the manuscript. Robson Giovani Paes. Maria de Fátima Mantovani. Marta Cossetin Costa. Adriana Cordeiro Lopes Pereira. Luciana Puchalski Kalinke. Ricardo Castanho Moreira. Approval of the final version of the article. Robson Giovani Paes. Maria de Fátima Mantovani. Marta Cossetin Costa. Adriana Cordeiro Lopes Pereira. Luciana Puchalski Kalinke. Ricardo Castanho Moreira. Responsibility for all aspects of the content and integrity of the published article. Robson Giovani Paes. Maria de Fátima Mantovani. Marta Cossetin Costa. Adriana Cordeiro Lopes Pereira. Luciana Puchalski Kalinke. Ricardo Castanho Moreira.

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[1] Article extracted from the master's thesis defended in 2021, entitled "The influence of health literacy and knowledge of the disease on self-management of care for adults with type 2 diabetes mellitus: subsidies for nursing," of the Graduate Program in Nursing of the Federal University of Paraná, authored by Robson Giovani Paes and supervised by Maria de Fátima Mantovani.