

ORIGINAL ARTICLE

Educational interventions for people with diabetes in the context of the COVID-19 pandemic and post-pandemic period: a quasi-experiment

HIGHLIGHTS

1. The interventions contributed to improving knowledge.
2. There has been a change in COVID-19 prevention practices.
3. There have been changes to diabetes management measures.

Alex dos Santos Silva¹ 
Graziela Silva Batista¹ 
Camila Ferreira do Monte¹ 
Erielton Gomes da Silva¹ 
Carla Lidiane Jácome dos Santos² 
Mariana Albernaz Pinheiro de Carvalho¹ 
Lidiane Lima de Andrade¹ 

ABSTRACT

Objective: To evaluate the effectiveness of educational interventions for people with diabetes in the context of the COVID-19 pandemic and the post-pandemic period. **Method:** quasi-experimental study conducted in a municipality in Paraíba, Brazil, from February to May 2023. Educational interventions with content extracted from a validated booklet were applied to 34 people with diabetes. A questionnaire was used to collect sociodemographic data and to assess COVID-19 prevention practices and specific measures for diabetes management. The paired Student's t-test was used to compare the mean scores. **Results:** Positive changes were observed in handwashing and antisepsis, environmental hygiene, diet adherence, physical exercise, and blood glucose levels. **Conclusion:** The interventions improved knowledge among participants, which modified some COVID-19 prevention practices and specific measures for diabetes management.

DESCRIPTORS: Diabetes Mellitus; Health Education; Health Literacy; COVID-19; Educational Technology.

HOW TO REFERENCE THIS ARTICLE:

Silva AS, Batista GS, do Monte CF, da Silva EG, dos Santos CLJ, de Carvalho MAP, et al. Educational interventions for people with diabetes in the context of the COVID-19 pandemic and post-pandemic period: a quasi-experiment. Cogitare Enferm [Internet]. 2025 [cited "insert year, month and day"];30:e96647en. Available from: <https://doi.org/10.1590/ce.v30i0.96647en>

¹Universidade Federal da Paraíba, João Pessoa, PB, Brasil.

²Centro Universitário Maurício de Nassau, João Pessoa, PB, Brasil.

INTRODUCTION

Diabetes mellitus (DM) is one of the most prevalent Chronic Noncommunicable Conditions (CNCCs) globally. It is characterized by insulin resistance and persistent hyperglycemia. Type 2 DM (T2DM) accounts for about 90% of cases and has a significant economic impact on healthcare systems, requiring specific care and effective strategies for proper management¹.

In addition to metabolic and economic implications, DM2 affects the immune system. People with this condition face greater risks of infectious processes, as macrophages, neutrophils, and natural killer cells are unregulated. This causes insulin resistance to worsen and compromises the body's ability to fight infections².

This increased risk of infection has become even more evident with the *Coronavirus Disease 2019* (COVID-19) pandemic, as people living with DM2 are considered a risk group for infection with SARS-CoV-2, the etiological agent of COVID-19. A systematic review and meta-analysis showed that DM2 was significantly associated with death in patients with COVID-19 and suggested that these individuals need constant monitoring to reduce the risk of complications and death³.

In addition, people with DM2 may experience persistent symptoms or develop complications after COVID-19 infection. COVID-19 infection can also increase insulin resistance and compromise the management of condition⁴. Thus, continuous care and engagement in managing CNCC are crucial factors for risk reduction, both in the pandemic and post-pandemic context. Given that, it is necessary to consider the possibility of new variants of the virus that cause COVID-19 and other health crises that may arise and affect people with DM2⁵.

Continuous care is one of the pillars for the proper management of DM2. However, the COVID-19 pandemic has challenged healthcare professionals with the continuity of care for CCNCC, especially with DM2, as pointed out in a study⁶. In addition, the COVID-19 pandemic has required people with DM2 to adapt to their habits, as restrictions have limited physical activity, impacted eating habits, complicated medication management, and reduced regular medical appointments⁷. These vulnerabilities can lead to difficulties in DM2 care, which affects quality of life in the short and long term⁸.

Therefore, it is necessary to engage people with DM2 in managing their condition using strategies that promote autonomy and encourage self-care. In Brazil, the Strategic Action Plan for Chronic Diseases and Noncommunicable Diseases (2021) reinforces the role of health education in raising awareness and improving access to information. This includes helping people learn about the importance of diabetes management, thereby increasing Health Literacy (HL)¹.

HL refers to understanding and applying health information to make individual and collective decisions. People with higher levels of HL have more effective self-management skills, make more assertive decisions, and enjoy a better quality of life and lower chances of complications¹⁰. HL for people with DM2 is a determining factor in achieving glycemic targets. Therefore, inadequate levels of HL in people living with DM2 are one of the factors that hinder essential decision-making for managing the condition. They contribute to a higher incidence of complications and aggravating factors, such as more severe stages of infections., levels of HL in people living with DM2 are one of the factors that hinder essential decision-making for managing the condition and contribute to a higher incidence of complications and aggravating factors, such as more severe stages of infections¹¹

This further reinforces the importance of health education activities to reduce this lack of knowledge, promote effective self-management, and achieve glycemic targets¹². A systematic review that evaluated the effectiveness of educational interventions in the LS of people living with CNCC showed that the interventions carried out in the included studies were effective in increasing knowledge and improving people's activities. Especially those with DM2.¹³

The literature points to a gap in studies that have conducted educational interventions with people with diabetes in the COVID-19 and post-pandemic contexts. This study seeks to fill this gap by improving health education strategies for the LS of people with DM2, considering the high global prevalence of the condition, the adverse outcomes in cases of infection, and the economic impact of complications on health systems.

In the context of the pandemic, many people with DM2 faced challenges in care, mainly because they are part of a risk group for serious complications. In this scenario, strengthening educational activities is essential to promote self-care, engage these people in health practices, and maintain their bond with health services.

Given this, the following research question was formulated: How effective are educational interventions for people with diabetes during the COVID-19 and post-pandemic periods? The study's objective was to evaluate the effectiveness of educational interventions for people with diabetes during the COVID-19 and post-pandemic periods.

METHOD

A quasi-experimental study was conducted at a Basic Health Unit (UBS) in a municipality in Curimataú Paraibano, in the Northeast Region of Brazil. It was performed following the Transparent Reporting of Evaluations guidelines *with Nonrandomized Designs* (TREND)¹⁴.

The population consisted of users living with diabetes who were monitored at the service. People who had a diagnosis of DM2 confirmed in medical records, were over 18 years of age, and participated in at least three different group health education activities at the health unit or individually at home were included.

To delimit the sample size, the literature recommended at least 30 participants for intervention studies, which was considered¹⁵. In this study, a sample of 34 people with DM2 was obtained. Users were selected through simple random sampling. To this end, the medical records of eligible participants were screened, and their names and addresses were noted, with this data identified with a numerical code. Once this was done, a quick draw application was used to draw the numbers.

Participants were approached through an invitation mediated by the community health agent or called in person by the unit's nurse when the user attended the service.

The actions took place in groups every two weeks in a room at the UBS. To mitigate losses, users unable to participate in the collective activity informed the community health agents and received the researchers at home. The actions with the participants were carried out in the same week as the group activity, with the same duration, the same technologies, and similar operationalization to the collective activity.

Three researchers developed the health education activities in six meetings, each lasting at least ninety minutes. The content was taken from a validated booklet entitled "Diabetes mellitus: care during and after the COVID-19 pandemic,"¹⁶ and addressed using low-cost educational technologies such as games and simulators developed by the authors. Chart 1 shows the content covered in each intervention and the educational technologies used.

Chart 1. Content covered and resources used in each educational intervention. Cuité, PB, Brazil, 2023

Intervention	Contents	Educational technologies
I	The importance of healthy eating, vitamin D supplementation, and water consumption.	Secret box" game: Participants explored images of food in the box and tried to estimate the amount of sugar in each food by comparing it with bags containing different amounts of sugar.
II	Care and prevention of COVID-19.	True-or-false game: Each participant was given a two-colored card: green, representing "true," and red, representing "false." The questions were asked aloud, asking whether a particular measure aggravated or prevented COVID-19 infection and its complications. As participants answered, the information was pasted onto posters.
III	Management of DM through oral medication and insulin therapy.	Target game" - enlarged medicine boxes were created, low-cost simulators made from EVA sheets and cardboard to explain how insulin works in the body, and larger syringes to illustrate fractioning into International Units (IU). A mannequin was also used as a simulator to demonstrate insulin application sites. This action emphasized the importance of glycemic monitoring.
IV	The importance of regular physical activity for managing DM.	A low-cost simulator made from cardboard and EVA sheets, consisting of a trolley (representing insulin), a garage (representing a cell), pieces of EVA cut into diamond shapes (representing glucose molecules), and a representation of a blood vessel (symbolizing the bloodstream, where glucose circulates). The simulator aimed to illustrate the role of insulin in transporting glucose from the bloodstream to the inside of cells, while also highlighting the influence of physical activity on this process.
V	Foot care/ prevention of foot ulcers.	Low-cost simulators made from Styrofoam and modeling clay represented the feet and were used to explain the types of foot ulcers and their signs and symptoms.
VI	The importance of adequate sleep for DM management.	Illustrated poster to explain the sleep cycle. Folders with examples of relaxing teas.

Source: The authors (2023).

Data collection took place in February and May 2023, respectively. In May 2023, the World Health Organization declared the end of the public health emergency of international concern caused by the COVID-19 pandemic¹⁷.

It should be noted that the time interval between actions was based on the need to carry out interventions every two weeks, approximately over four months, to reduce the bias of forgetting the intervention. This was evidenced in the studies summarized in a scoping review.¹⁸

For data collection, at Im (initial moment), a questionnaire related to sociodemographic and clinical data and behavioral habits was answered, and researchers applied a questionnaire to measure Knowledge and Practices on COVID-19 Prevention Measures (CPP COVID-19) at Im and Fm (final moment).

The Knowledge and Practices on COVID-19 Prevention Measures (CPP, in Portuguese) was developed based on a survey conducted at UBS entitled "Factors related to COVID-19 prevention in people with diabetes: a cross-sectional study." It contains questions on general preventive measures (hand hygiene/antiseptic use, social distancing, mask use, precautions when returning home, environmental hygiene), and specific prevention measures (monitoring of capillary blood glucose, hypoglycemic diet, oral medications/insulin, physical activity, seeking medical care, vaccination against other respiratory diseases)¹⁹.

It includes twenty questions on general COVID-19 prevention measures and six on DM-specific measures. For this study, five questions on general measures and six questions on specific measures were used. As the answers are distributed on a *Likert* scale (0-never, 1-few times, 2-sometimes, 3-many times, and 4-always), they result in a minimum score of zero and a maximum score of 44, considering only the questions used in this study.

In addition, as the health education activities always took place in the afternoon, the researchers also checked postprandial capillary blood glucose at the start of each action. They recorded the results in a follow-up table. This table contained rows with the names of the participants and columns for the variables date of action and blood glucose value.

IBM® SPSS® *Statistical Package for the Social Sciences - Version 22.0* was used to process data *statistically*. The univariate analysis included means and standard deviations for quantitative variables and absolute and relative frequencies for categorical data. In the inferential analysis, the Shapiro-Wilk test confirmed the normality of the data (p -value = 0.718 and 0.08, at Im and Fm, respectively), allowing the use of the paired Student's t -test to compare means between the Mi and Mf times. The significance level adopted was ≤ 0.05 .

This study is part of the project "Impact of the use of educational technologies on health promotion practices and quality of life of people living with diabetes mellitus during and after the COVID-19 pandemic," approved by the Ethics and Research Committee *Centro de Educação e Saúde*, opinion no. 5.722.885/2022.

RESULTS

The age of the 34 participants ranged from 44 to 88 years, with an average of 65.8 years (± 10.16). There was a predominance of females (70.6%), and half declared themselves brown (50.0%). Concerning marital status, the majority were married (35.3%). In terms of level of education, the years of study ranged from 0 to 12 years, with an average of 5.1 years (± 3.3), where 20 (58.8%) had incomplete primary education. Income ranged from R\$1,302 to R\$3,000, with an average of R\$2,058.88 (± 657.80), 55.9% lived on more than one minimum wage and 44.1% on one minimum wage. As for occupation, 85.3% were retired. Table 1 shows the participants' sociodemographic data.

Table 1. Sociodemographic characterization of the research participants. Cuité, Paraíba, Brazil, 2023

Variables	n	%
Gender		
Female	24	70.6
Male	10	29.4
Self-reported skin color		
White	11	32.4
Brown	17	50.0
Black	6	17.6
Marital status		
Married	12	35.3
Widower	9	26.5
Consensual union	6	17.6
Single	5	14.7
Separated	2	5.9
Household arrangement		
Lives with someone	30	88.2
Lives alone	4	11.8
Religion		
Catholic	24	70.6
Evangelical	9	26.5
Other	1	2.9
Level of education		
Incomplete primary education	20	58.8
Elementary school complete	5	14.7
High school complete	4	11.8
Illiteracy	4	11.8
Higher education complete	1	2.9
Income[†]		
More than one minimum wage	19	55.9
One minimum wage	15	44.1
Occupation		
Retired	29	85.3
Farmer	2	5.9
Unemployed	1	2.9
Self-employed	1	2.9
Other	1	2.9

Legend: [†]Value of the minimum wage/February 2023: R\$1,302.00 reais.

Source: The authors (2023).

Table 2 shows the clinical and behavioral data. The time of diagnosis and follow-up ranged from 1 to 30 years, with an average of 7.1 (± 6.6). 67.6% were only followed by the public service, and 70.6% reported living with systemic arterial hypertension in addition to DM2. About lifestyle habits, 52.9% said they didn't follow a diet, and 67.6% said they exercised. As for pharmacological therapy, 91.2% used oral anti-diabetics and 8.8%

used insulin. Regarding vaccination against COVID-19, 79.4% were fully vaccinated at the time of the study, having taken the two doses of the primary vaccination schedule, plus two booster doses.

Table 2. Clinical and behavioral data of the research participants. Cuité, PB, Brazil, 2023

Variables	n	%
Type of service used to treat DM		
Only the public service	23	67.6
Alternates between public and private service	11	32.4
Co-existing conditions		
Hypertension	24	70.6
No comorbidities	10	29.4
Goes on a diet		
Yes	16	47.1
No	18	52.9
Performs physical exercise		
Yes	23	67.6
No	11	32.4
Uses oral antidiabetic		
Yes	31	91.2
No	3	8.8
Uses insulin		
Yes	3	8.8
No	31	91.2
COVID-19 confirmed by test		
Yes	7	20.6
No	27	79.4
Vaccination schedule against COVID-19		
Two doses and two booster doses	27	79.4
Two doses and one booster dose	6	17.6
Two doses, but no booster dose	1	2.9

Source: The authors (2023).

Table 3 shows the mean scores for the CPP COVID-19 instrument between Im and Fm. It can be seen that there was an increase in the overall average for the items referring to COVID-19 prevention practices, but the p-value indicated that there was no difference between the two moments ($p=0.562$). However, there was an increase in the scores between Im and Fm for the variables "frequency of handwashing and antisepsis, frequency of social distancing, and frequency of mask use", inferring an improvement in these variables after the health education activities. With the items on specific measures for diabetes management, there was an overall increase in the means and a difference between them ($p<0.001$). The "frequency of adherence to diet and regular physical activity" variables increased after the health education activities.

Table 3. Comparison of the mean scores of the Knowledge and Practices on COVID-19 Prevention Measures instrument between the initial moment (Im) and the final moment (Fm). Cuité, PB, Brazil, 2023

CPP COVID-19 variables	Im		Fm		p-value [†]
	m	sd	m	sd	
GENERAL	31.2	7.4	31.7	4.9	0.562
Frequency of hand washing and antisepsis	6.4	1.3	7.2	1.0	<0.001
Frequency of social distancing	1.2	1.4	0.6	0.9	0.004
Frequency of mask use	5.1	1.7	4.3	1.7	0.004
Frequency of care when returning home	13.2	3.3	12.9	1.9	0.422
Frequency of environmental hygiene	5.3	2.3	6.7	1.5	<0.001
SPECIFIC	16.2	3.0	18.4	2.2	<0.001
Frequency of capillary blood glucose monitoring	2.4	0.7	2.5	0.7	0.058
Frequency of following the correct diet for diabetes	2.2	1.2	3.2	0.6	<0.001
Frequency of use of oral medication/insulin	3.5	1.1	3.7	1.1	0.325
Frequency of physical activity	2.1	1.3	2.9	1.1	<0.001
Frequency of seeking medical attention	2.3	0.7	2.4	0.9	0.600
Frequency of seeking vaccination for other respiratory diseases	3.6	0.8	3.8	0.7	0.096
TOTAL	47.3	8.8	50.1	5.3	0.011

Legend: Im = Initial moment; Fm = Final moment; [†]Pairwise Student's t-test.

Source: The authors (2023).

Concerning post-prandial blood glucose values, before and after the interventions, there was a reduction from 165.5 mg/dL ($\pm$ 55.3) to 132.7 mg/dL ($\pm$ 41.0), p-value (<0.001).

DISCUSSION

The sociodemographic profile of the participants in this study represents a relatively elderly, female, poorly educated, and low-income population. This profile is like that of two other studies that carried out interventions with people living with DM2, in which many participants were female, had low levels of education, and were on low incomes^{10,20}.

Although getting older doesn't mean getting sick, the increased clinical and functional vulnerability with age raises the risk of chronic conditions such as DM2. Culturally, women tend to seek health services more and adopt preventive practices, leading to more frequent diagnoses. Through education and income indicators, low social status directly impacts knowledge and self-care skills, contributing to the onset of diseases, worse clinical outcomes, and reduced quality of life²¹⁻²².

After the interventions, there was no difference in the overall score for COVID-19 prevention measures. However, the average for handwashing, antisepsis, and environmental hygiene increased, while the average for social distancing and wearing masks decreased.

A cross-sectional study revealed that COVID-19 prevention practices were adequate among people with DM during the pandemic¹⁹. Therefore, the results of this outcome may have been influenced by the epidemiological context at the end of the pandemic. No recent studies were found on COVID-19 prevention measures for people with diabetes in the post-pandemic scenario.

After the educational activities, handwashing and antisepsis were more frequent, reflecting the participants' greater commitment. This practice effectively protects against COVID-19 and other diseases, such as liquid soap and 70% alcohol dissolve pathogens' lipid membranes, making it indispensable in the daily lives of people with DM²³.

There was also a drop in the averages for social distancing and the frequency of wearing masks, which suggests that people began to follow these measures less frequently. During the most critical period of the COVID-19 pandemic, it was clear that these measures effectively contained the spread of the virus, resulting in people becoming more aware and committed to adopting them. Two studies that investigated knowledge and practices with COVID-19 prevention in patients with chronic conditions, including DM2, conducted in 2020 and 2021, when the pandemic was still going on, pointed to reasonable levels in social distancing practices and the use of masks to prevent COVID-19 and reduce the chances of illness²⁴⁻²⁵.

After the interventions, the participants in this study showed greater attention to environmental hygiene, including cleaning their homes. Although literature has not reached a consensus on the transmission of SARS-CoV through surfaces, it is believed that the virus can be deposited on inanimate surfaces through large droplets. A study in the United Kingdom²⁶ indicated it can also be transferred to mucous membranes through hand contact with contaminated objects.

The interventions improved the frequency of following the diet and practicing physical activity and reduced postprandial glycemia levels. Blood glucose monitoring, medication use, seeking medical attention, and vaccinations against respiratory diseases were also assessed.

Following a proper diet is one of the pillars of DM2 treatment, but it also represents one of the most significant challenges for managing the condition, as individuals' socioeconomic factors²⁷ influence it. Therefore, educational actions focusing on dietary guidelines are essential to prevent glycemic changes, maintain control of the condition, and avoid complications.

The data from this study indicated an increase in the average frequency of following the appropriate diet between the two periods evaluated. Similar results were observed in an intervention study carried out with elderly people living with DM2, which used serial albums as an educational technology to elucidate the contents of the interventions. This study also showed changes in adherence to a healthy diet between the beginning and end of the interventions²⁸.

Physical activities are also essential for maintaining glycemic levels, as they help with weight loss, improve insulin resistance, lower blood pressure, and help to prevent and control depression. In this variable, there was an increase in the averages at different times after taking part in the actions. An intervention study in Recife used strategies like this, such as educational games and posters, to address the importance of healthy eating and physical exercise. It positively affected physical activity in both the intervention and control group²⁹.

The educational activities facilitated by the booklet improved the mean post-prandial blood glucose values within the target set for DM2 management³⁰. Reaching the glycemic target strengthens the confidence of people with DM, while lower-than-expected levels can reduce their belief in self-management. This highlights the importance of educational interventions encouraging appropriate practices in managing the condition³¹.

This result is consistent with a randomized clinical trial conducted in Pará, which explored topics like those in this study, such as diet, physical exercise, and glycemic monitoring. Using active methodology, a similar number of meetings, and an intervention period, the study recorded a reduction in the average fasting capillary blood glucose in the intervention group, from 211.6 mg/dL to 181.9 mg/dL³².

The results of this study revealed that the educational interventions mediated by the booklet positively impacted the participants' lives. They began to adopt necessary self-care measures for preventing COVID-19 and the therapeutic management of DM2.

Limitations of the study include the fact that Fm was collected a few days after the end of the interventions and that motivation for guided practices is common during the first few weeks following the interventions. Another significant limitation is that the change observed in blood glucose cannot be attributed exclusively to the intervention because, as is characteristic of quasi-experimental studies, without a control group, it is impossible to directly compare the results with a reference situation. Professionals must integrate these guidelines into the care routine to ensure continuity of care and improve aspects that are not statistically significant.

CONCLUSION

The interventions increased the participants' knowledge levels, which improved some COVID-19 prevention practices, such as handwashing, antisepsis, and environmental hygiene, as well as two specific measures crucial for diabetes management: practicing physical exercise and following a proper diet. Although improvements were identified in some of the practices assessed in this study, some behaviors showed no statistically significant difference. Therefore, it is necessary to consider additional strategies to emphasize the importance of these measures and highlight their benefit.

This study provides implications for nursing practice by reflecting on educational activities to improve the LS of people with DM2, achieve effective glycemic management, and reduce the risks of infections such as COVID-19. A booklet developed especially for the target audience guided the educational activities. In contrast, low-cost simulators and physical games were used as support tools to make the activities more interactive. These methods, detailed in the study, can be replicated in similar contexts, promoting autonomy and care.

ACKNOWLEDGEMENTS

Coordination for improving Higher Education Personnel (CAPES) Code 001 and Paraíba State Research Support Foundation (FAPESQ). Call for Proposals for the SUS Research Program (PPSUS) n°005/2020.

REFERENCES

1. Butayeva J, Ratan ZA, Downie S, Hosseinzadeh H. The impact of health literacy interventions on glycemic control and self-management outcomes among type 2 diabetes mellitus: a systematic review. *J Diabetes* [Internet]. 2023 [cited 2024 May 12];15(9):724-35. Available from: <https://doi.org/10.1111/1753-0407.13436>
2. Vaibhav, Nishad SS, Dongare D, Tripathi ACP, Tripathi T, Tripathi P. Deciphering the intricacies of immune system dysfunction and its impact on diabetes mellitus: revisiting the communication strategies to manage diabetes mellitus. *Health Sci Rev* [Internet]. 2024 [cited 2024 Nov 21];13:100201. Available from: <https://doi.org/10.1016/j.hsr.2024.100201>
3. Garg A, Posa MK, Kumar A. Diabetes and deaths of COVID-19 patients: systematic review of meta-analyses. *Health Sci Rev* [Internet]. 2023 [cited 2024 Nov 21];7:100099. Available from: <https://doi.org/10.1016/j.hsr.2023.100099>
4. Agarwal S, Schechter C, Southern W, Crandall JP, Tomer Y. Preadmission diabetes-specific risk factors for mortality in hospitalized patients with diabetes and coronavirus disease 2019. *Diabetes Care* [Internet]. 2020 [cited 2024 Nov 21];43(10):2339-44. Available from: <https://doi.org/10.2337/dc20-1543>
5. Sanya RE, Karugu CH, Binyaruka P, Mohamed SF, Kisia L, Kibe P, et al. Impact of the COVID-19 pandemic on type 2 diabetes care and factors associated with care disruption in Kenya and Tanzania. *Glob Health Action* [Internet]. 2024 [cited 2024 Nov 23];17(1):2345970. Available from: <https://doi.org/10.1080/16549716.2024.2345970>
6. Duarte LS, Shirassu MM, Atobe JH, de Moraes MA, Bernal RTI. Continuidade da atenção às doenças crônicas no estado de São Paulo durante a pandemia de Covid-19. *Saúde Debate* [Internet]. 2021 [cited 2024 Nov 21];45(2 Spec No):68-81. Available from: <https://doi.org/10.1590/0103-11042021E205>
7. Pedroza GGO, Monção ACM, Valladares HO, Mello SDP, de Souza VHMP, da Silva JCS, et al. Life habits of people with diabetes mellitus during the covid-19 pandemic. *Cogitare Enferm* [Internet]. 2021 [cited 2024 May 12];26:e75769. Available from: <https://doi.org/10.5380/ce.v26i0.75769>
8. Malta DC, Gomes CS, Barros MBA, Lima MG, de Almeida WS, de Sá ACMGN, et al. Noncommunicable diseases and changes in lifestyles during the COVID-19 pandemic in Brazil. *Rev Bras Epidemiol* [Internet]. 2021 [cited 2024 Nov 23];24:210009. Available from: <https://doi.org/10.1590/1980-549720210009>
9. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis no Brasil: 2022-2030 [Internet]. Brasília: Ministério da Saúde; 2022 [cited 2024 Dec 1]. 118 p. Available from: https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/svsa/doencas-cronicas-nao-transmissiveis-dcnt/09-plano-de-dant-2022_2030.pdf
10. Paes RG, Mantovani MF, Costa MC, Pereira ACL, Kalinke LP, Moreira RC. Effects of educational intervention on health literacy and knowledge about diabetes: a quasi-experimental study. *Esc Anna Nery* [Internet]. 2022 [cited 2024 Nov 21];26:e20210313. Available from: <https://doi.org/10.1590/2177-9465-EAN-2021-0313en>
11. Alsaedi R, McKeirnan K. Literature review of type 2 diabetes management and health literacy. *Diabetes Spectr* [Internet]. 2021 [cited 2024 Nov 21];34(4):399-406. Available from: <https://doi.org/10.2337/ds21-0014>
12. López-Ríos JM, Herrera-Franco E, Taparcúa-Cardona FE, Rodríguez-Corredor LC, Díaz-Valencia PA, Peñaranda-Correa F. Education aimed at people with Diabetes Mellitus: pedagogical, theoretical and practical approaches in tension. *Interface (Botucatu)* [Internet]. 2023 [cited 2024 May 10];27:e220235. Available from: <https://doi.org/10.1590/interface.220235>
13. Heine M, Lategan F, Erasmus M, Lombaard CM, Mc Carthy N, Olivier J, et al. Health education interventions to promote health literacy in adults with selected non-communicable diseases living in low-to-middle income countries: a systematic review and meta-analysis. *J Eval Clin Pract* [Internet]. 2021 [cited

2024 Nov 23];27(6):1417-28. Available from: <https://doi.org/10.1111/jep.13554>

14. Des Jarlais DC, Lyles C, Crepaz N; the TREND Group. Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: the TREND statement. *Am J Public Health* [Internet]. 2004 [cited 2024 Jun 2];94:361-6. Available from: <https://doi.org/10.2105/AJPH.94.3.361>
15. Fraenkel JR, Wallen NE, Hyun HH. *How to design and evaluate research in education*. 8th ed. New York: McGraw-Hil; 2006. 704 p.
16. dos Santos CLJ, Silva AS, Nunes WB, Oliveira JS, Acioly CMC, Ferreira TMC, et al. Validity of a booklet to promote the health of people with diabetes in the face of COVID-19. *Rev Bras Enferm* [Internet]. 2023 [cited 2024 May 5];76(Suppl 1):e20220472. Available from: <https://doi.org/10.1590/0034-7167-2022-0472>
17. Organização Pan-Americana da Saúde (OPAS). OMS declara fim da Emergência de Saúde Pública de Importância Internacional referente à COVID-19. OPAS [Internet]; 2023 May 5 [cited 2024 Jun 7];Notícias:[about 3 screens]. Available from: [https://www.paho.org/pt/noticias/5-5-2023-oms-declara-fim-da-emergencia-saude-publica-importancia-internacional-referente#:~:text=%C3%A0%20COVID%2D19-,OMS%20declara%20fim%20da%20Emerg%C3%Aancia%20de%20Sa%C3%BAde%20P%C3%BAblica,Internacional%20referente%20%C3%A0%20COVID%2D19&text=Bras%C3%ADlia%2C%205%20de%20maio%20de,\)20referente%20%C3%A0%20COVID%2D19](https://www.paho.org/pt/noticias/5-5-2023-oms-declara-fim-da-emergencia-saude-publica-importancia-internacional-referente#:~:text=%C3%A0%20COVID%2D19-,OMS%20declara%20fim%20da%20Emerg%C3%Aancia%20de%20Sa%C3%BAde%20P%C3%BAblica,Internacional%20referente%20%C3%A0%20COVID%2D19&text=Bras%C3%ADlia%2C%205%20de%20maio%20de,)20referente%20%C3%A0%20COVID%2D19)
18. Mustapa A, Justine M, Manaf H. Effects of patient education on the quality of life of patients with type 2 diabetes mellitus: a scoping review. *Malays Fam Physician* [Internet]. 2022 [cited 2024 Apr 5];17(3):22-32. Available from: <https://doi.org/10.51866/rv.208>
19. Matias LDM, de Lucena JGS, de Azevedo TF, Silva ALDA, Costa MML, de Andrade LL. Factors related to the prevention of covid-19 in people with diabetes: a cross-sectional study. *Online Braz J Nurs* [Internet]. 2021 [cited 2024 May 10];20(Suppl 1):e20216517. Available from: <https://doi.org/10.17665/1676-4285.20216517>
20. Silva ALDA, das Neves ELF, de Lucena JGS, Oliveira Neta MS, de Azevedo TF, Nunes WB, et al. Contact time in educational interventions and self-care of individuals with diabetes mellitus. *Cogitare Enferm* [Internet]. 2021 [cited 2024 Apr 2];26:e72588. Available from: <https://doi.org/10.5380/ce.v26i0.72588>
21. da Silva DSM, de Assumpção D, Francisco PMSB, Yassuda MS, Neri AL, Borim FSA. Chronic non-communicable diseases considering sociodemographic determinants in a cohort of older adults. *Rev Bras Geriatr e Gerontol* [Internet]. 2022 [cited 2024 Apr 10];25(5):e210204. Available from: <https://doi.org/10.1590/1981-22562022025.210204.en>
22. Francisco PMSB, de Assumpção D, Bacurau AGM, da Silva DSM, Yassuda MS, Borim FSA. Diabetes mellitus in older adults, prevalence and incidence: results of the FIBRA study. *Rev Bras Geriatr Gerontol* [Internet]. 2022 [cited 2024 Apr 7];25(5):e210203. Available from: <https://doi.org/10.1590/1981-22562022025.210203.en>
23. Poczai P, Karvalics LZ. The little-known history of cleanliness and the forgotten pioneers of handwashing. *Front Public Health* [Internet]. 2022 [cited 2024 Apr 10];10:979464. Available from: <https://doi.org/10.3389/fpubh.2022.979464>
24. Addis SG, Nega AD, Miretu DG. Knowledge, attitude and practice of patients with chronic diseases towards COVID-19 pandemic in Dessie town hospitals, Northeast Ethiopia. *Diabetes Metab Syndr* [Internet]. 2021 [cited 2024 Nov 24];15(3):847-56. Available from: <https://doi.org/10.1016/j.dsx.2021.03.033>
25. Legese YM, Gebru SB, Gebremariam AG, Tesfay ZA. Knowledge, attitude, and practice towards COVID-19 among chronic disease patients visiting public hospitals. *Heliyon* [Internet]. 2023 [cited 2024 Nov 24];9(7):e17734. Available from: <https://doi.org/10.1016/j.heliyon.2023.e17734>

26. Derqui N, Koycheva A, Zhou J, Pillay TD, Crone MA, Hakki S, et al. Risk factors and vectors for SARS-CoV-2 household transmission: a prospective, longitudinal cohort study. *The Lancet Microbe*. [Internet]. 2023 [cited 2024 Apr 13];4(6):e397-408. Available from: [https://doi.org/10.1016/S2666-5247\(23\)00069-1](https://doi.org/10.1016/S2666-5247(23)00069-1)
27. Levi R, Bleich SN, Seligman HK. Food insecurity and diabetes: overview of intersections and potential dual solutions. *Diabetes Care* [Internet]. 2023 [cited 2024 Nov 24];46(9):1599-608. Available from: <https://doi.org/10.2337/dci23-0002>
28. Marques MB, Coutinho JFV, Martins MC, Lopes MVO, Maia JC, da Silva MJ. Educational intervention to promote self-care in older adults with diabetes mellitus. *Rev Esc Enferm USP* [Internet]. 2019 [cited 2024 Nov 24];53:e03517. Available from: <https://doi.org/10.1590/S1980-220X2018026703517>
29. Borba AKOT, de Arruda IKG, Marques APO, Leal MCC, Diniz AS, Linhares FMP. Problematization educational intervention to promote healthy habits in elderly people with diabetes: randomized clinical trial. *Rev Bras Enferm* [Internet]. 2020 [cited 2024 Nov 30];73(Supl 3):e20190719. Available from: <https://www.scielo.br/j/reben/a/43FXnmvCwSHhX54GJVMq8Mw/?lang=pt>
30. Pititto BA, Dias ML, de Moura FF, Lamounier R, Vencio S, Calliari LE. Metas no tratamento do diabetes. In: Sociedade Brasileira de Diabetes (SBD). Diretriz da Sociedade Brasileira de Diabetes (2023) [Internet]. São Paulo: SBD; 2023 [cited 2024 Nov 24]. Available from: <https://diretriz.diabetes.org.br/metasp-no-tratamento-do-diabetes/>
31. Nunes LB, dos Santos JC, Reis IA, Torres HC. Avaliação do programa comportamental em diabetes mellitus tipo 2: ensaio clínico randomizado. *Ciênc Saúde Colet* [Internet]. 2023 [cited 2024 Nov 30];28(3):851-62. Available from: <https://doi.org/10.1590/1413-81232023283.10102022>
32. Correa ST, Castelo-Branco S. Amandaba in the Caeté: culture circles as an educational practice in the self-care of patients with diabetes. *Saúde Debate* [Internet]. 2019 [cited 2024 Nov 30];43(123):1106-19. Available from: <https://doi.org/10.1590/0103-1104201912310>

Received: 23/08/2024

Approved: 10/02/2025

Associate editor: Dra. Cremilde Aparecida Trindade Radovanovic

Corresponding author:

Alex dos Santos Silva

Universidade Federal da Paraíba

Campus I, Castelo Branco, João Pessoa, Paraíba, CEP: 58051-900

E-mail: alexsilva.07@outlook.com

Role of Authors:

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Silva AS, Batista GS, do Monte CF, da Silva EG, dos Santos CLJ, de Carvalho MAP, de Andrade LL**. Drafting the work or revising it critically for important intellectual content - **Batista GS, do Monte CF, da Silva EG, dos Santos CLJ, de Carvalho MAP, de Andrade LL**. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **Silva AS, Batista GS, dos Santos CLJ, de Carvalho MAP, de Andrade LL**. All authors approved the final version of the text.

Conflicts of interest:

The authors have no conflicts of interest to declare.

ISSN 2176-9133



This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).