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EDUCATIONAL TECHNOLOGIES FOR PATIENTS WITH CARDIOMETABOLIC DISEASES IN COVID-19 PANDEMIC: SCOPING REVIEW

TECNOLOGIAS EDUCACIONAIS PARA PACIENTES COM DOENÇAS CARDIOMETABÓLICAS NA PANDEMIA DO COVID-19: REVISÃO DE ESCOPO

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ABSTRACT: **Objective**: to map technologies aimed at health education for cardiometabolic patients during the COVID-19 pandemic. **Method**: We conducted a scoping review using the population concept and context strategy (PCC) aligned with the Joanna Briggs Institute (JBI). The PCC strategy involves defining the population of interest, the concept under investigation, and the context in which the idea occurs. Our research question was: 'Which technologies are available for health education in persons with cardiometabolic diseases during the COVID-19 pandemic?' **Results**: Eight articles were selected and published from 2020 to 2022, highlighting the use of telemedicine, social media, and mobile applications. Telemedicine, in particular, has shown wide application and proven effective in managing cardiometabolic diseases during the pandemic. Although other technologies, such as educational videos and e-books, were less explored, this review underscores the need for greater diversification and digital inclusion. **Conclusion:** with its proven effectiveness, telemedicine has been instrumental in addressing key concerns and promoting more significant interaction between the population and health professionals.

KEYWORDS: COVID-19. Diabetes. Cardiovascular Diseases. Nursing. Obesity. Educational technology.

RESUMO: **Objetivo**: Mapear as tecnologias voltadas à educação em saúde de pacientes cardiometabólicos durante a pandemia do COVID-19. **Método:** Revisão de escopo utilizando a estratégia População, Conceito e Contexto (PCC), alinhada ao método do *Joanna Briggs Institute (JBI)*, com à seguinte questão de pesquisa: "Quais tecnologias estão disponíveis para a educação em saúde de pessoas com doenças cardiometabólicas durante a pandemia de COVID-19?". **Resultados:** Foram selecionados oito artigos, publicados a partir de 2020 a 2022, que destacaram o uso da telemedicina, mídias sociais e aplicativos móveis. Embora a telemedicina tenha mostrado ampla aplicação, tecnologias como vídeos educativos e *e-books* foram menos exploradas, apontando para a necessidade de maior diversificação e inclusão digita. **Conclusão:** A telemedicina foi eficaz para esclarecer as principais dúvidas e promover maior interação entre a população e profissionais de saúde. As tecnologias foram aliadas estratégicas na promoção da saúde e no manejo de doenças cardiometabólicas, sendo indispensáveis para o gerenciamento de pandemias.

PALAVRAS-CHAVE: COVID-19. Diabetes. Doenças Cardiovasculares. Enfermagem. Obesidade. Tecnologia educacional.

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INTRODUCTION

Cardiometabolic diseases (CMDs) represent the leading causes of morbimortality worldwide, responsible for 38 million obits a year [1–3]. Between the CMDs are Systolic Blood Pressure (SBP), obesity, diabetes mellitus (MD), and atherosclerotic cardiovascular disease [3].

Associated with epidemiology, CMDs have become part of global epidemiology. The (SBP) affects 22,3% to 32,5 % of the adult Brazilian population and affects approximately a fourth of the world's population, with a 60% increase in cases expected by 20252,4. Obesity is one of the main risk factors for type 2 diabetes, and in addition, it is calculated that between 80 and 90% of individuals affected by this disease are obese [5,6].

It is well known that chronic conditions affect social groups that are more deprived and more vulnerable to social determinants. The combination of CMDs in a scenario of social and economic inequalities exacerbates the adverse effects of each disease individually, especially COVID-19, in which people with CDM were at higher risk of clinical complications and obit [6].

Therefore, several international reports from China, Italy, and the United Kingdom have emphasized the association between CDMs and increased mortality from COVID-19. MD has the highest prevalence and is responsible for increases in morbidity and mortality, especially in low-income regions [7,8] resulting in higher use of health services, hospital admissions, and financial costs [9].

The COVID-19 pandemic imposed significant global challenges, demanding rapid and innovative responses from health systems worldwide. In this context, educational technologies have emerged as strategic instruments to mitigate the consequences of the crisis, providing care continuity, especially for chronic conditions, such as cardiometabolic diseases. Countries such as Canada, Brazil, Korea, Switzerland, Europe regions, the Middle East, and Africa adopted various solutions, including telemedicine, social media, and mobile applications, which have been highlighted for expanding access, promoting self-care, and reducing obstacles to health [10,11].

In the United States, where telemedicine was already widely used before the pandemic, the technological infrastructure has allowed for a rapid expansion of these services. Including telemedicine as a refundable procedure in health plans has also encouraged its adoption. Studies reveal a significant growth in the demand for care of chronic diseases and mental health issues, surpassing those directly related to the coronavirus[12].

In Brazil, the pandemic has accelerated the implementation of telemedicine, positively impacting the care of patients with cardiometabolic diseases. Telemedicine has ensured continuity of care in remote and low-income regions, where the range of specialists is limited, playing a crucial role in the management of cardiovascular diseases, which are among the leading causes of death in the country [13].

This practice promotes health and is an essential element in the prevention and management of cardiometabolic diseases, representing a comprehensive approach that prioritizes the population's well-being and quality of life. During the COVID-19 pandemic, digital technologies became key to achieving this objective, enabling patients to receive safe and effective guidance even in mobility-restricted scenarios. These technologies, such as telemedicine, social media, and mobile applications, are crucial in promoting self-care by providing patients with precise and personalized information about their condition and how to manage it effectively.

In Brazil, projects such as telemedicine and remote monitoring applications have extended the scope of educational interventions. Patients with hypertension and diabetes, for example, were continuously accompanied by health professionals who offered personalized instructions about glycemic control, medication, and healthy lifestyle practices. These services, facilitated by educational

technologies, have not only provided crucial information but also empowered patients to take control of their health and prevent severe health complications such as CVA (Cerebral Vascular Accident) or strokes and heart attacks, conditions primarily associated with cardiometabolic diseases and which represent the leading causes of mortality in the country. In addition, health education strategies using social media and educational videos promoted self-care by providing clear information about balanced nutrition, physical activity, and stress reduction, essential for controlling chronic diseases. One concrete example was the increase in the use of platforms such as "Conecte Sistema Único de Saúde (SUS)" (Brazilian Public Health System), which not only assisted patients but also expanded the monitoring capacity of health services in remote regions.

In this scenario, your role in encouraging people with cardiometabolic diseases to practice self-care through health education is not just important; it's essential. You are the ones who can motivate them to be the protagonists of their care. Your contributions to the development of educative activities and educational technologies are crucial. They assist in the process of health promotion and prevention.From this perspective, educational technologies in the pandemic were initially developed as emergency measures aimed at reducing people's exposure to the threat of the new coronavirus.

Therefore, with the advance of COVID-19, several areas of health have had to adapt to the changes in the world, as well as nursing, which has also needed to renovate its care practices to continue offering care. In response to the new challenges encountered, nursing has developed various resources to monitor and educate patients, even at a distance, especially those with comorbidities, as they are part of the risk groups and are considered vulnerable.

In this sense, this study is justified by the need to collect primary information on health education for people with cardiometabolic diseases after COVID-19 to synthesize effective care strategies in the face of social distancing during the pandemic. Consequently, this study aimed to map technologies aimed at health education for patients with cardiometabolic diseases during the COVID-19 pandemic.

METHODOLOGY

This is a scoping review to identify the primary scientific evidence and concepts in the literature related to a particular area of knowledge [20]. To prepare this review, we followed the instructions established by the Preferred Reporting Items for Systematic Reviews checklist and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) and the *Joanna Briggs Institute Reviewer´s Manual* (JBI) [21].

To prepare this study, we used the stages idealized by Arksey and O'Malley (2005): (1) establishing the research question; (2) identifying relevant studies; (3) selection and inclusion of studies; (4) grouping the data; (5) compilation, synthesis and report of the results. The research question was drafted using the PCC (Population, Concept, and Context) mnemonic guided by the JBI to develop a scoping review. In this sense, the “study population” was defined as people with cardiometabolic diseases, as “concept” technology used for health education, and as “context” of the COVID-19 pandemic. The following research question was formulated: “What technologies are available for health education for people with cardiometabolic diseases during the COVID-19 pandemic?”.

The inclusion criteria were Studies available online in integral form that answered the research question, such as dissertations, theses, ministerial orders, guidelines, and scientific articles from the last 4 years and in any language. The search period is justified because the COVID-19 pandemic started in December 2019 in Wuhan province[22]. Abstracts, letters to the editor, and opinion articles were excluded.

Search standardization occurred through access to the databases via the *Portal de Periódicos da Coordenação de Aperfeiçoamento de Pessoal do Nível Superior (CAPES)* and the *Biblioteca Virtual em Saúde (BVS)*.

We used the controlled descriptors present in DeCS/MeSH (Descriptors in Health Sciences/Medical Subject Headings): "Comorbidity," "cardiovascular diseases," "Diabetes Mellitus," "Obesity," "Educational Technology," and "COVID-19" and in Medical Subject Headings (MESH): "Comorbidity," "cardiovascular diseases," "Diabetes Mellitus," "Obesity" and "COVID-19". The Boolean operators AND and OR were used to conduct a more comprehensive search and identify more specific articles for the review. In addition, the search strategy was adapted according to the particularities of each database, as shown in Table 1.

Table 1. Search strategies, according to database/portal. Redenção, CE, Brazil, 2024

Data source	Search syntax in databases
BDENF	*Comorbidity OR Cardiovascular Diseases OR Diabetes mellitus OR Obesity AND COVID-19 [Palavras] and Educational Technology [Palavras] and Health Education [Palavras]*
PubMed	*(((Comorbidity OR Cardiovascular Diseases OR Diabetes mellitus OR Obesity AND COVID-19)) AND Educational Technology) AND Health Education*
Scielo	*(*Comorbidity OR Cardiovascular Diseases OR Diabetes mellitus OR Obesity AND COVID-19) AND (Educational Technology) AND (Health Education)*
Lilacs	*Comorbidity OR Cardiovascular Diseases OR Diabetes mellitus OR Obesity AND COVID-19 [Palavras] and Educational Technology [Palavras] and Health Education [Palavras]*
Google Scholar	*("Comorbidity" OR "Cardiovascular Diseases" OR "Diabetes mellitus" OR "Obesity" AND "COVID-19") AND ("Educational Technology") AND ("Health Education")*

Following the database search, the resulting findings were imported into Rayyan software. Two independent researchers collaborated on selecting studies, and a third reviewer addressed disagreements between them to ensure a thorough and unbiased resolution. In the first phase, duplicate studies were excluded, followed by a reading of the titles and abstracts. The studies that met the inclusion criteria were selected and read in full.

After this phase, the papers comprising the final sample were carefully selected. The selected articles were then subject to thorough analysis, during which relevant data was systematically extracted.

Two independent investigators extracted and recorded the data in a Microsoft Word® spreadsheet, and the third reviewer verified the information. The extraction chart covered the following details: year of publication, country of origin, type of study, type of co-morbidity, sample size, and main findings related to educational technologies.

This information was organized into descriptive graphs, and the studies were categorized according to the type of cardiometabolic disease.

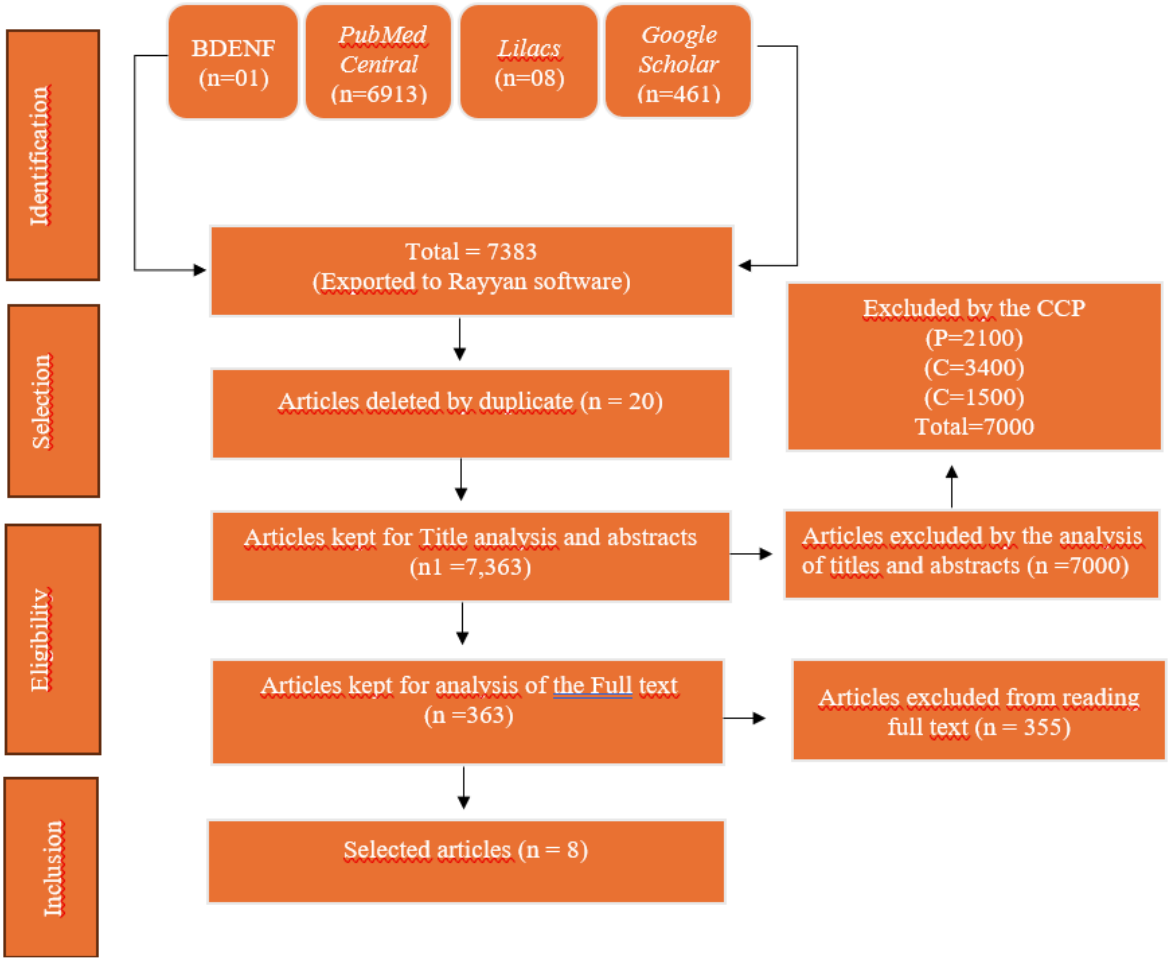
RESULTS

The search was conducted in five electronic databases, resulting in 7,383 publications identified. The sources consulted were BDENF (n=1), PubMed Central (n=6,913), SciELO (n=0), Lilacs (n=8), and Google Scholar (n=461). After removing (20) duplicate publications, (7,363) articles were retained for

initial analysis. Of these, (7,000) were excluded by analysis criteria, with (2,100) due to the population, (3,400) eliminated due to inadequacy of the concept, (1,500) for not meeting the context of the study included by the PCC strategy. Subsequently, 363 articles were evaluated, including (355) for detailed analysis.

After this stage, eight studies were selected to make up the final version of the review. The other search stages are described in the flow diagram in Figure 1.

Figure 1 - Search flowchart adapted from PRISMA ScR. Redenção, CE, Brazil, 2024.



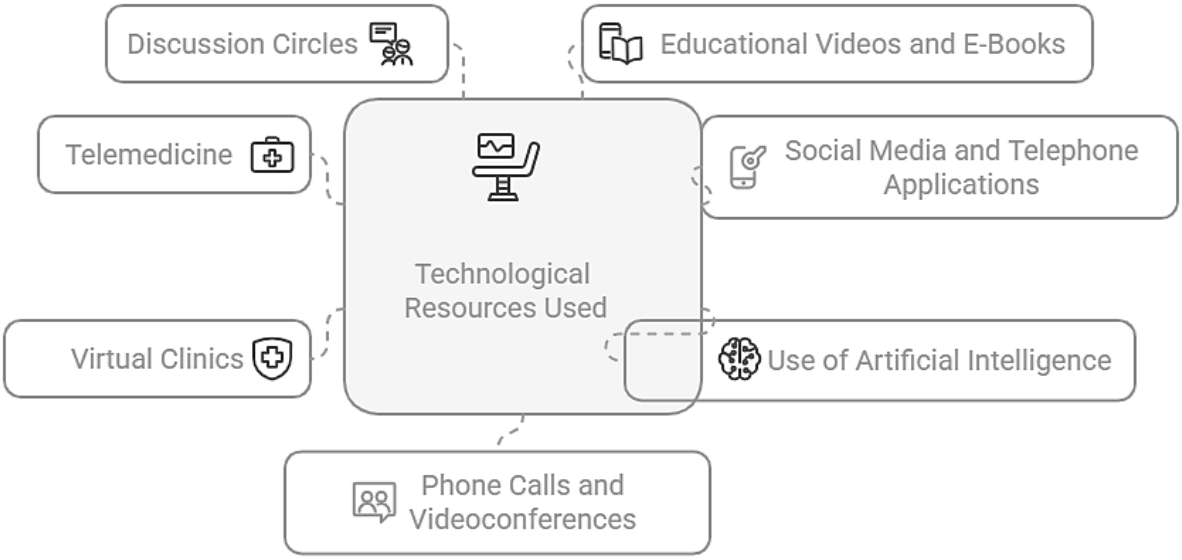
Summarizes the selected articles, emphasizing the information relevant to this study. It is categorized as follows: Authors/Year, Type of study/Place of publication, Type of comorbidity, Technological Resources Used, and Summary of the Subjects Covered by the Technological Resources.

Chart 2 - Summary of the articles included in the scoping review. Redenção, Ceará, Brazil, 2024.

ID*	Authors Location/ Year	Type of Study	Type of Comorbidity	Technological Resources used	Subjects approached by the technological resources
E1	Canada[23]	Bibliographic Review	Cardiovascular Diseases	Telemedicine, social media, smartphone applications, and the deployment of artificial intelligence.	General precautions, use of protective equipment, clinical manifestations of Covid-19.
E2	Europe, Middle East, and Africa[8]	Experience Report	Diabetes, *Mellitus,* and obesity	Telemedicine e virtual clinics.	General questions, counseling, risk assessment, healthy nutrition, risks of infection. Monitoring of glycemic control and weight.
E3	Switzerland [24]	Cohort Study	Diabetes *Mellitus*	Conversation Circles and Telemedicine.	Assistance with any concerns, quality of Life, risk factors, and explanations about diabetes mellitus and COVID-19 are important. Hand hygiene, the use of masks, and social distancing are also important.
E4	Thailand [25]	Cohort Study	Diabetes *Mellitus*	Telemedicine Program	Questions answered, information on treatment, glycemic control, risk factors, and COVID-19.
E5	Korea [26]	Bibliographic Review	Diabetes *Mellitus*	Mobile applications, educational videos, and e-books about diabetes self-management and COVID-19 prevention.	Information regarding glycemic control, blood pressure, physical activity, healthy nutrition, and medication adherence.
E6	United States of America [27]	Bibliographic Review	Diabetes *mellitus*	Telephone Calls, videoconferences, and social media applications.	Monitoring the progress of diabetic foot problems, medication control, and information about the risk of unnecessary direct exposure and disease transmission.
E7	Brazil [28]	Methodological Study	Diabetes *mellitus*	Mobile Application.	General Information: What is necessary to know and to do concerning COVID-19, what are the symptoms, how to prevent it, how is the diagnosis made, is there any treatment, what types of vaccines are available, diabetes and COVID-19, healthy eating, monitoring, medication, risk reduction.
E8	Saudi Arabia [29]	Bibliographic Review	Diabetes *mellitus*	Telemedicine Technology	Information for maintaining glycemic control, medical advice, and remote consultation.

From the selected studies, the year with the highest number of publications was 2021 (E2, E3, E6, E8), followed by 2020 (E1, E5) and 2022 (E4, E7). The methodological designs used in the records were diverse, mostly bibliographic reviews in four studies (E1, E5, E6, E8). About the types of comorbidities listed, Diabetes Mellitus was mentioned in 87.5% of the studies (E2, E3, E4, E5, E6, E7, E8), and cardiovascular diseases (E1) and obesity (E2) were highlighted in one study each. It was also noted that although the studies used more than one technological resource, there was a predominance of the use of Telemedicine (E1, E2, E3, E6, E8), social media (E1, E6) and telephone applications (E1, E5, E6, E7). Other instruments, such as educational videos and e-books, appear less frequently in the results.

Figure 2- The study highlights primary educational and technological resources for cardiometabolic diseases. Redenção, Ceará, Brazil, 2024.



Contents such as general care related to comorbidities, help with doubts, quality of life, risk factors, information on treatment, medication, and explanations on diabetes mellitus, cardiovascular diseases, obesity, and COVID-19 were discussed. Medical advice and remote consultations were also provided using these technological devices.

Most of the studies examined indicated that health education conducted through telemedicine solved the main doubts raised by patients and increased the interaction between professionals and patients (E1, E2, E3, E6, E8). In addition, the technological resources utilized have facilitated the management of healthcare services and reduced long waiting lines (E2, E4, E6, E8).

DISCUSSION

The results of this scoping review emphasize the relevance of technological resources in health education and the management of cardiometabolic comorbidities, especially in the context of the COVID-19 pandemic. The predominance of telemedicine use in different geographic and demographic settings corroborates previous studies that indicate its effectiveness in expanding access to care, reducing waiting lines, and facilitating interactions between health professionals and patients[8,25,27,29].

Approved technological resources, such as mobile applications, videoconferencing, and social media, have been presented as effective methods for addressing questions, such as glycemic control,

healthy nutrition, and adherence to treatment[26-28]. This diversity of resources allows educational strategies to be adapted to different patient profiles, promoting a more inclusive and accessible approach for patients.

Diabetes mellitus, reported in 87.5% of the studies included, was the comorbidity most frequently associated with the use of these technologies. The literature indicates that diabetes is a condition that benefits greatly from telemedicine, both in terms of clinical monitoring and support for self-management of the disease. In addition, a recent study emphasized the importance of apps and e-books in disseminating information on the prevention and control of diabetes during a pandemic, reinforcing the importance of accessible and interactive educational materials[26].

Despite the progress, some challenges persist. The small number of studies using educational videos and e-books, in contrast to the widespread adoption of technology such as telemedicine and social media, suggests the need to expand the application of less explored but potentially effective technologies in health education. In addition, matters concerning digital accessibility, especially in low-income populations, must be approached to guarantee equity in access to technological technologies.

Finally, a regional analysis of the studies confirms the importance of local conditions in the implementation and effectiveness of technological resources. Countries such as Brazil have advanced and adapted these aids to local needs. In contrast, regions such as Thailand and Saudi Arabia have emphasized the impact of telemedicine programs in contexts of physical and social restrictions imposed by the pandemic[25,28,29].

Based on these results, we can conclude that the technological resources developed in this scoping review have great potential to transform health education and the management of comorbidities, especially in adverse scenarios such as the COVID-19 pandemic. However, there is a significant demand for additional studies to explore the impact of these resources on under-represented social issues and to assess the sustainability of their application in the long term.

The study has some limitations due to the variability in methodologies and population characteristics among the studies analyzed. Variations in study designs, such as literature reviews, cohort studies, and methodological approaches, can affect the comparison of results and the generalizability of conclusions.

In addition, aspects such as the accessibility and quality of technological infrastructure, public policies to support the use of educational technologies, and socio-economic variables (e.g., income disparities and digital inclusion) can influence the effectiveness of these tools but were not comprehensively discussed in this study.

PRACTICAL IMPLICATIONS

The results of this study provide important practical implications for managing CMD during and after the COVID-19 pandemic. Telemedicine has been demonstrated to be an effective tool for health education and follow-up of patients with CMD, contributing to continuity of care and prevention of complications[21,25].

Public policies should prioritize expanding and integrating into the health system, especially in remote and low-income regions where access to health services is still restricted[28]. In addition, training professionals in using these technologies is essential, guaranteeing that they are used efficiently and adapted to the population's needs 24.

Digital inclusion should also be a priority, with investments in technological infrastructure and internet access for vulnerable populations (Reiter-Brennan et al., 2021) [9]. Finally, it is necessary to diversify the resources used, such as educational videos and e-books, which have significant academic potential but are still little explored[26]. These measures can contribute to a more inclusive, preventive, and efficient model of care, strengthening health promotion and the management of chronic diseases in different contexts.

CONCLUSION

Consequently, this study has demonstrated that educational technologies have been essential in managing cardiometabolic diseases during the COVID-19 pandemic, especially in enabling continuity of care in a scenario of social isolation. Telemedicine, mobile applications, and social media have proven effective in providing health education, glycemic control, treatment adherence, preventing complications, and promoting better interaction between patients and health professionals.

The limited use of educational videos and e-books indicates the need to exploit these technologies widely. In addition, factors such as digital accessibility and socio-economic inequalities emphasize the importance of inclusive strategies that ensure equal access to educational technologies.

Consequently, the results of this scoping review evidence the potential of educational technologies as allies in health promotion and self-care for people with cardiometabolic diseases, especially in contexts of adversity such as the pandemic. The studies delved into evaluating the impact of these future tools in under-represented environments and explored their long-term sustainability.

Thus, this study reaffirms the relevance of educational technologies as strategic allies in health promotion and prevention. They are indispensable for nursing and other health areas in facing health emergencies and building a more integrated and efficient treatment model

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