

LITERATURE REVIEW

Self Care Management of Diabetes

An Integrative literature review to understand challenges faced by the elderly

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Keywords: Disabled; Elderly; Long-term-care; CiteSpace visualization; Integrated Care; social work;

ABSTRACT

The world's elderly population with diabetes is growing and self-management has its challenges, not only because of the complications that age brings, but also because of possible co-existing diseases.

It is important to identify the influence of age and its complications of diabetes self-management, so that effective and efficient strategies can be created to combat the complications associated with the disease.

Elderly diabetics are a heterogeneous group with varying clinical, functional and psychosocial characteristics and, in order to achieve efficient and effective self-management, specific self-management behaviors must be taken into account on an ongoing basis in order to avoid complications. An individualized, multi-faceted approach to diabetes management should be taken and an investment should be made in diabetes self-management education.

Therefore, this review focuses on the influence of advanced age and its complications on the elderly diabetes self-management and proposes strategies for effective self-management of the disease.

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What do we already know about this topic?

The world's elderly population with diabetes is growing and self-management has its challenges, not only because of the complications that age brings, but also because of possible co-existing diseases. It is important to identify the influence of age and its complications of diabetes self-management, so that effective and efficient strategies can be created to combat the complications associated with the disease. Elderly diabetics are a heterogeneous group with varying clinical, functional and psychosocial characteristics and, in order to achieve efficient and effective self-management, specific self-management behaviors must be taken into account on an ongoing basis in order to avoid complications. An individualized, multi-faceted approach to diabetes management should be taken and an investment should be made in diabetes self-management education.

What is the main contribution to Evidence-Based Practice from this article?

The analysis identified 3 relevant themes that could help health professionals, families and the elderly diabetics themselves to define more effective and efficient self-management strategies, namely: Difficulty in DM self-management by the elderly; Individualized and multifaceted approach to DM management and Education for DM self-management. It should be noted that the elderly with DM are a heterogeneous group with varying clinical, functional, and psychosocial characteristics (Munshi, 2023) and that, in order to achieve effective self-management, specific self-management behaviors must be continuously adopted in order to avoid complications. (American Diabetes Association, 2016, quoted by Lee et al., 2020). In this sense, it is suggested that more future studies be carried out focusing on the difficulties of self-management of DM by the elderly, given that the proportion of elderly diabetics in the world is gradually increasing (Yanase et al. 2018).

What are this research's implications towards health policy?

The studies by McCarthy & Grey (2018); Chiou et al. (2022); Bahar-Fuchs et al. (2019); Munshi (2023); Hoy (2023) and ElSayed, et al. (2023) state that self-management of DM by the elderly is challenging due to the comorbidities, cognitive and psychosocial challenges associated with this age group. The study by Costa et al. (2020) concludes that self-management differs from participant to participant and changes over time, and in summary, the studies by McCarthy & Grey (2018); Lee et al. (2019); Chiou et al. (2022); Hoy (2023) and ElSayed, et al. (2023), conclude that when assessing older people with DM, it is important to accurately categorize the type of DM, as well as other factors, including the duration of DM, the presence of complications and concerns related to treatment, so that there is a personalization of information about the care and management of DM in different health profiles. The studies by Zimbudzi et al. (2016); Lee et al. (2019) and ElSayed, et al. (2023) state that DM education and self-management is important to make elderly diabetics more aware of how to self-manage the disease effectively and efficiently, avoiding complications. The relevance of these themes could help health professionals, families and the elderly diabetics themselves to define more effective and efficient self-management strategies.

Authors' Contributions Statement:

Joao Casegas took on all the work of this article.

Introduction

Diabetes mellitus (DM) is characterized by chronic hypoglycemia and is associated with various complications, including retinopathy, neuropathy, nephropathy and macro vascular complications (UN & World Population Prospects, 2015, quoted by Yanase et al., 2018).

The prevalence of DM in the elderly is increasing worldwide and its management is challenging given the comorbidities, cognitive and psychosocial challenges associated with this age group (Hoy, 2023).

The proportion of elderly diabetics (aged over 65) in the world is gradually increasing, making up 5.1% of the world's population in 1950 and 8.3% in 2015 (UN & World Population

Prospects, 2015, quoted by Yanase et al., 2018).

Self-management is the key factor in controlling the disease and preventing complications (Albargawi, Snethen, Gannass & Kelber, 2017; Lin et al., 2017; Tan et al., 2017, quoted by Lee et al., 2020) and to achieve effective self-management, specific self-management behaviors must be carried out on an ongoing basis (American Diabetes Association, 2016, quoted by Lee et al., 2020). Large-scale research projects on DM control have confirmed the importance of self-management, including self-efficacy, in DM control (Shrivastava, Ramasamy, 2013; Raaijmakers et al., 2002; American Association of Diabetes, 2002, quoted by Chiou et al.,

2022), and the number of re-entries is significantly associated with self-management (Lee et al., 2020). Regarding this association, D'Addario, Lascio, Villari and Damiani (2013) found that re-entry is associated with self-administration of interventions (Lee et al., 2020).

Thojampa and Mawn (2017) showed that DM self-management is affected by social support, self-efficacy, and health beliefs, and is associated with Glycated hemoglobin values (HbA1c). Self-management is also related to physical activity and integrated care experiences (Lee et al., 2020).

The main aim of this review is to explore the influence of old age and its complications on the self-management of DM by the elderly. The following research question arose: What influence does old age and its complications have on older people's self-management of DM?

To carry out this study, we used an integrative literature review. This review aims to summarize and analyse the information that exists on DM and self-management by the elderly.

By reviewing the literature, it will be possible to carry out a more in-depth analysis of the subject and discuss the results, which may prove to be an important help to health professionals, family members and elderly diabetics themselves in taking a more effective and efficient approach to self-management of the disease, mitigating the risks associated with it.

Thus, the review will focus on 2 dimensions:

factors that make DM self-management more difficult for the elderly; and solutions for effective and efficient self-management by the elderly.

Methodology

For this integrative literature review study, specific search keywords were used, making the choice of articles more selective and focused. The research platforms used were: Medline (Pubmed), The Cochrane Database, Ebsco Research Database, Scopus, ISI e Google Scholar.

The Key words used were: "diabetes mellitus", "self-management", "aged", "diabetes complications", "age complications", "self-managed", "elderly" e "diabetics".

On Medline (Pubmed), The Cochrane Database, Ebsco Research Database, Scopus, ISI, I used the research method: "diabetes mellitus AND self-management AND aged AND diabetes complications" without any time window restrictions.

On Google Scholar, I used the research method: "Age complications influence on elderly diabetes self-management". Given the large number of results (8,150), the search was filtered by year, and only publications from the current year, 2023, were used.

Results

The flowchart below (fig.1) shows the stages involved in selecting the studies included in this review.

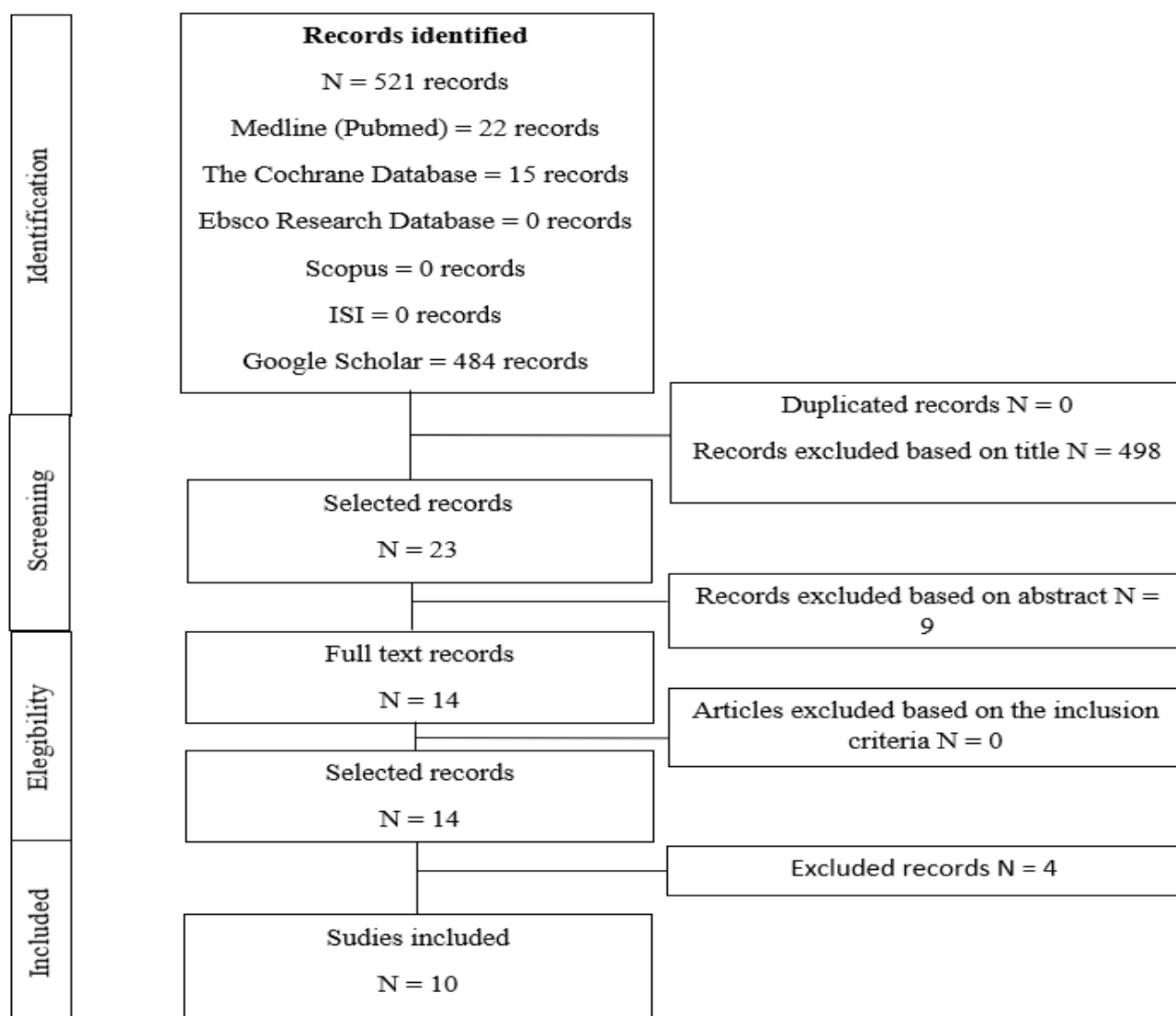


Fig.1. Article selection process according to the Prisma Model (Moher et al., 2009)

The table below summarizes the information gathered for each of the 10 studies included in the review. The table is divided into 6 columns, including the title of the study, the authors, the

objectives of the study and its participants, the intervention carried out, the results of the study and the conclusions drawn.

Study	Author(s)	Objectives and participants	Intervention	Results	Conclusions
Frailty in elderly diabetes patients	Toshihiko Yanase et al.	Categorized patients as having or not frailty, using the Clinical Frailty Scale (CFS) and tried to identify the risk factors for frailty; 132 elderly with DM2.	Patients with a CFS score of 1–4 e 5–9 were defined as non-frail and frail respectively.	No U-shaped risk was observed between HbA1c and frailty; Low HbA1c was associated with frailty in elderly patients with DM2, considering the defined frailty scale (CSF).	Although recent studies in elderly patients with DM2 have shown a J- or U-shaped relationship between HbA1c and frailty, only low HbA1c was associated with frailty in the present study. This difference may be due to the type of fragility scale used. However, strict glycemic control in some elderly people with DM can promote mortality, cardiovascular events, dementia and frailty due to malnutrition and hypoglycemia.
Self-management in patients with diabetes and chronic kidney disease is associated with incremental benefit in HRQOL	Edward Zimbudzi et al.	To analyze, in a cross-sectional study of patients with DM and chronic kidney disease, participation in DM self-management and their quality of life; 308 diabetics with chronic kidney disease (stages 3 to 5) recruited from outpatient clinics at 4 tertiary public hospitals in Australia.	Correlations were analyzed using Pearson's correlation coefficients and hierarchical multiple regression; A trend analysis across all levels of patient participation in self-management was assessed using a non-parametric test for trend.	Diet in general, physical exercise and taking medication were positively associated with at least one quality of life subscale (all with $p < 0.05$), but DM-specific diet, blood sugar testing and checking feet were not; As levels of participation in self-management activities increased, there was a gradual increase in average quality of life scores across all subscales (p for trend < 0.05).	In people with DM and moderate to severe chronic kidney disease, participation in DM self-management activities, particularly those focused on general diet, exercise and taking medication, were associated with a higher quality of life.
Patients' Journey Toward Engagement in Self-Management of Diabetic Foot Ulcer in Adults With Types 1 and 2 Diabetes	Idevania G. Costa RN et al.	To develop the first theory that could explain the processes of involvement in the self-management of adults with diabetic foot ulcers.. 30 participants	Used constructivist grounded theory informed by Charmaz and symbolic interaction to guide the study design.	The results of 30 study participants with active diabetic foot ulcers draw attention to the complexity that exists for individuals trying to balance life and control DM and diabetic foot ulcers; The categories/phases and the associated set of concepts make up the theory known	The results show the paths taken by the participants in learning about self-management practices and how they became involved in the daily management of diabetic foot ulcers; Involvement in the self-management of an active diabetic foot ulcer is complex and a development process that differs from participant to participant, and changes

				as "The Journey to Self-Management Involvement"; This theory consists of 5 phases: 1) awareness of the disease, 2) awareness of changes in the feet, 3) awareness of severity, 4) beginning to learn about self-management and 5) commitment to self-management.. The phases of the theory describe the processes of involvement in self-management, based on the participants' unique experience of living with and managing a diabetic foot ulcer.	over time; Although the majority of participants preferred to take a more passive role in the self-management of the diabetic foot ulcer (observed in phase 4), others showed the confidence to move on to the next stage (observed in phase 5); In the advanced stage, they took an active role in self-management, expressing their needs and preferences, and were involved in their own care and in making decisions related to treatment options.
Type 1 Diabetes Self-Management From Emerging Adulthood Through Older Adulthood	Margaret M. McCarthy & Margaret Grey	Analyze patterns of DM1 self-management behaviors and predictors of glycemic control throughout adulthood; 7,153 adults enrolled in the T1D Exchange Clinic Registry who were divided into four developmental stages (emerging, young, middle-aged and elderly).	This study was a secondary cross-sectional analysis of participant data. Data was collected through questionnaires and medical history review at the time of enrollment. Statistical analyses compared sociodemographic, clinical and DM-related factors between the groups; Logistic regressions were carried out for each group to identify factors associated with HbA1c greater than or equal to 7%.	Emerging adults had the highest average HbA1c level, while the elderly had the lowest level. Emerging adults were less likely to use an insulin pump or a continuous glucose monitor, but were more likely to miss at least one insulin dose a day and to have had an episode of diabetic ketoacidosis in the last year; Different factors were associated with HbA1c greater than or equal to 7% in each age group, but two factors were observed in several groups: failure to frequently check blood glucose and insulin doses.	When discussing DM self-management, healthcare providers should take into account the adult's life stage and its competing demands (such as work and family), psychosocial adjustments and the potential burden of comorbidities.

Predictors of self-management in older adults with type 2 diabetic nephropathy	Li-Yun Lee et al.	Investigating factors related to self-management and predictors of self-management in elderly people with DM2 nephropathy; 123 elderly patients with DM2 nephropathy.	Data collection through a demographic questionnaire to measure experience in integrated care and self-management; Data analysis included descriptive statistics, independent student t-tests, Pearson's product moment correlation and multiple linear regressions.	Regression analysis showed that readmissions during the year prior to the study year prior to the study, physical capacity and experience in integrated care influence self-management in elderly patients with DM2 and explained 42.8% of the variation in self-management behavior.	The results can be used to raise awareness among healthcare professionals about the importance of an integrated care and self-management experience among elderly patients with type 2 diabetic nephropathy. Doctors should also pay attention to physical capacity and the experience of integrated care to promote self-management of the disease.
Using Patient Health Profile Evaluation for Predicting the Likelihood of Retinopathy in Patients with Type 2 Diabetes: A Cross-Sectional Study Using Latent Profile Analysis	Shang-Jyh Chiou et al.	To determine whether long-term self-management among patients with DM2 carries a risk of developing complications.	A questionnaire on self-management behaviors, using diabetes self-management scales (DMSES-C and TSRQ-d) linked to biomarkers (glucose, lipid profile, blood pressure and kidney function), and the variable measurement values were transformed into normal rate ratios; A latent profile analysis (LPA) was performed to categorize the patient into different health profiles, using five classes (C1-C5), and predicted the risk of retinopathy after adjusting for co-variables.	A longer duration of DM and being elderly were correlated with an increased risk of retinopathy events.	Optimal biomarker health profiles and patients with strong motivation related to their DM2 care produced better results; Personalizing information on DM care for different health profiles raises awareness of control strategies for health professionals and patients..
Computerized Cognitive Training for Older Adults at Higher Dementia Risk due to Diabetes: Findings From a Randomized Controlled Trial	Alex Bahar-Fuchs et al.	Evaluate the effects of adaptive computerized cognitive training on cognition and self-management of DM in the elderly; 84 elderly diabetics.	Adapted adaptive computerized cognitive training or a condition of non-adapted generic adaptive computerized cognitive training; The participants in each type of training were also randomly allocated to a specific	Adherence and retention were lower in the generic computerized cognitive training condition, but the self-efficacy intervention was not associated with adherence; Moderate improvements were observed in performance, in	Elderly people at higher risk of dementia due to DM may show improvements in both cognition and disease self-management after multidisciplinary computerized cognitive training at home; The difficulty of adaptation and the adaptation of individual tasks may not be critical components in

			global / cognitive self-efficacy intervention, or in one without self-efficacy; The primary outcome was global cognition immediately after the intervention and secondary outcomes included DM self-management, meta-memory, mood and self-efficacy; Evaluations were carried out at the start of the study, immediately after training and at a 6-month follow-up.	terms of global cognition, in the post-treatment evaluations in both forms of cognitive training, with a slight additional improvement observed at the 6 month follow-up; The results for DM self-management showed an improvement in the self-assessment of DM care for both forms of intervention after treatment, which was maintained at the 6 month follow-up.	interventions.
Glucose Monitoring Use in Older Adults for Optimal Diabetes Management	Medha N. Munshi	To analyze the existence of evidence supporting the use of Continuous Glucose Monitoring (CGM) in the elderly population.	Analysis of studies supporting the use of MCG in the elderly.	Studies prove the effectiveness of using MCG for: Mitigate the risk of hypoglycemia; Improving glycemic results; Improving quality of life.	The use of MCG in elderly diabetics has been shown to improve overall glycemia, reduce the number of hypoglycemic events and increase feelings of safety and well-being..
Take an individualized and multipronged approach when managing older adults with type 2 diabetes	Hoy, S.M	Analyzing the approach of Gandhi GY, Mooradian AD, 2021, to the management of DM2 in the elderly.	The article summarizes the management of DM2 in the elderly, as reviewed by Gandhi GY, Mooradian AD, 2021.	Gandhi GY, Mooradian AD, 2021, recommend: Adopt an individualized and multifaceted approach to managing DM2 in the elderly: aim to improve quality of life without intrusive and complicated interventions (e.g. avoid marked hyperglycemia while reducing the risk of hypoglycemia).; Lifestyle changes, as they are essential; Consider medical complexity and functional status	An individualized and multifaceted approach aimed at improving quality of life without intrusive and complicated interventions is recommended for elderly people with DM2.

				when introducing lifestyle changes and choosing a pharmacological agent.	
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Table 1: *Summary of information from the studies included in the review*

Results

After analyzing the studies, the specific topic of difficulty in self-management of DM by the elderly is not often addressed, which makes it more difficult to analyze. However, it is possible to draw a lot of relevant and common information about DM self-management by

the elderly, which allows us to draw some conclusions from this review. In view of the above, the table below (Table 2) was drawn up to summarize the most relevant and common themes collected from each study.

Listing of the topic	Topic description
1	Difficulty in self-management of DM by the elderly The studies by McCarthy & Grey (2018); Chiou et al. (2022); Bahar-Fuchs et al. (2019); Munshi (2023); Hoy (2023) and ElSayed, et al. (2023) state that self-management of DM by the elderly is challenging due to the comorbidities, cognitive and psychosocial challenges associated with this age group.
2	Individualized and multifaceted approach to DM management The study by Costa et al. (2020) concludes that self-management differs from participant to participant and changes over time, and in summary, the studies by McCarthy & Grey (2018); Lee et al. (2019); Chiou et al. (2022); Hoy (2023) and ElSayed, et al. (2023), conclude that when assessing older people with DM, it is important to accurately categorize the type of DM, as well as other factors, including the duration of DM, the presence of complications and concerns related to treatment, so that there is a personalization of information about the care and management of DM in different health profiles.
3	DM self-management education The studies by Zimbudzi et al. (2016); Lee et al. (2019) and ElSayed, et al. (2023) state that DM education and self-management is important to make elderly diabetics more aware of how to self-manage the disease effectively and efficiently, avoiding complications.

Tabel 2: Summary of the most relevant and common topics from each study

Difficulty in self-management of DM by the elderly

The comorbidities and cognitive and psychosocial challenges (e.g., cognitive dysfunction, depression, falls with injuries, neuropathic pain, urinary incontinence and polymedication) associated with the elderly complicate the management of DM in this population (Weinger, Beverly, Smaldone, 2014, citado por Hoy, 2023). Managing these challenges is vital, as they affect the ability to self-manage the disease (Gandhi & Mooradian, 2022, citado por Hoy, 2023).

Cognitive dysfunction is associated with poorer DM self-management and, consequently, poorer glycemic control, the occurrence of severe hypoglycemic episodes and an increase in the occurrence of serious cardiovascular events and death. (Gandhi, Mooradian, 2022, quoted by Hoy, 2023).

Cognitive dysfunction makes it difficult to carry out complex self-management tasks (National Institute on Aging, 2022, quoted by Elsayed et al., 2023), such as monitoring glucose and adjusting insulin doses. It also hinders the ability to comply with meal routines and the respective content of the diet (Elsayed et al., 2023).

The elderly have higher rates of unidentified cognitive dysfunction and dementia, making it difficult to adhere to complex self-management activities (e.g., glucose monitoring and adjusting insulin doses) (Elsayed et al., 2023).

Previous studies have mentioned the potential threats that cognitive difficulties could bring to problems of self-management, glycaemic control, and adherence to recommended activities (Yang et al., 2020; Cuevas, Stuifbergen, Brown, 2020; Srikanth et al., 2020, quoted by Chiou et al., 2022).

The care of elderly people with DM is

challenging due to their clinical, cognitive, and functional heterogeneity. Some elderly people may have developed DM years before and have significant complications, others are newly diagnosed and may have had years of undiagnosed DM with resulting complications, and still others may have the disease with very recent onset and few or no complications (Selvin, Coresh, Brancati, 2006, quoted by Elsayed et al., 2023).

Many older people with DM have other underlying chronic conditions, substantial DM-related comorbidities, limited cognitive or physical functioning or frailty (Bandeem-Roche et al., 2015; Kalyani, 2012, quoted by Elsayed et al., 2023). Other older people with DM have few comorbidities and are active (Elsayed et al., 2023).

It is suggested that DM is related to a higher risk of frailty (Kalyani et al., 2012; Blaum et al., 2009; Ricci et al., 2014, quoted by Yanase et al., 2018).

Multiple regression analyses revealed that advanced age, low albumin levels, high-density lipoprotein cholesterol, systolic blood pressure, HbA1c, total cholesterol and weight were considered high risk factors for the clinical frailty scale, with age and albumin being the most relevant (Yanagita et al., 2017, quoted by Yanase et al., 2018).

HbA1c is a risk factor for frailty, independent of hemoglobin, as is malnutrition in the elderly with DM2, which may also contribute to frailty, given that it is a constitutional symptom or the result of strict control of a diet that is self-guided or guided by the doctor. (Yanagita et al., 2017, quoted by Yanase et al., 2018).

The level of HbA1c is not a U-shaped risk for frailty, which suggests that relatively good glycemic control may be a risk for frailty in elderly DM2 patients (Yanagita et al., 2017, quoted by Yanase et al., 2018).

Elderly people with DM are a heterogeneous group with varying clinical, functional, and psychosocial characteristics. Some older people have severe multiple comorbidities, while others are in good general health. Some may be frail and need significant support from a caregiver, while others are independent in their activities of daily living. Some have the resources and support structures to manage their needs, others do not (Munshi, 2023).

One of the main challenges in the management of DM in the elderly is to individualize the provision of care in a person with multiple comorbidities. Elderly people with DM have a higher risk of chronic microvascular and macrovascular complications, including severe lower limb amputations, myocardial infarction, visual impairment and end-stage renal disease, compared to any other age group (Kirkman, Briscoe, Clark, 2012, quoted by Munshi, 2023).

Several conditions occur more frequently in both aging and MD, often referred to as geriatric syndromes, which are not traditionally considered in younger adults. These conditions include cognitive dysfunction, depression, functional decline, polymedication, chronic pain and urinary incontinence. Cognitive dysfunction and functional limitations should be taken into special consideration when using Continuous Glucose Monitoring (CGM) in the elderly (Munshi, 2023).

For elderly people with DM1, continuous glucose monitoring (CGM) is a useful approach for predicting and reducing the risk of hypoglycemia (Toschi et al., 2020, quoted by Elsayed et al., 2023).

Cognitive decline in older people can limit patients' ability to use CGM safely and effectively in the day-to-day management of DM, as it affects several domains, including memory, learning ability, mental dexterity, attention span and execution ability (Munshi,

2017, quoted by Munshi, 2023).

The degree to which cognitive dysfunction affects patients' self-management abilities covers a wide spectrum of severity, ranging from mild cognitive impairment, in which patients have little or no difficulty carrying out daily activities, to severe dysfunction, which is commonly referred to as dementia (Munshi, 2017, quoted by Munshi, 2023) and although studies have shown that DM2 is associated with an approximately 1.5 to 2.5-fold increase in the risk of dementia (Ott et al., 1999; Peila, Rodriguez, Launer, 2002, quoted by Munshi, 2023), cognitive dysfunction affects not only DM2 patients, but also those with DM1.

While cognitive impairment in elderly DM patients may cause hypoglycemia, hypoglycemia is considered to have a negative effect on senile diabetic patients and those with dementia (Huang, Liu, Moffet, John, Karter, 2011, quoted by Yanase et al., 2018). A study by Pfutzner et al. (2011) concluded that a significant number of elderly people with DM1 and DM2 had difficulties with manual tasks and motor performance (Pfutzner et al., 2011, quoted by Munshi, 2023). On the one hand, for visually impaired patients, cell phone and CGM receiver screens can be difficult to see, and on the other hand, alarms and alerts can be ignored by hearing-impaired patients (Munshi, 2023).

Prasad-Reddy et al. (2022) state that patients who experience frequent hypoglycemia or fear of hypoglycemia often avoid certain activities, which increases anxiety and feelings of social isolation (Prasad-Reddy et al., 2022, quoted by Munshi, 2023).

In a cross-sectional study including 165 elderly people with DM1 (aged 65 or over), the researchers found that individuals with a diabetes duration of 50 years or more were >2x more likely to be unable to experience hypoglycemia (Munshi et al., 2022,

quoted by Munshi, 2023). They also found that older people with a DM1 duration of 50 years or more were 2x more likely to have depression compared to those with a duration of less than 50 years. The results show that, in elderly people with DM1, the duration of diabetes impacts their clinical and functional status, regardless of age and glycemic control. These observations can help doctors develop safe and effective strategies for treating DM (Munshi, 2023).

The elderly have a higher risk of not being able to sense hypoglycemia, preventing them from recognizing and treating it in a timely manner and reporting hypoglycemic events (Munshi et al., 2011, quoted by Munshi, 2023). Thus, the use of CGM is the only way in which hypoglycemia will be recognized in many of the oldest and most frail patients (Munshi, 2023).

As already mentioned, the elderly can have multiple comorbidities and cognitive decline, which consequently interfere with diabetes management (Chaytor, 2016, quoted by McCarthy & Grey, 2018), which can result in more frequent hypoglycemia (DuBose et al., 2016, quoted by McCarthy & Grey, 2018). Poor glycemic control and longer duration of diabetes are associated with cognitive decline in the elderly who also deal with DM complications. (American Diabetes Association, 2017, quoted by McCarthy & Grey, 2018). In short, the elderly may be particularly at risk due to the negative effects that cognitive difficulties have on self-management (Sinclair, Girling, Bayer, 2020, quoted by Chiou et al., 2022), and subtle cognitive dysfunction in older people with diabetes is usually associated with worse diabetes self-management. (Grodstein et al., 2001; Munshi et al., 2006, quoted by Bahar-Fuchs et al., 2020).

Maintaining cognitive skills in older people with diabetes, through effective cognition-oriented

treatments, can play an important role in preventing DM-related complications and avoiding an associated downward spiral. Important evidence supports the hypothesis that psychosocial behaviors can play an important role in attenuating the association between cognition and pathophysiological changes in the elderly (Wilson, Bennett, 2017, quoted by Bahar-Fuchs et al., 2020).

Individualized and multifaceted approach to DM management

DM self-management programs seek to change behavior that leads to better control of the disease, and which should, in turn, result in better outcomes for the patient (Zimbudzi et al., 2017).

Although the results are inconsistent with medium and long-term studies, in which some report improvements in results and others do not, several interventions in DM self-management have been reported in the literature. These interventions were associated with improvements in clinical outcomes (Bodenheimer, Lorig, Holman & Grumbach, 2002; Curtin et al., 2008; Lorig, Sobel, Ritter, Laurent & Hobbs, 2001, quoted by Zimbudzi et al., 2017) and cost reduction (Ahn et al., 2013, quoted by Zimbudzi et al., 2017) in some medium and long-term studies (Glasgow, Fisher, Skaff, Mullan & Toobert, 2007; Norris, Engelgau & Narayan, 2001; Norris et al., 2002; Warsi, Wang, LaValley, Avorn & Solomon, 2004; Khunti et al., 2012, quoted by Zimbudzi et al., 2017).

Managing DM in the elderly requires regular assessment of the medical, psychological, functional, and social domains. When assessing elderly people with DM, it is important to accurately categorize the type of DM, as well as other factors, including the duration of DM, the presence of complications and concerns

related to self-management, such as fear of hypoglycemia (Elsayed et al., 2023).

When discussing and promoting DM self-management, providers should consider each patient's stage of development, considering family, professional, community issues, psychosocial adjustments, and the potential burden of comorbidities (McCarthy & Grey, 2018).

Elderly people with DM are at greater risk than other elderly people of several common geriatric syndromes, such as polymedication, cognitive dysfunction, depression, urinary incontinence, injurious falls, persistent pain, and frailty (Laiteerapong, Huang, 2018, quoted by Elsayed et al., 2023). If these conditions are not considered, they can affect the self-management capacities of the elderly and their quality of life (Centers for Disease Control and Prevention, 2022; Sudore et al., 2012; Laiteerapong et al., 2011, quoted by Elsayed et al., 2023).

When caring for patients with cognitive impairment, it is essential that doctors simplify care plans and facilitate and involve the appropriate support structure to help patients in all aspects of care (Elsayed et al., 2023). Preferences for the intensity and mode of glucose control also vary between elderly patients (Brown et al., 2008, quoted by Elsayed et al., 2023). Health professionals must take this heterogeneity into account when setting and prioritizing treatment goals (Laiteerapong, 2012; Blaum et al., 2010, quoted by Elsayed et al., 2023).

Declining or diminished ability to self-manage DM may be an indication that the elderly person with DM needs cognitive and physical functional assessment, through age-standardized assessment tools and help establishing a support structure for DM management (Kirkman et al., 2012; Associação Americana de Psicologia, 2021, quoted by

Elsayed et al., 2023).

Many elderly diabetics struggle to maintain the frequent blood glucose monitoring and insulin injection regimes they previously followed (perhaps for decades) as they develop medical conditions that can impair their ability to follow their treatment plan safely. Individualized glycemic targets should be established and adjusted periodically based on coexisting chronic diseases, cognitive function, and functional status (Centers for Disease Control and Prevention, 2022, quoted by Elsayed et al., 2023).

Management requires not only an individualized approach, but also a multifaceted approach. It should include DM education, medical nutrition and exercise therapy, pharmacological agents, monitoring of disease control and complications, and evaluation of the psychosocial aspects of patient care. Each individual's capacity for self-management must also be taken into account (Gandhi, Mooradian, 2022, quoted by Hoy, 2023).

Individualized lifestyle modifications (e.g., changes in diet and exercise) are an integral part of managing hyperglycemia (Gandhi & Mooradian, 2022, quoted by Hoy, 2023). Lifestyle intervention alone has been shown to reduce the incidence of DM and seems to be more effective in the elderly (Crandall et al., 2006, quoted by Hoy, 2023).

As the prevalence of DM continues to grow, doctors will be challenged to provide care to an increasing number of older people. A large proportion of these patients will be burdened by chronic comorbidities, physical capacity deficits and cognitive dysfunction. All these patients will have a significantly higher risk of severe hypoglycemia compared to younger patients (Munshi, 2023).

The use of CGM in elderly and younger diabetic populations has been shown to

improve overall glycemia, reduce hypoglycemia and increase feelings of safety and well-being. No entanto, em idosos, o uso de MCG apresenta desafios significativos devido à heterogeneidade dos indivíduos dentro desta faixa etária. Recommendations for the use of MCG should be individualized, considering the potential risks, capabilities, and limitations of each patient (Munshi, 2023). LeRoith et al. (2019) showed that individuals aged 65 and over with DM should be provided with a multidisciplinary team to develop personalized care goals and to monitor their implementation (Lee et al., 2020). Multicomponent self-management interventions could be important for improving the quality of life of patients with DM and other comorbidities (Barrera et al., 2011; Heinrich, Schaper & de Vries, 2010, quoted by Zimbudzi et al., 2017). However, the fact that multi-component self-management strategies are sometimes complex to teach makes their implementation a challenge. This requires not only commitment and collaboration between DM patients and healthcare providers, but also the investment of considerable time and effort by the patient (Zimbudzi et al., 2017).

DM self-management education

A trusting relationship with nurses and doctors who encourage questions and provide adequate information can promote patient engagement, while a weak and disrespectful relationship can contribute to passive engagement with healthcare and consequently poorer outcomes (Sainio, Lauri & Eriksson, 2001, quoted by Costa et al., 2021). Active commitment to the treatment of chronic diseases is a responsibility of the individual and an essential element in facilitating the transition between an active and passive role in self-management (Costa, Camargo-Plazas & Tregunno, 2017, quoted by Costa et al., 2021).

It is necessary to prepare and support patients with DM or complications related to the disease in participating in self-management as early as possible and as much as they wish and are able. (Costa et al., 2021).

The DM self-management process is complex (Alrahbi & Alghenaimi, 2017, quoted by Lee et al., 2020) and DM education is important to make diabetics more aware of how to self-manage the disease, in terms of physical activity, nutrition, medication, blood glucose control and psychosocial adjustments. (Joslin Diabetes Centre, 2019, quoted by Lee et al., 2020).

Education mainly concerns the role of DM in daily life, as well as providing support and encouragement so that patients learn to manage their diabetes daily. Lack of literacy is a challenge for effective health education and healthcare providers must step in and play an important role in helping to integrate knowledge and behavior when it comes to patients' medical care (Nazar, Bojerenu, Safdar & Marwat, 2015, quoted by Lee et al., 2020).

Integrated care provides a good patient experience (Mastellos et al., 2014, quoted by Lee et al., 2020), especially in terms of reducing mortality from DM (Ballotari et al., 2018, quoted by Lee et al., 2020). Mastellos et al. (2014) verified that the integrated care plan should be determined on the basis of the patient's values and needs and that constant, participatory care should be provided to increase knowledge and improve the relationship with health professionals. Age, gender, level of education, financial status, physical condition, duration of illness (Alrahbi, 2014; D'Souza et al. 2017; Hara et al., 2014; Keke et al., 2017; Tan et al., 2017, quoted by Lee et al., 2020), adequate information on DM control, support networks, (Kurnia, Amatayakul & Karuncharernpanit, 2017, quoted by Lee et al., 2020) and an integrated

care experience (D'Souza et al., 2017; Veldman, Reijneveld, Lahr, Uittenbroek & Wynia, 2017, quoted by et al., 2020) are important factors influencing self-management.

Li-Yun Lee et al. (2019), states that patients' level of knowledge about health care is related to positive experiences in the treatment of DM and that integrated care can improve patients' relationship with health professionals and increase knowledge about DM management. These results are similar to those of the studies by Alrahbi & Alghenaimi (2017), Mastellos et al. (2014) and Tan et al. (2017), who found that DM patients who follow treatment methods achieve good treatment results, have greater self-efficacy and believe that the assistance of healthcare providers helps them to better control DM on a daily basis. Alrahbi and Alghenaimi found that support and planning from healthcare providers, family members and friends can positively affect the self-management of DM patients (Lee et al., 2020). In addition, elderly diabetics should be assessed regarding the treatment of the disease and knowledge of self-management, health literacy and mathematical literacy (numeracy) at the start of treatment (Elsayed et al., 2023).

DM self-management education and ongoing disease self-management support are vital components of DM care for the elderly and their caregivers. Self-management knowledge and skills should be reassessed when changes are made to the treatment plan or when an individual's functional capabilities decrease (Elsayed et al., 2023).

However, it is not always possible to provide the necessary education. A study examining factors influencing patient completion of DM

self-management education found that poor physical and mental health was responsible for not completing DM self-management education (Adams et al., 2013, quoted by Zimbudzi et al., 2017).

Conclusions

The aim of this review was to answer the PICO question "What is the influence of advanced age and its complications on the self-management of DM by the elderly?". After the review, we found that the literature is somewhat scarce. However, despite the scarcity of any content to substantiate our starting question, the analysis has enabled us to partly answer the question posed.

The analysis identified 3 relevant themes that could help health professionals, families and the elderly diabetics themselves to define more effective and efficient self-management strategies, namely: Difficulty in DM self-management by the elderly; Individualized and multifaceted approach to DM management and Education for DM self-management.

It should be noted that the elderly with DM are a heterogeneous group with varying clinical, functional, and psychosocial characteristics (Munshi, 2023) and that, in order to achieve effective self-management, specific self-management behaviors must be continuously adopted in order to avoid complications. (American Diabetes Association, 2016, quoted by Lee et al., 2020). In this sense, it is suggested that more future studies be carried out focusing on the difficulties of self-management of DM by the elderly, given that the proportion of elderly diabetics in the world is gradually increasing (Yanase et al. 2018).

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