



# Challenges and Management Strategies in the Nutrition of Older People with Diabetes

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J Diabetes Endocrine Practice 2023;6:126–133.

## Abstract

Diabetes has increased in prevalence and is the most common chronic metabolic disease worldwide. Its incidence and prevalence have particularly increased among older adults over the last few decades. The older adult population older than 60 years is diagnosed chiefly with type 2 diabetes, prediabetes, and type 1 diabetes in a small percentage; there is also an incidence of a transient form of diabetes secondary to chronic underlying diseases or as a part of their treatment-related complications. The primary goal in managing older adults with diabetes is to maintain glycemic status against the risk of hypoglycemia and its complications. In the older adult population, the problem of polypharmacy and nutrition must be kept in mind while achieving glycemic targets and preventing diabetes complications. Few studies have highlighted the importance of nutrition in older adults with diabetes and hypoglycemia as a complication leading to increased morbidity and mortality. Many factors in the older aged groups interplay in diabetes patients. Increasing the risk of hypoglycemia and managing nutritional aspects is paramount in older adults with diabetes mellitus. This review highlights various aspects of nutritional management in older adults with diabetes based on the current evidence available in the literature. However, most dietary recommendations for older adults with diabetes are based on studies in the adult population, and further studies targeting the older adult population are needed.

## Keywords

- ▶ nutritional management
- ▶ diabetes mellitus
- ▶ older adults
- ▶ nutritional deficiency

## Introduction

Does adequate nutritional management in an older aged adult patient with diabetes help achieve the liberal target glycemic control and reduce the risk of hypoglycemia, espe-

cially in patients with associated comorbidities, physical disabilities, cognitive impairment, or polypharmacy?

Diabetes is one of the most common chronic diseases worldwide, and its prevalence is on the rise, with an increase in cases from 108 million to over 400 million from 1980 to

article published online  
September 12, 2023

DOI <https://doi.org/10.1055/s-0043-1771201>.  
ISSN 2772-7653.

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2014.<sup>1</sup> This is particularly relevant in the older adult population, with a prevalence of 19.3% in patients aged 65 to 99 years.<sup>2</sup> The diagnosis is often made in older adults during an intercurrent illness or a stressful life event. Most older adults with type 2 diabetes (T2D) are older than 60 years, especially in Western societies, where the population is increasingly aged, and the prevalence of diabetes is higher.<sup>3,4</sup> We come across a broad spectrum of diabetes in the older age group, which consists of the prediabetes group, a small but increasing population of older adults patients with type 1 diabetes (T1D), older adult patients with newly diagnosed T2D, and transient forms of diabetes secondary to an intercurrent or underlying disease or treatment.<sup>5,6</sup>

In older adults, an unrecognized, gradual rise in blood glucose levels can occur, which is worsened by the physiological changes associated with aging and can contribute to the development of overt T2D. Some factors include increased fasting hepatic glucose production, decreased beta-cell mass, changes in beta-cell secretory function, changes in body composition, and increased insulin resistance.

Most diabetes-associated complications are dependent on the duration of diabetes and glycemic control. The goals of diabetes care for older adults should be balanced against the risks of hypoglycemia. For example, in some patients with multiple comorbidities, terminally ill, and advanced age, it may be more appropriate to focus on ameliorating glycemic symptoms and promoting general well-being rather than striving for euglycemia. Older people who develop diabetes in their later years have different clinical needs than a similarly aged person with diabetes of many years' duration. Undoubtedly, older adult patients with long-standing diabetes are more likely to have diabetic micro- and macrovascular complications, and a more aggressive approach to achieve their glycemic control may be warranted.<sup>7-9</sup> However, at the same time, the risk of severe hypoglycemia has a higher impact on morbidity and mortality in older adults. As improving glycemic control has been shown to improve cognition, one should continue to strive for adequate glycemic control whenever possible and appropriate.<sup>10</sup> Furthermore, diabetes with associated comorbidities, polypharmacy, cognitive impairment, and increased dependence on others for daily living should be considered while managing diabetes in older adults.<sup>11-14</sup> All management plans should take a holistic approach, as any one of the comorbidities may take precedence over the actual management of diabetes.

In the older adult population, the nutritional aspect of diabetes management is of paramount importance. With no specific dietary guidelines for older adult patients with diabetes, recommendations for nutritional management in these patients are based on the same guidelines as for all adult age group patients. Considering the high prevalence of diabetes in older adults, trials are needed, and accordingly, standard guidelines have to be established to address the needs of the older adult population. This study highlights the importance of adequate standard nutritional therapy in older adults, balanced with pharmacological medications, to achieve ideal blood glucose targets that reduce hypoglycemic or osmotic symptoms.

## Size of the Problem

The most important studies that addressed the nature and size of the problem are summarized in ►Table 1. Studies carried out in the United Kingdom residential and nursing homes reveal the prevalence of diabetes from 7.2 to 17.5% in older adults. The studies were conducted using self-related questionnaires and random blood glucose sampling, which surprisingly showed that the prevalence of diabetes is more in the older population in care homes than in the community.<sup>15,16</sup>

Two interesting American studies were looking specifically at dietary care. One study investigated the benefits of a diabetic diet in nursing home residents. It showed no significant difference in glucose control in patients taking a regular diet than a diabetic diet. It concluded that there was an average difference in glucose levels of about 0.6 mmol/L, which was insignificant.<sup>17</sup> The other study investigated the local standards of diabetic care in nursing home residents with diabetes. The study used a questionnaire and chart review of a random selection sample of patients with diabetes. The results showed that the care needed to meet local or national standards. The valuable data and the results highlighted the essential need for dietetic input into residential and nursing homes to provide education, assess, and monitor old age patients with diabetes.<sup>18</sup>

In 1999, the British Diabetic Association issued practice guidelines for residents with diabetes in care homes. It aimed to identify the significant issues relating to the nature and delivery of diabetes care within care homes. It emphasized providing each patient with individualized care in diet and nutritional plans, apart from monitoring weight. The association also obtained the input of a state-registered dietitian. It came out with a few essential recommendations for dietary and nutritional care in the older diabetic population, which include the following: (1) each resident to be allowed to play a role in self-diabetes care, individualized dietary and nutritional care, and easy access to community health professionals; (2) each nursing care home should train the staff and catering staff about the dietary and dietary requirements in older diabetic population; and (3) access to community health professionals and community dietitian.<sup>19</sup>

In 1996, a retrospective study identified the inpatient and outpatient activity for patients with diabetes compared to those without diabetes.<sup>20</sup> The study showed older aged people with diabetes have more hospital admissions and stay longer than nondiabetic patients.<sup>20</sup> In 2000, the prevalence of malnutrition in older patients on hospital admissions and problems related to undernutrition was evaluated.<sup>21</sup> The study showed that undernutrition is prevalent on admission in the older aged patient group and that this can worsen during the hospital stay, thus prolonging hospitalization. Contributing factors to undernutrition during hospitalization include loss of appetite, poorly controlled glycemic status, cognitive impairment, reduced food choices, polypharmacy, dysphagia, increased infections, and sensory impairment, which may create management difficulties and increase the risk of undernutrition in this vulnerable population of older age group.<sup>21</sup>

**Table 1** Summary of the studies on the nature and size of the nutrition in older people with diabetes

Study	Methodology	Conclusion	Study
The prevalence of diabetes and quality of diabetic care in residential and nursing homes	Postal survey	Highlights the need for structured care with defined standards for care home residents with diabetes	Taylor and Hendra <sup>15</sup>
Dietary management of nursing home residents with NIDDM	Observational	Results raised the possibility that the custom of routine prescribing diabetic diets for patients with NIDDM confined to chronic care facilities may not be necessary	Coulston et al <sup>17</sup>
Diabetes care policies and practices in Michigan nursing homes	Questionnaire-based and chart reviews	Valuable data and the results highlighted the essential need for dietetic input into residential and nursing homes to provide education, assess, and monitor old age patients with diabetes	Funnell and Herman <sup>18</sup>
A district survey of the patterns of in- and outpatient activity for diabetes	Comparative study	Older-aged people with diabetes have more hospital admissions and stay longer than nondiabetic patients	Currie et al <sup>20</sup>
Protein–energy undernutrition in hospital inpatients	Review	Undernutrition is prevalent on admission in the older patient group and can worsen during the hospital stay, thus prolonging hospitalization	Corish and Kennedy <sup>21</sup>
Health News Briefing: Hungry in Hospital?	Community Health Council report	It documented inadequacy of meal service to the elderly patients in hospitals as a potential reason leading to starvation in such patients	Association of Community Health Councils for England and Wales <sup>22</sup>
Health Advisory Service. Not because They Are Old	Independent inquiry report	Lack of attention to nutritional needs in more aging diabetic population and the provision of insufficient help with eating and drinking	Health Advisory Service <sup>23</sup>

Abbreviation: NIDDM, non-insulin-dependent diabetes mellitus.

The inquiry report “Hungry in Hospital” by the Association of Community Health Councils for England and Wales examined why some patients do not drink or eat enough and who ensures they eat correctly. It documented the inadequacy of meal service to older adult patients in hospitals as a potential reason leading to starvation in such patients.<sup>22</sup> “Not because they are old” was another independent inquiry into the care of the older adult by the Health Advisory Service (UK) in 1998 and was then revisited in 2004. It also highlighted the lack of attention to nutritional needs in the aging older diabetes population and the provision of insufficient help with eating and drinking.<sup>23</sup>

The British Association for Parenteral and Enteral Nutrition report put food forward as treatment together with other recommendations. Some of the key recommendations include (1) staff training and highlighting the importance of nutrition in the hospital along with clear roles and responsibilities of staff at mealtimes, (2) provision of additional nutrient contents with meals for undernourished patients, (3) individual nutrition screening of all patients, and (4) increasing the budget for hospital food and regular auditing of nutrition screening and assessment of nutritional care.<sup>24</sup>

In one of the evidence-based nutrition guidelines for the prevention and management of diabetes, Dyson et al advised adhering to the cardioprotective dietary recommendation (based on the Mediterranean and Dietary Approaches to Stop

Hypertension [DASH] diets) for adults with diabetes by reducing salt intake (<6 g/d), eating two portions of oily fish a week, eating a variety of fruit and vegetables, eating more whole grains, fish, nuts, and legumes, and eating less red and processed meat, refined carbohydrates, and sugar-sweetened beverages.<sup>25</sup>

An important clinical aspect of nutritional management of diabetes in the older adult population is the prevention of hypoglycemia. The high risk of hypoglycemia in diabetes care has been highlighted by the large HYPOTHESIS study revealing that considerably high hospitalization and death rates occur when severe hypoglycemic events require referral to the emergency department, especially in old and frail patients.<sup>26</sup>

## Nutrition in the Older Adults

Most people with diabetes are older than 60 years.<sup>3</sup> The insidious clinical presentation of T2D in older adults is likely due to the physiological changes associated with aging. Some of these include increased fasting hepatic glucose production, decreased beta-cell mass, changes in body composition, and increased insulin resistance.<sup>6,27</sup>

In older adults with diabetes, microvascular complications should be balanced against the life expectancy, unlike in young individuals. Many factors, such as comorbidities,

functional and mental ability, and daily activities, will decide the extent of glycemic control. The goal of nutritional management in diabetes is to help achieve glycemic control and reduce cardiovascular disease and nephropathy.<sup>7</sup> The main factors include body weight, physical activity, and diet composition.<sup>28</sup>

### Bodyweight

In older adults, about 65 years of age, a body mass index (BMI) of 24 to 29 kg/m<sup>2</sup> has been considered appropriate. It is a more realistic and safer target in older adults and is associated with lower mortality rates.<sup>29</sup> This might be because, in older adults, body fat is lost, and lean body mass increases the number of underweight individuals. For this reason, using the weight-based formulas alone to estimate the adult population's needs daily is not accurate. In this population, the sex, age, and activity levels should be used to adjust the recommended daily intake.<sup>30</sup> Furthermore, the Dietary Guidelines for Americans 2010 recommend approximately 2,000 to 2,600 kcal for men  $\geq$ 65 years of age, depending on their activity level, and 1,600 to 2,000 kcal for women in the same age group.<sup>30</sup>

### HbA1c Level

The optimal HbA1c target for each patient should be determined by considering the potential risks associated with hypoglycemia and the glycemic control needed. According to the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD), the level of glycated hemoglobin (HbA1c) recommended as the optimal target is less than 7%.<sup>31</sup>

### Activity

Moderate physical activity of about 30 minutes daily is recommended for the older adult. However, it does not have to be continuous.<sup>32</sup> Exercises must be adapted to the individual's ability and the frailty and increased risk of falls in older individuals should be considered.

### Carbohydrates

Individuals should obtain 45 to 60% of the total energy requirement from carbohydrates. Individuals should be encouraged to consume foods with a low glycemic index to improve glycemic control.<sup>28</sup> Fibrous foods have an increasing satiating effect, and they also improve bowel function, resulting in decreased rates of constipation. Nevertheless, this is a double-edged sword and should be used cautiously in the older adult with a depressed appetite.

### Fat

Fat, including monounsaturated fatty acids, should comprise 25 to 35% of the energy needed. Oily fish weekly and plant sources are recommended for omega-3 fatty acids. Cholesterol should not exceed 300 mg a day.<sup>5</sup>

### Protein

The literature review suggests a protein intake of 0.3 to 0.8 g/kg daily. Higher protein intake has been shown to

contribute to nephropathy. Lower protein intake appeared to slow the progression to renal failure; however, the acceptable range of protein intake per day in older adults has limited evidence.<sup>33,34</sup> The WHO guidelines in 1985 and the current European recommendations suggest a protein intake of 0.7 to 0.9 g/kg body weight per day is adequate in patients with diabetes who have evidence of microalbuminuria or have established nephropathy.<sup>35</sup> An adequate protein intake decreases the risk of malnutrition. Therefore, in older adults with diabetes, it is vital to balance the risk of developing nephropathy and malnutrition.

### Alcohol

Older adults have higher peak blood alcohol concentrations than younger subjects due to reduced lean body mass and a smaller volume of alcohol distribution.<sup>36</sup> Ideally, alcohol should be restricted in men to 2 to 3 units (30 g) per day and in the woman to 1 to 2 units (15 g) per day<sup>28</sup> to balance out the benefit of blood pressure and glycemic control over the risk of development of hypertension, stroke, hypoglycemia, and lactic acidosis and ketoacidosis.<sup>37</sup> Those on insulin or sulfonylureas are recommended to consume alcohol with carbohydrate-containing foods. Another study published in 2022 showed that MENA (Middle Eastern and North African region) region had the lowest alcohol-related age-standardized rates for deaths and DALYs (disability-adjusted life year) in the world and has the lowest alcohol consumption per capita. It also categorically mentioned that the number of DALYs related to alcohol consumption in the MENA region was highest in the 50- to 54-year age group for males compared to female, which was in the 25- to 29-year age group. Of interest, the number of alcohol consumption-related deaths in the MENA region was the highest in the older adults of the 60- to 64-year age group.<sup>38</sup>

### Sodium

Adding salt and monosodium glutamate enhances flavors to encourage dietary intake. Ideally, daily intake should not exceed 6 g considering the risk of exacerbation of hypertension.<sup>28,39</sup>

### Vitamins and Minerals

The older adult above 65 years has inadequate intake of folate; vitamins D, C, and K; iron; and magnesium. There is insufficient literature concerning vitamin and mineral supplementation in the older adult with diabetes. Hence, it is advisable to individualize micronutrient supplementation based on dietary history, clinical findings, and laboratory results. Patients with diabetes are at an increased risk of pressure sores with delayed wound healing. Some studies have supported vitamin C supplementation with zinc, which has been shown to improve outcomes and wound healing; however, the routine use of vitamin supplementation alone was not beneficial.<sup>40</sup> Older adults are also at an increased risk of fractures secondary to falls and osteoporosis. In diabetes, peripheral neuropathy, autonomic neuropathy, hypoglycemic episodes, and poor eyesight increase the risk of falls. Calcium supplementation is recommended for people above

50 years of age at 700 mg daily and 1,500 mg for people above 60. Vitamin D supplementation is advised for all older adult housebound individuals who cannot achieve sunlight exposure.<sup>41</sup>

### Special Clinical Considerations in the Older Adults with Diabetes

Achieving glycemic control in older patients with diabetes should be weighed on the risk and benefits, especially in long-standing diabetes with gastroparesis, other chronic comorbidities, polypharmacy that might alter drug metabolism, different antidiabetic medications, and the risk of hypoglycemia.

#### Delayed Gastric Emptying

Hyperglycemia contributes significantly to gastroparesis development in the elderly. Almost half of the patients with long-standing diabetes have evidence of delayed gastric emptying.<sup>42</sup> Gastroparesis affects glycemic control as well as the absorption of drugs. A mismatch between an oral hypoglycemic agent and glucose absorption can precipitate hypoglycemia.

Dietary advice is critical in patients with gastroparesis. Patients should be advised to take small, frequent meals to avoid malnutrition and improve symptoms. In cases of malnutrition, dietary supplements are needed. However, pharmacological treatment remains the most successful treatment modality for gastroparesis.<sup>42</sup>

#### Hypoglycemia

One of the most common reasons for undertreating diabetes in older adults is the fear of hypoglycemia. Studies have shown decreased complications with improved glycemic control in older adults, but tighter glycemic control led to an increased risk of hypoglycemia.<sup>43,44</sup> Due to their frailty, an older adult with diabetes is at higher risk of hypoglycemia than young adults. Alteration in the metabolism of drugs, polypharmacy, low oral intake, delayed gastric emptying, worsening kidney function, and intercurrent illnesses with frequent hospitalizations significantly increase the number of hypoglycemic episodes in such patients.<sup>45</sup> Glycemic targets for older adults with diabetes should be individualized. A blood glucose level of 6 to 8 mmol/L premeal and 7 to 9 mmol/L at bedtime, with less tight control for individuals with recurrent hypoglycemia, has been recommended.<sup>46</sup> A multicenter, retrospective HYPOS-1 study highlighted the differences between severe and symptomatic episodes of hypoglycemia. It demonstrated that patients with T2D less frequently need access to the emergency room, compared with those with T1D, but have a higher hospitalization rate.<sup>47,48</sup>

Multiple studies revealed the relationship between hypoglycemic events and the increased risk of cardiovascular events and mortality rates among diabetic patients undergoing intensive antiglycemic treatment. Hence, more attention must be paid to monitoring hypoglycemic events in older adults with diabetes, and personalized antihypergly-

cemic therapy must be implemented.<sup>48-51</sup> For these reasons, the older adult should be educated about the management of hypoglycemia episodes and the means of avoiding them. In case of hypoglycemia, rapidly absorbed carbohydrates should be consumed. A complex carbohydrate should follow this. The older adult should be advised to take frequent meals with adequate carbohydrate content.

#### Medication

The medications for diabetes control in older adults should be tailored individually. The patient's nutritional status, weight, and kidney function should be considered. Long-acting sulfonylureas, for example, glibenclamide, increase the risk of inducing hypoglycemia in older adults.<sup>52</sup> Moreover, a decrease in kidney function also delays the clearance of really excreted drugs and predisposes to hypoglycemia development. Metformin is an agent that is not associated with hypoglycemia. However, it should be avoided in patients with significantly impaired kidney function.<sup>53</sup> Age should not be a limiting factor in prescribing insulin to older adults if needed, and patients do well on pen devices due to the convenience of usage.<sup>46</sup> Furthermore, physicians should check for potential food/drug interactions or medication side effects for the patient's appetite or glycemic control.<sup>53</sup>

### Nutritional Impact of Acute Intercurrent Illness

Frequent intercurrent illnesses in older adults contribute significantly to hypoglycemia by affecting nutritional intake and food access. The older adult should be advised to take regular meals during the disease. Moreover, suitable foods should be stored at home for an illness. Undernutrition is also a significant concern in diabetes.<sup>54-56</sup>

#### Oral Health

Diabetic patients are at increased risk of many oral infections, gingivitis being the commonest. Gingivitis causes pain and tooth loss, leading to decreased oral intake. Chewing difficulties due to poor oral and dental hygiene contribute to malnutrition and reduced quality of life and health. An older adult patient with dentures or no teeth has decreased oral intake, reducing nutrient intake.<sup>56</sup> All patients are advised to maintain good oral hygiene. Patients with chewing difficulties and other oral health problems should take prompt dental advice. However, fear of going to a dentist and the cost are significant barriers for an older adult patient to seek a dental opinion.

#### Sensory Loss

Sensory losses occur naturally due to age and certain diseases, such as cancer.<sup>57</sup> Adding ready-to-use flavor enhancers containing monosodium glutamate may improve dietary intake, reverse weight loss, and improve immunity, functional status, and quality of life.<sup>57</sup> Many older adult patients deliberately reduce their fluid intake to concentrate their urine frequency, which may be increased due to glycosuria and prescribed diuretics. The recommended

minimum daily fluid intake is 1,500 mL (~7–8 cups/glasses), but this will be higher for poorly controlled diabetes patients since the urinary output is increased.

## Psychosocial Determinants of Nutrition in Older Adults with Diabetes

Many socioeconomic factors and physical and cognitive states of subjects with chronic debilitating conditions interplay in managing adequate blood glucose control and risk of hypoglycemia in older adults with diabetes.

### Social Factors

Food choices and access to food can be affected by numerous factors, including bereavement, immobility, and isolation. Therefore, it is difficult for many older adult patients to follow a prescribed diabetic diet, primarily as many luncheon clubs, community meals, day centers, and ready meals do not cater to people with diabetes.

### Financial Aspects

Financial issues can affect the ability to acquire healthful foods and self-care, especially in older adults. Frequent hypoglycemic attacks, weight loss, substituting habitual foods, and residence in a general food desert area are markers of possible food insecurity. As a result, these patients may require to be referred to food programs to help them with their struggles.<sup>58</sup>

### Psychological and Cognitive Risk Factors

Memory lapses can result in missed meals and medication or an inadvertently repeated dose of some drugs leading to hypoglycemia. Cognitive function is also impaired in people with diabetes due to increased cerebrovascular disease and depression, dementia.<sup>59,60</sup>

### Physical Factors

Functional limitations such as mobility and illness affect nutritional status. Patients with diabetes are at an increased risk of developing stroke, and any resulting neurological deficit can lead to eating problems and malnutrition. The most frequently encountered eating problems are hoarding food in the mouth, poor lip seal leading to leakage of food, and difficulty swallowing and chewing difficulty. A careful observation at mealtimes, and assessment by a speech therapist, if necessary, will enable the identification of specific eating problems. Moreover, older adults suffering from visual-related diseases have a higher risk of injury when preparing and cooling their food.<sup>61</sup> Improvements in cognitive functions have been seen in patients with better glycaemic control.<sup>10</sup> Additionally, cognitive dysfunction and memory disorders will make it more challenging to obtain a detailed and accurate food history.<sup>62,63</sup>

## Conclusion

Nutritional management of diabetes in the older adult population is the cornerstone to achieving glycaemic targets and preventing the development of immediate and long-

term complications. Systematic planning and including a nutritional diet, considering the background comorbidities and the specialized training of nursing staff taking care of the older adult and residents, is of prime importance in achieving an adequate liberal glycaemic goal, thereby reducing the risk of mortality and morbidity. Due to the paucity of data specifically on the nutritional requirements in the older adult diabetic population, which constitutes a significant part of disease prevalence, there is an urgent potential need for further studies to address this issue.

### Compliance with Ethical Principles

No ethical approval is required for the review article type of study.

### Authors' Contribution

K.F., A.A.K., H.H.A.-Y. were responsible for manuscript writing and literature review. T.P., J.S., H.A.K., F.H., and K.R.F.A.F. contributed to manuscript writing. A.-N.E. contributed to literature review and review of the manuscript. All the named authors approved the final version of the manuscript.

### Funding and Sponsorship

None.

### Conflict of Interest

None declared.

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