Management of Diabetes Mellitus in the Elderly

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ABSTRACT

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Introduction: Due to increasing life expectancy and lifestyle changes, the prevalence of diabetes among the elderly is rising, along with the associated public health burden. Diabetes management in this population is complicated by age-related physiological changes, sarcopenia, comorbidities, and varying degrees of functional and cognitive abilities that contribute to frailty.

Methods: This narrative review examines the unique characteristics and complex challenges of managing diabetes in the elderly. It synthesizes recent literature and clinical guidelines to recommend a comprehensive yet personalized management strategy that accounts for the heterogeneity of this patient group.

Results: Elderly patients with diabetes often face multiple chronic conditions that increase their risk of cardiovascular disease, cancer, and mortality. They are also more vulnerable to severe acute complications such as hyperosmolar hyperglycemic state and hypoglycemia. Optimal management involves a holistic assessment of functional and cognitive status, nutritional state, and the presence of geriatric syndromes. This assessment guides the individualization of glycemic targets, which are often less stringent than in younger adults. Therapeutic choices should prioritize agents with a low risk of hypoglycemia and consider the patient's comorbidities, polypharmacy, and overall quality of life.

Conclusions: A personalized, patient-centered approach is essential to reduce morbidity and mortality in geriatric patients with diabetes. Optimal management, which includes ongoing education, regular screening for complications and geriatric syndromes, and multidisciplinary supervision, is critical for maintaining functional independence and improving health outcomes.

Keywords: Diabetes Mellitus; Elderly; Multimorbidity; Sarcopenia

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both [1]. In the geriatric population, this condition presents a unique and complex set of challenges that demand a departure from standard management protocols [2]. Older adults with diabetes face a significantly higher risk for both acute and chronic microvascular and macrovascular complications, including lower-extremity amputations, myocardial infarction, vision impairment, and end-stage renal disease [3]. Furthermore, they are more susceptible to hyperglycemic crises and have an increased frequency of emergency department visits for severe hypoglycemia, contributing to higher rates of morbidity and mortality compared to younger individuals [4].

The management of DM in older adults is complicated by the substantial heterogeneity within this population, which is driven by age-related physiological changes, the presence of multiple chronic diseases (multimorbidity), and varying levels of functional, cognitive, and mobility capabilities that often lead to frailty and sarcopenia [5, 6]. The pathophysiology of type 2 diabetes in the elderly is distinct, marked by a progressive, age-related decline in pancreatic beta-cell function, compounded by increased insulin resistance from changes in body composition, such as the loss of muscle mass and an increase in visceral fat [5]. Additionally, polypharmacy is a common issue, elevating the risk of adverse drug interactions and side effects [1]. Given these complex individual characteristics and specific psychosocial challenges, a personalized, interdisciplinary approach is essential for effective diabetes management [2, 4]. This review aims to discuss the comprehensive and individualized management of diabetes mellitus in the elderly in order to improve clinical practice and achieve better health outcomes for this vulnerable population [7, 8, 9, 10].

METHODS

This is a narrative review of recent literature. Information was synthesized to provide a practical framework for clinicians on the management of diabetes mellitus in the elderly population. The review emphasizes a comprehensive and personalized management strategy, taking into account the unique challenges presented by this patient group. Key areas of focus included age-related physiological changes, sarcopenia, comorbidities, and varying degrees of functional and cognitive abilities that contribute to frailty. Information was primarily gathered from established clinical practice guidelines, including those from the American Diabetes Association (ADA), the Indonesian Society of Endocrinology (PERKENI), and the International Diabetes Federation (IDF). These sources were supplemented with relevant clinical studies and literature reviews to elaborate on the pathophysiology, diagnosis, and specific therapeutic considerations, such as diet, exercise, and pharmacotherapy in older adults with diabetes . The collected information was then structured to guide clinicians in developing individualized treatment plans that balance glycemic control with the prevention of hypoglycemia and the maintenance of quality of life. Sources

RESULTS

The literature review reveals that the management of diabetes mellitus in the elderly is a complex process that requires a departure from standard protocols used for younger adults. Key findings on pathophysiology, diagnosis, and management are synthesized below.

Pathophysiology and Clinical Presentation

The pathophysiology of type 2 diabetes (T2DM) in older adults is distinct, characterized by both an age-related decline in pancreatic beta-cell function and increased insulin resistance. This insulin resistance is largely driven by changes in body composition, including sarcopenia (the loss of muscle mass and function) and a relative increase in visceral body fat. Factors such as decreased physical activity, mitochondrial dysfunction, and a chronic low-grade inflammatory state also contribute significantly. Unlike in younger adults, the clinical presentation is

often atypical or asymptomatic. The classic symptoms of polyuria and polydipsia are frequently absent due to an age-related increase in the renal threshold for glucose and an impaired thirst mechanism. Consequently, a diagnosis of diabetes in an older adult is often made incidentally or following the presentation of non-specific symptoms such as fatigue, cognitive decline, falls, incontinence, or during an acute hyperglycemic crisis like a hyperosmolar hyperglycemic state (HHS).

Individualized Assessment and Glycemic Targets

A cornerstone of geriatric diabetes management is the individualization of care, which is guided by a comprehensive geriatric assessment rather than chronological age alone. This assessment evaluates the patient's functional status (Activities of Daily Living), cognitive function, comorbidities, and the presence of geriatric syndromes like frailty and malnutrition. Tools such as the Clinical Frailty Scale, Mini-Cog, and Mini Nutritional Assessment (MNA) are recommended to stratify patients and guide therapeutic goals. Based on this assessment, glycemic targets (HbA1c) are relaxed to prioritize safety and quality of life over intensive control:

- Healthy Elderly (Functionally Independent, Intact Cognition): An HbA1c target of <7.0-7.5% is considered reasonable.
- Complex/Intermediate Health (Multiple Comorbidities, Mild-to-Moderate Cognitive or Functional Impairment): A less stringent HbA1c target of <8.0% is appropriate.
- Very Complex/Poor Health (End-of-Life, Severe Impairments, Residing in Long-Term Care): HbA1c targets are de-emphasized. The focus shifts entirely to avoiding symptomatic hyperglycemia and preventing hypoglycemia.

Lifestyle Management

Lifestyle interventions must be tailored to the individual's functional capacity and nutritional status.

- Nutrition: Overly restrictive diets are discouraged to prevent malnutrition and sarcopenia. A key recommendation is ensuring adequate protein intake, with a target of 1.0–1.5 g/kg of body weight per day, to preserve muscle mass.
- Physical Activity: Exercise is crucial for improving functional status and insulin sensitivity. Programs should be adapted to the patient's ability, incorporating aerobic, resistance, and balance exercises with a guiding principle of "start slow, go slow".

Pharmacological Therapy

The primary principle of pharmacotherapy in the elderly is to minimize the risk of hypoglycemia and simplify treatment regimens to reduce the burden of polypharmacy.

- Metformin: It is the preferred first-line agent due to its low risk of hypoglycemia and potential cardiovascular benefits. However, its use is contraindicated in patients with an eGFR <30 mL/min/1.73 m^2 and requires caution due to gastrointestinal side effects.
- Sulfonylureas (SUs): These agents should be used with extreme caution due to their high risk of severe and prolonged hypoglycemia. If an SU is necessary, shorter-acting agents like gliclazide or glipizide are preferred over long-acting ones like glyburide, which should be avoided.
- DPP-4 Inhibitors: This class is generally considered safe and well-tolerated in the elderly, with a very low risk of hypoglycemia, making them a favorable choice.
- SGLT-2 Inhibitors: These agents offer significant cardiovascular and renal benefits but must be used cautiously in older adults, particularly those who are frail, due to the increased risk of genitourinary infections, dehydration, and orthostatic hypotension.
- GLP-1 Receptor Agonists: While providing cardiovascular benefits, these agents can cause gastrointestinal side effects and weight loss, which may be undesirable in frail or undernourished patients.

- Insulin: When insulin is required, regimens should be simplified as much as possible to reduce complexity and the risk of errors. A once-daily basal insulin regimen is often preferred over more complex basal-bolus or multiple pre-mixed insulin schedules.

DISCUSSION

The management of diabetes mellitus in the elderly presents a distinct and formidable clinical challenge, necessitating a fundamental shift away from the standardized, aggressive glycemic targets often pursued in younger adult populations [11]. This review synthesizes evidence that underscores the critical importance of a holistic, individualized approach, one that prioritizes patient safety, functional status, and quality of life over strict metabolic control [12, 13]. The core challenge lies in the profound heterogeneity of the geriatric population; a "one-size-fits-all" strategy is rendered ineffective and potentially harmful by the complex interplay of age-related physiological changes, the high burden of multimorbidity, and the pervasive influence of geriatric syndromes such as frailty, sarcopenia, and cognitive impairment [14, 15]. The traditional focus on preventing long-term microvascular and macrovascular complications must be carefully balanced against the immediate and tangible risks of therapy, most notably severe hypoglycemia, which is more frequent and poorly tolerated in older adults due to blunted counter-regulatory hormonal responses and impaired autonomic function [16].

A central theme emerging from modern guidelines is the stratification of care based on a comprehensive geriatric assessment rather than chronological age alone [17, 18]. The decision to set glycemic targets—whether a relatively tight HbA1c of <7.5% for a robust, functionally independent older adult or a more liberal target of <8.5% for a frail individual with multiple comorbidities and limited life expectancy—is a clinical judgment that must be continuously re-evaluated [10]. This individualized approach extends to all facets of management. Lifestyle interventions, for instance, pivot from a focus on weight loss to the preservation of muscle mass and function. Nutritional guidance must actively guard against malnutrition by ensuring adequate protein intake, while physical activity programs are tailored to improve strength, balance, and mobility, thereby reducing the risk of falls and maintaining independence [18, 19]. This contrasts sharply with the often more intensive diet and exercise regimens prescribed for younger patients.

Pharmacotherapy in the elderly is governed by the principle of "start low, go slow" and an overarching goal to minimize complexity and the risk of adverse events, particularly hypoglycemia [12]. The high prevalence of polypharmacy in this age group makes simplifying medication regimens a priority to enhance adherence and reduce the potential for drug-drug interactions [1, 13]. Consequently, there is a clear preference for agents with a low intrinsic risk of hypoglycemia. While metformin remains a first-line choice due to its efficacy and safety profile, its use is contingent on renal function [19]. The use of sulfonylureas, especially long-acting agents like glyburide, is strongly discouraged due to the high risk of severe, prolonged hypoglycemia [12, 20]. Newer classes, such as DPP-4 inhibitors, have gained favor for their safety and tolerability, while GLP-1 receptor agonists and SGLT-2 inhibitors offer significant cardiovascular and renal benefits but require careful patient selection to mitigate risks such as undesirable weight loss or volume depletion in frail individuals [14]. When insulin is necessary, simplifying the regimen to a once-daily basal insulin is often the safest and most practical approach, avoiding the complexity and high risk associated with multiple daily injections [10]. Ultimately, managing diabetes in the elderly is less about achieving a specific number and more about a collaborative, patient-centered process that honors the individual's health status, life goals, and preferences to ensure that the treatment does not become more burdensome than the disease itself.

CONCLUSIONS

The management of diabetes in the elderly requires a highly individualized and comprehensive approach that diverges significantly from protocols for younger adults. Due to the high prevalence of undiagnosed cases, often

presenting with non-specific symptoms, early screening and awareness are critical. The cornerstone of effective management is the personalization of therapeutic regimens based on a thorough assessment of the patient's functional status, cognitive ability, comorbidities, and life expectancy.

Author Contributions

Conceptualization, S.T.M. and E.N.; methodology, E.N.; investigation, S.T.M.; writing—original draft preparation, S.T.M.; writing—review and editing, S.T.M. and E.N.; supervision, E.N.; project administration, E.N. All authors have read and agreed to the published version of the manuscript.

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No new data were created or analyzed in this study. Data sharing is not applicable to this article as it is a narrative review of existing literature. All data discussed are sourced from previously published studies, which are cited in the reference section.

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Conflicts of Interest

The authors declare no conflict of interest

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