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Newer Challenges in Diabetes Mellitus: A Literature Review

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I. INTRODUCTION

Diabetes mellitus (DM) continues to pose a major global health burden, with rising prevalence, especially in low- and middle-income countries. While significant progress has been made in early diagnosis, pharmacological advances, and glycemic control, new clinical, public health, and systemic challenges are emerging. These challenges extend beyond traditional microvascular and macrovascular complications and increasingly involve multidimensional care, emerging comorbidities, and socioeconomic and healthcare system constraints. This literature review highlights the key emerging challenges associated with diabetes mellitus based on recent global evidence.

1. Emerging Complications of Diabetes Mellitus

Recent literature suggests a growing prevalence of complications not traditionally associated with diabetes. One such condition is metabolic dysfunction-associated steatotic liver disease (MASLD), previously referred to as non-alcoholic fatty liver disease (NAFLD). Studies have shown that MASLD is present in over 50% of individuals with type 2 diabetes mellitus (T2DM), and its progression to steatohepatitis and liver fibrosis poses a significant burden on health systems (Younossi et al., 2023). Despite this, MASLD remains underdiagnosed due to lack of standardized screening protocols in diabetic care.

Another rising concern is the increased incidence of certain cancers among people with diabetes. Epidemiological studies have found a strong association between T2DM and increased risk of liver, pancreatic, endometrial, and colorectal cancers (Giovannucci et al., 2010; Harding et al., 2023). This is thought to be due to hyperinsulinemia, chronic inflammation, and insulin resistance stimulating oncogenic pathways. However, diabetes-related cancer screening is not yet well-integrated into routine diabetes management.

A further complication that is increasingly recognized is cognitive decline and dementia. Diabetes is associated with up to a twofold increased risk of Alzheimer's disease and vascular dementia (Biessels et al., 2020). Mechanisms include microvascular cerebral damage, glycemic variability, and neuroinflammation. The growing population of elderly diabetics makes this a particularly urgent issue, especially since cognitive decline significantly impacts self-management and treatment adherence.

Additionally, sarcopenia and frailty are being reported more frequently among aging diabetic patients. Insulin resistance, decreased physical activity, and low-grade systemic inflammation are contributing factors. Sarcopenia worsens mobility and increases the risk of falls, hospitalization, and mortality (Liao et al., 2022). This underscores the need for multidisciplinary approaches in managing elderly diabetics.

Furthermore, studies increasingly highlight the link between diabetes and mental health disorders, particularly depression and anxiety. These conditions affect treatment compliance and outcomes. Research suggests that people with diabetes are twice as likely to experience depression compared to the general population (Roy & Lloyd, 2012). However, integration of mental health screening and treatment into diabetes care remains insufficient, especially in low-resource settings.

Lastly, infectious disease susceptibility, especially highlighted during the COVID-19 pandemic, has shown that diabetics have increased risk of severe infections and poor outcomes. Poor glycemic control impairs immune function, and comorbidities such as obesity and cardiovascular disease further elevate risk (Zhu et al., 2020). This reaffirms the need for preventive strategies like vaccination and infection monitoring in diabetic populations.

2. Challenges in Diabetes Management and Health Systems

Despite therapeutic advances, many people with diabetes remain poorly controlled. A major barrier is therapeutic inertia, where healthcare providers fail to initiate or intensify treatment regimens in a timely manner. This has

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been documented globally and is associated with worse long-term outcomes (Khunti et al., 2018). Delay in insulin initiation and underuse of newer agents like SGLT2 inhibitors and GLP-1 receptor agonists contribute to this gap.

Access to these newer medications is also a major equity challenge, particularly in low- and middle-income countries. While SGLT2 inhibitors and GLP-1 analogs show cardiovascular and renal protective effects beyond glycemic control, high cost and limited availability restrict their use (Seidu et al., 2021). In many regions, insulin availability is also inconsistent due to supply chain and affordability issues.

Patient self-management and lifestyle modification are critical for long-term diabetes control. However, real-world implementation is challenged by poor health literacy, cultural factors, and lack of ongoing support. Many patients struggle to maintain diet and exercise regimens, especially in the context of socioeconomic stressors (Shrivastava et al., 2013). Structured diabetes education and support are often lacking or poorly implemented.

Another growing issue is the shortage of trained healthcare personnel, especially endocrinologists and diabetes educators. In many health systems, diabetes care is managed by general practitioners who may lack specialized training or resources. This is compounded by fragmented care systems where comorbidities are not managed in an integrated way (Zhou et al., 2022).

In terms of monitoring and data management, there is underutilization of technologies such as continuous glucose monitoring (CGM), especially in resource-limited settings. Even in high-income settings, CGM adoption is limited by cost and insurance restrictions. Real-world data on long-term outcomes of CGM and telemedicine in diverse populations remain limited (Beck et al., 2019).

Additionally, new therapies including cell-based therapies, beta-cell regeneration, and stem-cell transplantation are under active research. However, these face barriers related to cost, long-term efficacy, immune rejection, and ethical considerations (Shapiro et al., 2021). Translating these experimental therapies into widespread clinical use remains a distant goal.

3. Public Health and Social Determinants

Diabetes is increasingly recognized as a disease of social and environmental determinants. Urbanization, dietary shifts, sedentary lifestyles, and aging populations contribute to the rising prevalence globally. Socioeconomic deprivation is associated with higher incidence and worse outcomes. Environmental exposures such as air pollution and endocrine-disrupting chemicals are being investigated for their potential diabetogenic effects (Rajagopalan & Brook, 2012). However, policies addressing these upstream factors are still in their infancy.

Health disparities in diabetes care and outcomes persist across income levels, race/ethnicity, and geographic regions. In low-income countries, the lack of basic diabetes services—glucose monitoring, retinopathy screening, foot care—leads to preventable complications. Addressing these disparities requires structural investment in primary healthcare, education, and community-based interventions.

II. CONCLUSION

The landscape of diabetes mellitus is rapidly evolving. Beyond traditional complications such as nephropathy and cardiovascular disease, newer challenges such as fatty liver disease, cancer risk, cognitive impairment, and sarcopenia are gaining prominence. Simultaneously, systemic issues such as therapeutic inertia, inequitable access to care, mental health comorbidities, and limitations in workforce and infrastructure complicate effective disease management. To meet these emerging challenges, a more holistic, multidisciplinary, and equity-oriented approach is essential. Future research must focus on real-world implementation, prevention of emerging complications, and delivery of care models that are affordable and scalable across diverse settings.

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