Chapter 4
App Your Health:
Harnessing Digital Tools for Diabetes Prevention and Health Promotion

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ABSTRACT

Type 2 diabetes mellitus (T2DM) is rising globally, with low- and middle-income countries, including South Africa, bearing a disproportionate burden. This chapter explores the role of digital health tools such as mobile health (mHealth), wearable technologies, and artificial intelligence in supporting T2DM prevention and management. It critically examines how these innovations promote education, behaviour change, and self-management in under-resourced settings. The chapter highlights that while digital tools offer scalable solutions for diabetes care, their success depends on equitable access, cultural relevance, and integration into primary healthcare. Challenges such as the digital divide, data privacy, and weak system alignment must be addressed. Community engagement enhances trust and long-term use. Looking forward, digital health can transform care if supported by context-specific research, inclusive design, and enabling policies. A hybrid model—blending innovation with person-centred care—is essential for sustainable, accessible diabetes management rooted in local realities.

1. INTRODUCTION

The rapid digitisation of health systems is reshaping how societies approach health promotion, disease prevention, and long-term management of chronic conditions. This shift is especially significant for type 2 diabetes mellitus (T2DM), a condition rising at alarming rates globally and disproportionately burdening low- and middle-income countries (LMICs). Digital health innovations such as mobile applications, wearable sensors, telemedicine platforms, and artificial intelligence present new opportunities to strengthen diabetes prevention, enhance patient engagement, and support sustained self-management. With a particular focus on South Africa, this chapter examines how these technologies can be adapted for resource-limited settings to improve access to care, reinforce health education, encourage behaviour change, and ultimately enhance health outcomes in populations most at risk of developing T2DM.

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2. BACKGROUND

Diabetes is one of the world's fastest-growing health challenges, affecting an estimated 589 million adults, with projections reaching 853 million by 2050. One in eight adults may be living with diabetes, and over 252 million cases are expected to remain undiagnosed, intensifying the health and economic burden on already strained systems (International Diabetes Federation (IDF), 2025). LMICs face the steepest rise, driven by rapid urbanisation, demographic transitions, and lifestyle shifts that accelerate the emergence of non-communicable diseases (NCDs). The rise of T2DM in LMICs reflects broader societal transformations. Once more prevalent in high-income countries, the burden has shifted toward LMICs due to increased consumption of energy-dense foods, reduced physical activity, higher tobacco and alcohol use, and widespread obesity (Rob et al., 2025; Mphasha, Skaal & Mothiba, 2022; Ford, Patel, & Narayan, 2017). These risk factors: intensified by globalisation, socioeconomic inequality, and food system changes (Gong et al., 2025; Fox, Feng & Asal, 2019; Ruel et al., 2017) result in earlier disease onset, more severe complications, and poorer long-term outcomes.

T2DM remains largely preventable, as it is strongly associated with modifiable lifestyle factors such as unhealthy diets, physical inactivity, and excess body weight (IDF,2021). Yet prevalence continues to grow, revealing weaknesses in prevention efforts, early detection systems, and continuous self-management support. Digital health interventions offer scalable, cost-effective solutions that can address these gaps. They provide personalised coaching, real-time glucose tracking, lifestyle guidance, and remote consultations, empowering individuals to adopt healthier behaviours and maintain long-term disease control (Giansanti, 2025; Chatterjee et al., 2021; Rollo et al., 2016). When integrated effectively, these tools can complement overburdened healthcare systems and expand access to care in resource-constrained LMIC environments.

2.1. Description and Diagnosis

Type 2 diabetes mellitus is a chronic metabolic condition characterised by insulin resistance, progressive β-cell dysfunction, and sustained hyperglycaemia (IDF, 2025). In LMICs, its pathophysiology reflects complex interactions between genetic, lifestyle, and environmental factors (Pledger & Ahmadizar, 2023). Insulin resistance reduces glucose uptake in muscle and adipose tissue, while impaired hepatic insulin signalling increases glucose production (DaSilva et al., 2020). Chronic inflammation and prolonged hyperinsulinaemia eventually exhaust β-cells, worsening glycaemic control (Thouvenot et al., 2022). Emerging evidence from African populations suggests that reduced insulin clearance, not only resistance, may represent an early metabolic defect preceding β-cell deterioration (Kunyiha et al., 2025).

The rising prevalence of T2DM in LMICs is further linked to sedentary lifestyles, rapid urbanisation, and increased consumption of ultra-processed, high-calorie foods (Popkin & Ng,, 2022). Central obesity, alcohol and tobacco use, and newer risk contributors such as air pollution compound vulnerability (Bell et al., 2011). Socioeconomic barriers such as low income, limited health literacy, poor access to care, and under-resourced health systems delay diagnosis and hinder long-term management (Woodward et al., 2024). In many LMIC contexts, individuals develop T2DM at younger ages and sometimes at lower BMI thresholds, increasing lifetime complications (Ford, Patel, & Narayan, 2017). Diagnosis follows standard WHO/ADA criteria:

- Fasting plasma glucose ≥7.0 mmol/L

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