

Editorial

Prevention of Type 2 Diabetes with Lifestyle Interventions: Evidence vs. Reality

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Type 2 diabetes is a serious global public health concern that affects every country in the world [1], with a disproportionately higher burden in low- and middle-income countries [2]. Lifestyle changes focused on improving diet quality and increasing physical activity, the so-called “conventional lifestyle interventions”, remain the cornerstone for the prevention of type 2 diabetes in people at high risk for type 2 diabetes [3,4]. High-risk individuals are defined clinically as those with isolated impaired fasting glucose (i-IFG), isolated impaired glucose tolerance (i-IGT), IFG plus IGT, elevated HbA1c, or a high diabetes risk score [5]. Diabetes risk scores take into consideration a range of risk factors such as ethnicity, age, past history of gestational diabetes mellitus, central obesity, hypertension, physical activity, and family history of diabetes [6]. Among these high-risk groups, as shown by randomized controlled trials, conventional lifestyle interventions could prevent the onset of type 2 diabetes in people with i-IGT [4,5,7] or IFG plus IGT [4,5,7], but not in those with i-IFG [7], elevated HbA1c [8], or a high diabetes risk score [9]. The reasons for this differential effect of conventional lifestyle interventions on the incidence of diabetes by different high-risk groups remain unclear. However, one strong possibility is that conventional lifestyle interventions mainly target the pathophysiology of IGT and not that of i-IFG [5,7]. The metabolic features are distinct in these phenotypes, with impaired early-phase insulin secretion and hepatic insulin resistance in i-IFG, impaired early- and late-phase insulin secretion and skeletal muscle insulin resistance in i-IGT, and a combination of these defects in IFG plus IGT [5,10]. While conventional lifestyle interventions improve beta-cell function and skeletal muscle insulin sensitivity that characterizes IGT, their effect is limited on hepatic insulin resistance, a predominant defect in i-IFG [5,10].

Individuals with IGT can only be identified with a 75 g 2 h oral glucose tolerance test (OGTT), which is an expensive and cumbersome test for physicians and patients [5]. Consequently, the OGTT has often been replaced by more convenient tests, such as HbA1c, fasting plasma glucose (FPG), or diabetes risk scores, to identify high-risk individuals in clinical practice in many countries [11–15]. For example, in the US, HbA1c is a commonly performed test, and those identified with prediabetes (5.7–6.4%) are referred to the CDC’s National Diabetes Prevention Program to undergo conventional lifestyle interventions [12]. Notably, there is limited overlap between HbA1c and the OGTT in identifying those with IGT [16–18] who benefit the most from conventional lifestyle interventions [7].

Using tests that identify individuals with a low likelihood of reducing diabetes risk with conventional lifestyle interventions [16–18] and the failure to deliver tailored lifestyle interventions according to prediabetes phenotypes [5,7,19–22] are major challenges for stemming the growing worldwide diabetes pandemic. Therefore, further research is warranted to identify tests that could determine ideal candidates for diabetes prevention programs



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with high accuracy and develop lifestyle interventions specifically targeting hepatic insulin resistance, such as low-calorie diets [5,7] or high-intensity interval training [5,7] in people with i-IFG. Although tailoring lifestyle interventions to an individual's diabetes risk may be the most effective way to reduce the chances of those at the highest risk going on to develop diabetes, challenges of how to effectively identify these high-risk individuals and how to individually tailor lifestyle interventions at scale and in line with individual's preferences remain [23]. For example, underserved communities, which have some of the highest rates of diabetes, are less likely to engage with healthcare services than socially advantaged communities [24] and demonstrate lower participation and engagement in diabetes prevention programs [25–27]. Thus, whilst the individual tailoring of programs may have a place in preventing diabetes in high-risk groups, we must ensure that disadvantaged communities are not missed in diabetes prevention efforts.

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