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Review

Effects of lifestyle changes on adults with prediabetes: A systematic review and meta-analysis

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ABSTRACT

Aims: To assess the efficacy, safety, and cost-effectiveness of lifestyle intervention, compared with treatment as usual in people with prediabetes as defined by the American Diabetes Association. For older studies, we used the 1985 World Health Organization definition.
Methods: We systematically searched multiple electronic databases and referenced lists of pertinent review articles from January 1980 through November 2015. We performed an update search in MEDLINE on April 26, 2017. Based on a priori established eligibility criteria, we dually reviewed the literature, extracted data, and rated the risk of bias of included studies with validated checklists. To assess the efficacy of lifestyle intervention to prevent or delay further progression to type 2 diabetes, we conducted a random-effects meta-analysis. We assessed the certainty of evidence using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach.
Result: Pooled results of 16 randomized controlled trials showed that people with prediabetes who received lifestyle intervention had a lower rate of progression to type 2 diabetes after one (4% vs. 10%, RR 0.46 [CI 0.32, 0.66]) and three years of follow-up (14% vs. 23%, RR 0.64 [95% CI 0.53, 0.77]). The majority of the studies also showed a greater weight loss in lifestyle intervention participants, with a great variation between studies. Costs per quality-adjusted life-year were lower when the benefits of lifestyle intervention were analyzed over a lifelong time horizon compared to only the period of lifestyle intervention (three years) or to modeling over a ten-year period.

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Abbreviations: ADA, American Diabetes Association; CI, Confidence interval; Finnish DPS, Finnish Diabetes Prevention Study; HR, Hazard ratio; IDPP-1, Indian Diabetes Prevention Programme; IFG, Impaired fasting glucose; IGT, Impaired glucose tolerance; QALY, Quality-adjusted life-year; RCT, Randomized controlled trial; RR, Relative risk; U.S. DPP, United States Diabetes Prevention Program; vs., versus; WHO, World Health Organization.

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Conclusion: Lifestyle intervention is an efficacious, safe, and cost-effective measure to reduce the risk of progression to type 2 diabetes in people diagnosed with prediabetes. More research is necessary to compare the efficacy of various modes, frequencies, and intensities of lifestyle intervention across studies.

Contents

1. Introduction

According to the latest estimates from the International Diabetes Federation (IDF) (2017), 352 million adults between the ages of 20 and 79 (7.3% of that population) could be classified as having prediabetes [1]. To date no general agreement on laboratory thresholds for prediabetes exists. The American Diabetes Association (ADA) defines prediabetes as impaired fasting glucose (IFG) of 5.6–6.9 mmol/L and/or 2 h post-challenge glucose of 7.8–11.0 mmol/L with a 75 g oral glucose tolerance test (impaired glucose tolerance [IGT]) or based on a HbA1c value of 5.7–6.4% [2]. The World Health Organization (WHO) sets the threshold for prediabetes at an IFG of 6.1–6.9 mmol/L [3]. The ADA's lower threshold for IFG is based on the rationale that an IFG near the level of 6.1 mmol/L is associated with a higher risk of micro- and macrovascular complications [4].

Compared to the current WHO criteria, applying the ADA criteria leads to a two- to three-fold increase in the number of people diagnosed with prediabetes [5]. This may include many people at lower risk for developing diabetes and cardiovascular disease who might not benefit from any intervention. However, since individuals with prediabetes are at higher risk for developing type 2 diabetes, with about five to ten percent progressing to type 2 diabetes annually [6], early detection of prediabetes offers the possibility of intervention to prevent or delay further progression to type 2 diabetes.

In this context, we are specifically interested in the role of lifestyle intervention in achieving long-term behavioral changes in people at high risk of developing type 2 diabetes. A recent overview of systematic reviews, mostly containing RCTs, showed that there is sufficient evidence that lifestyle intervention, which often includes regular dietary advice and

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