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SYSTEMATIC REVIEWS AND META-ANALYSES

Impact of lifestyle interventions on depressive symptoms in individuals at-risk of, or with, type 2 diabetes mellitus: A systematic review and meta-analysis of randomized controlled trials

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Abstract *Background and Aim:* Depression affects one in four individuals with type 2 diabetes mellitus (T2DM). The impact of T2DM lifestyle interventions on depression is unclear. The aim of this analysis was to examine the influence of lifestyle interventions on depressive symptoms scores in individuals at-risk of or with T2DM.
Method and Results: Major bibliographic databases were searched for studies published in English from 1990 to 2015. Meta-analysis was conducted by random-effects model. Nineteen studies were included in the meta-analyses. A significant reduction in depression scores was shown for lifestyle interventions in the pooled analysis (Standardized Mean Difference (SMD): −0.165; 95%CI: −0.265, −0.064; I^2:67.9%) and when limited to individuals with T2DM (SMD: −0.202; 95%CI: −0.288, −0.079; I^2:72.5%). In subgroup analyses the most effective intervention methods were *face-to-face* individual consultations (SMD: −0.241; 95%CI: −0.403, −0.078, I^2: 50.8%) with a duration of *≤6 months* (SMD: −0.203; 95%CI: −0.381, −0.026, I^2:59.9%). Interventions were most effective when delivered four times a month (SMD: −0.247; 95%CI: −0.441, −0.053, I^2:76.3%).
Conclusions: Lifestyle interventions were effective in improving depression among people with T2DM.

Introduction

Depression is a global health concern which affects approximately 350 million people and by 2030 will be the leading cause of disease burden worldwide [1]. According to the World Mental Health Survey, one in 20 people reported having an episode of depression in their lifetime [2,3]. Depression is a major contributor to Disability

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Adjusted Life Years (DALYs) in developed countries [4,5]. Depressive individuals experience reduced quality of life and productivity, highlighting the importance of depression management [6,7]. Although depression is the most prevalent mental disorder in primary health care [5], it has not been appropriately recognized and treated [3,8,9], which leads to high costs for the public health care system and individuals [10]. Unhealthy lifestyles, including inadequate diet and/or physical inactivity, are common among individuals with depression and favor the development of chronic diseases, such as type 2 diabetes mellitus (T2DM) [11–13]. A meta-analysis reported a 1.8-fold higher mortality rate among people with depression [14].

Globally, 347 million people suffer from diabetes, of whom 90% have T2DM [15]. By 2025, the T2DM prevalence in adults is expected to increase by 122%, and in developing countries, it is projected to increase by 170% [15]. Its influence on health care systems includes lost days of work, premature mortality [16], physical disability [17], and excessive hospital admissions mainly due to cardiovascular complications [18]. To decrease the adverse impact on health care systems, there has been substantial investment in T2DM prevention [11–13,19]. However, implementing interventions to improve lifestyle [12,13], and to promote long-term maintenance of healthy behaviors, remains a challenge for health professionals.

There is a bidirectional association between depression and T2DM [20]. Depressed individuals may have up to a 60% higher risk of developing T2DM [21,22]. Concurrently, 25% of individuals with T2DM have depression during their lifetime [23]. Both conditions negatively influence quality of life [24], treatment adherence [25], and survival rates [26]. This association may also affect self-care and health care costs [27]. Previous studies suggest that management of depression may help to improve outcomes of diabetes treatment [28,29]. Moreover, integrating screening and management of depression with diabetes treatment has been recommended in international diabetes guidelines [30]. This approach allows patients with these chronic diseases to receive person-centered care and information on both conditions [31].

There is a consensus on the deleterious impact of depression associated with T2DM. A meta-analysis evaluating the impact of exercise on depression showed an increase in physical activity improved response to treatment for depression [32]. A recent systematic review assessing the effect of exercise on psychological aspects, particularly in people with diabetes, found only one in four studies that showed improved depression symptoms after the intervention when compared with the control group [33]. However, the importance of lifestyle interventions, considering also dietary changes, used to improve depression in adults at-risk of or with T2DM is unclear. This review comprehensively examines the effect of lifestyle interventions on depression management in individuals at-risk of or with T2DM by investigating: 1) the effect of lifestyle interventions on depression outcomes; 2) the effect of lifestyle interventions on dietary habits; 3) the degree of heterogeneity among the studies; 4) the potential sources of heterogeneity using subgroup analyses by methods, duration, and frequency of interventions.

Method

This systematic review followed the methods proposed by the Cochrane Collaboration [34] and was in accordance with the PRISMA Statement for Reporting Meta-analyses of Studies that Evaluate Health Care Interventions [35]. Risk of bias was assessed by the Cochrane Risk of Bias Tool (Appendix 1) [34]. We included intervention studies that: (i) examined adults (≥18 years old) at-risk of, or with T2DM; (ii) used biochemical tests to diagnose glucose tolerance disturbance; (iii) utilized standardized and validated assessment tools for depression with pre-established cut-off scores; and (iv) were published in English. Literature was excluded if it: (i) did not report depression based on standard and validated instruments with pre-established cut-offs from the literature to identify depression; (ii) focused only on treating depression; or (iii) contained duplicated data from another study. The duplicates were determined by thoroughly examining the study information about the study location and year, and the number, age, and sex of the participants. In general, studies focused on lifestyle (diet and/or physical activity) interventions directed at adults (≥18 years) at-risk of or with T2DM. All study participants received a minimum of four weeks intervention, a depression assessment at baseline, and a post-intervention. Participants “at-risk” were defined by the presence of impaired glucose tolerance or impaired fasting glucose [11]. T2DM was diagnosed by biochemical tests (75-g oral glucose tolerance test, fasting plasma glucose or glycated hemoglobin) according to the American Diabetes Association criteria [36].

Search strategy

We searched bibliographic databases PubMed/Medline, EMBASE, CINAHL, COCHRANE, PsycINFO, and Scopus, and identified studies on dietary/lifestyle interventions for individuals at-risk of or with T2DM published in the English language from January 1990 to March 2015. We used the following medical subject heading (MeSH) terms and/or pertinent text words for the search: “depression”, “major depression”, “depressive symptoms”, “depressive disorder”, “diabetes,” “lifestyle intervention,” “diet,” and “dietary intervention.” Two reviewers (AC, FK) independently assessed study titles and abstracts. In addition, the reference lists of all relevant reviews and selected papers were screened for additional studies. When deemed necessary, the first authors of selected publications were contacted for additional information [37–39]. We conducted a secondary search for relevant non-English publications to avoid excluding them. We identified 12 potentially relevant non-English studies; based on our review of the abstracts they were deemed irrelevant.