



Research paper

Subthreshold depression among diabetes patients in Beijing: Cross-sectional associations among sociodemographic, clinical, and behavior factors



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ABSTRACT

Background: This study explores the prevalence of subthreshold depression (SubD) and its association with factors in type 2 diabetes mellitus (T2DM) patients.

Methods: This cross-sectional study involved 808 outpatients with T2DM from ten hospitals in Beijing between September 2015 and January 2016. All participants completed the Patient Health Questionnaire 9-item (PHQ-9) to evaluate depressive status, with scores between 5 and 14 considered SubD. Conditional logistic regression was conducted to investigate the variables associated with SubD in T2DM patients.

Results: T2DM patients with SubD comprised 11.6% ($n = 94$) of the sample. The odd ratios for the variables having significant positive associations with SubD were: being a women (OR = 1.90; 95%CI: 1.09–3.32), divorced/widowed (OR = 3.27; 95%CI: 1.46–7.30), comorbidity of cerebrovascular disease (OR = 2.00; 95%CI: 1.06–3.76), more diabetic complications (OR = 8.04; 95%CI: 2.77–23.31), and higher HbA1c in men (OR = 2.41; 95%CI: 1.25–4.64). Being older (OR = 0.78; 95%CI: 0.62–0.98), exercising more (OR = 0.44; 95%CI: 0.22–0.91) and poverty (OR = 0.36; 95%CI: 0.19–0.69) were negatively related to SubD.

Limitations: The sample was mainly recruited from hospital settings, which limits generalization. The study's cross-sectional design precludes making causal inferences.

Conclusions: The proportion of SubD was estimated to be 11.6% among T2DM patients in Beijing. Having more diabetic complications and being divorced/widowed made the odds of having SubD 8-fold and 3-fold higher than not having it, respectively. The relationship between SubD and diabetes necessitates early screening for milder forms of depression, which can alleviate the social burden and individual impairment from major depression or other chronic diseases.

1. Introduction

Concerns about comorbid depression in diabetic patients has been increasing globally, and studies have reported that the risk of depression is twice as high among patients with type 2 diabetes mellitus (T2DM) (Ducat et al., 2014; Perrin et al., 2017; Hunter et al., 2018).

China has a large population of adults diagnosed with T2DM (approximately 10%) (Yang et al., 2010), but these patients rarely seek psychiatric services unless their depressive symptoms are relatively serious because they have adapted to having long-term depressed mood (Chen et al., 2011).

Although a multisector system approach is needed, as outlined in

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the guideline of the American Diabetes Association (ADA, 2014), the detection of depression is relatively poor in diabetic departments of general hospitals in China, with only 6.94% of non-psychiatric clinicians being able to identify the clinical features of anxiety or depression disorders and only 4.51% being able to diagnose and treat these disorders (Hao et al., 2015). Indeed, a systematic review reported that inadequate assessment of psychological and physical symptoms and inadequate referrals were barriers to providing optimal care to outpatients with depression or other chronic diseases (Fradgley et al., 2015). This situation contributes to the urgency for early screening and identification of depression in T2DM patients in China. A large number of cross-sectional and longitudinal studies, meta-analyses, and reviews have reported an association between depression and T2DM in developed countries (Munhoz et al., 2016; Li et al., 2009; de Groot et al., 2007; Anderson et al., 2001). Previous research has mainly focused on patients with major depression who were taking antidepressants (Katon et al., 2004; de Groot et al., 2016), resulting in higher medical expenditures and poorer health outcomes.

Subthreshold depression (SubD) (Judd et al., 1994), which is a mild form of depression with clinically relevant depressive symptoms that do not meet the diagnostic criteria for major depressive disorder (MDD), has been reported to be more prevalent than MDD in adults with diabetes (Albertorio-Diaz et al., 2017). Although the symptoms of SubD are less severe than MDD, SubD may lead to greater societal burden and functional impairment in the general population (Topuzoğlu et al., 2015). Moreover, SubD is an important risk factor for MDD (Bot et al., 2010). The risk factors associated with MDD among patients with diabetes have been thoroughly investigated and documented, bringing greater public attention to the prevention and treatment of MDD than SubD.

Most research on SubD among diabetic patients has been conducted in Europe and the USA. Studies on SubD in China have mainly focused on anatomical brain differences between SubD patients and healthy controls (Li et al., 2017a; Hwang et al., 2016; Zhou et al., 2016) or specific age groups, such as young adults without chronic diseases (Li et al., 2017b). There is a paucity of research on the relationship between SubD and diabetes. Furthermore, the limited research available does not provide adequate estimates of the risk factors for SubD in Chinese patients with T2DM (Sun et al., 2015), such as HbA1c levels, diabetic complications, personal income, or behavioral management. However, studies have found that depression can affect the health of patients with diabetes (e.g., its clinical course, severity of symptoms, comorbidities, cognitive functioning, and response to treatment). Therefore, we believe it is important to investigate the relationship between milder forms of depression and diabetes. The results of such research may indicate early interventions to prevent disease progression and, thereby, improve both physical and psychological status. Thus, our study is designed to explore the prevalence of SubD and its associated factors among patients with T2DM in Beijing.

2. Subjects and methods

2.1. Subjects and setting

This was a multicenter study conducted in cooperation with ten government-operated hospitals to establish the Psychological Investigation and Management of Diabetic Patients. Eight were urban first-class general hospitals and two were community hospitals. A total of 808 T2DM patients who met the inclusion and exclusion criteria participated in the study between September 2015 and January 2016 (see Fig. 1). The inclusion criteria were patients: (a) more than 18 years old; (b) with newly or previously T2DM, according to the 1990 WHO diagnostic criteria for T2DM (Yang et al., 2016); and (c) with informed consent forms signed by them or their appointed agents. The exclusion criteria were patients: (a) with type 1 diabetes, gestational diabetes, or other specific types of diabetes; (b) with thyroid disease, severe

hematological disease, or various organ lesions with pathologies other than diabetes; (c) who used systemic steroid drugs; (d) who had no history of psychiatric disorders; or (e) failed to respond to, or provided insufficient answers, to critical questions. The study protocol was approved by the Beijing Municipal Science & Technology Commission (Project: Application of Clinical Characteristics in Capital) and followed the guidelines of the Declaration of Helsinki.

2.2. Data collection

Information on sociodemographic characteristics, medical costs, family history of diabetes and mental disorders, complications and comorbidities, self-care behavior management, and use of medications was collected during face-to-face interviews with patients. Educational level was classified as illiterate, primary school diploma, junior high school diploma, high school diploma, and university or above. The information on diabetic complications included diabetic peripheral neuropathy (DPN), diabetic retinopathy (DR), diabetic nephropathy (DN), diabetic foot (DF), and diabetic vascular lesions of the lower extremities. The comorbidities included hypertension, coronary heart disease (CHD), cerebrovascular disease (CVD), and dyslipidemia. The age at which the patient was first diagnosed with diabetes was used to calculate the duration that the patient suffered from diabetes. The information on behavioral management included hours of exercise per day (≤ 1 h, 2 h, 3 h, 4 h, ≥ 5 h), control of diet (good, medium, and poor), current smoking status (smoker or not), and regular self-monitoring of blood glucose (SMBG) (yes or no). Clinical biochemical indices, such as HbA1c, were measured based on fasting blood samples. The measurement of height in meters and weight in kilograms was performed by trained nurses. Other variables are described in the following sections; all the baseline variables describing the sample's characteristics are listed in Table 1.

2.3. Depression and social functional assessments

2.3.1. Patient health questionnaire-9 (PHQ-9)

The PHQ-9 is a questionnaire used for screening, diagnosing, monitoring, and measuring the severity of depression, which has high sensitivity and specificity in Chinese (Wang et al., 2014). The 9 items (e.g., "Over the last 2 weeks, how often have you been bothered by little interest or pleasure in doing things?") are answered and scored as 0 = not at all, 1 = several days, 2 = more than half the days and 3 = nearly every day. The summed score represents five different degrees of depression: 0–4 = no depression, 5–9 = mild depression, 10–14 = moderate depression, 15–19 = moderately severe depression, and 20–27 = severe depression. The definition of SubD has been based on different scales and various cut-off scores (Rao et al., 2015). Patients in the current study who scored between 5 and 14 and scored ≥ 1 on either of the first two PHQ-9 items ("little interest or pleasure in doing things"; or "feeling down, depressed, or hopeless") were classified as having SubD (Kroenke et al., 2001; Schmitz et al., 2014). The study participants were assigned to two groups: a no depression (ND) group (PHQ-9 < 5) and a SubD group (PHQ-9 5–14).

2.3.2. European quality of life five dimension-visual analogue scale (EQ5D-VAS)

The EQ5D-VAS (Badia et al., 1999) was used to evaluate enjoyment and satisfaction with daily life and health status. The questionnaire included five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension had three levels: no difficulty, little difficulty, and great difficulty. The questions were answered on a visual analogue scale, with numbers ranging from 0 (worst) to 100 (best), in which the numbers represented utility value (Singh et al., 2017). The patients were requested to answer the questions about the five dimensions and mark the site on the visual analogue scale according to their own feelings about their quality of life. The

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