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## Factors associated with psychological distress, behavioral impact and health-related quality of life among patients with type 2 diabetes mellitus

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## ABSTRACT

**Background:** Data on psychological distress (DIS), behavioral impact (BI) and health-related quality of life (HRQoL) are important yet lacking among Asian patients with Type 2 diabetes mellitus (T2DM). We aim to identify factors associated with DIS, BI and HRQoL among T2DM to better understand patient needs.

**Methods:** DIS was measured with Diabetes Health Profile (DHP-18) Psychological Distress (DHP-PD) subscale, Problem Areas in Diabetes (PAID) and Kessler-10 (K10), BI with DHP-18 Barriers to Activity and Disinhibited Eating subscales and HRQoL with Audit of Diabetes-Dependent Quality of Life. Multiple linear regression analyses were performed to evaluate the associations between these outcomes and patient demographic, socioeconomic status, glycated hemoglobin (HbA1C) and comorbidities.

**Results:** 213 T2DM patients (mean (SD) age: 45.0 (12.1) years, mean (SD) HbA1C: 8.3% (1.9%) and 70.0% reported at least one comorbidity) were evaluated. Poorer glycemic control was significantly associated with higher DHP-PD, PAID and worse HRQoL. Taking oral hypoglycemic agents plus insulin was independently associated with Barrier to Activity and Disinhibited Eating.

**Conclusion:** Poorer glycemic control was only associated with diabetes-related distress (measured by DHP-PD and PAID) but not major depressive disorder (measured by K10). It may be more appropriate to screen for diabetes-related distress rather than major depressive disorder for patients with T2DM.

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### 1. Introduction

Diabetes Mellitus (DM) is a major cause of morbidity and mortality and imposes a significant economic burden on the national health care system worldwide (Zhang et al., 2010). The prevalence of DM in adults aged above 21 was estimated at 285 million worldwide in 2010 and is projected to increase to 439 million adults by 2030 (Shaw, Sicree, & Zimmet, 2010). Expenditure on the management of DM is expected to account for 12% of the world's total health expenditure. In Singapore, the prevalence of DM in 2010 was 11.3% (Wielink, Essink-Bot, van

Kerrebroeck, & Rutten, 1997), higher than most other countries of similar Gross Domestic Product (Sicree, 2009), and was the underlying cause of 1.0% of all deaths (Wielink et al., 1997). DM was also the 10th leading cause of hospitalisation in Singapore in 2012 (Bradley et al., 1999).

Besides economic burden, DM also exerts significant psychological and behavioral impact on the individuals as effective management of DM requires the individuals to take their medications according to schedule, monitor their blood glucose regularly, have a balanced diet and exercise regularly. In addition, many individuals are concerned about developing short or long term complications associated with poor glycemic control. As such, psychological distress is common among patients with DM. The prevalence of psychological distress among patients with type 2 diabetes mellitus (T2DM) in Singapore was reported at 31.1% (Tan et al., 2015; Verma, 2010). In Australia, the prevalence of psychological distress among individuals with T2DM increased from 5.9% in 2001 to 7.0% in 2008 (Atlantis, Sullivan, Sartorius, & Almeida, 2012).

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In addition to its negative impact on glycemic control (Fisher, Glasgow, & Strycker, 2010; Fisher et al., 2010), psychological distress may also impair health-related quality of life (HRQoL) (Pouwer, 2009). It is increasingly recognized that the assessment of HRQoL is important for evaluating treatment outcomes and patient needs as HRQoL is found to predict health services utilization and mortality (Dominick, Ahern, Gold, & Heller, 2002; Singh, Nelson, Fink, & Nichol, 2005; Sprenkle, Niewoehner, Nelson, & Nichol, 2004). In line with international interest in HRQoL, there have been several local publications that evaluated factors associated with poor HRQoL among Singaporeans with DM and these include presence of DM complications (Venkataraman et al., 2013), poor glycemic control (Shim, Lee, Toh, Tang, & Ko, 2012), being female, treatment with insulin and loss of freedom to eat (Wee, 2006). However, relatively little is known about factors that are associated with psychological distress and behavioral impact among patients with DM in Singapore. Hence, the main aim of this study is to identify factors associated with psychological distress and behavioral impact while the secondary aim is to contrast the factors identified against those factors that are associated with HRQoL in the same group of patients.

## 2. Subjects, materials and methods

### 2.1. Subjects and study design

A longitudinal self-administered survey with three follow-ups was conducted at a single tertiary hospital in Singapore. Patients were recruited through direct contact in the waiting areas of the DM clinic in National University Hospital. This study utilizes the data on T2DM patients from the baseline interviews performed. All adult patients aged 21–64, who were diagnosed with T2DM for at least 1 year, literate in English and able to consent and comply with study protocol were included. Patients with significant cardiovascular disease such as unstable angina or recent coronary artery bypass, liver failure defined as transaminase > 3 times upper limit of normal and renal failure with creatinine > 130  $\mu\text{mol/L}$  were excluded. Individuals who had plans to emigrate, or were on treatment for psychological or psychiatric disorders were also excluded. Trained research staff explained the study, obtained written informed consent from patients and administered the study questionnaires to the patients in one-to-one interviews.

Data on demographic factors were collected using self-administered questionnaires. Ethnic group was classified as Chinese, Malay, Asian Indian or Others. Marital status was classified as “single”, “married”, “divorced/separated” or widowed”. Education level was determined based on the number of schooling years and was categorized into <7, 7–10 and > 10 years, reflecting primary, secondary and tertiary educational levels in Singapore.

Comorbidities were based on self-reports and included retinopathy, cardiovascular disease, nephropathy, neuropathy, cerebrovascular disease, anemia, peripheral vascular disease, hepatic disease and renal disease. A sample survey question included “Has a doctor, a nurse, or healthcare professional told you that you have anemia (low red blood cell count)?”.

### 2.2. Study Questionnaires

#### (1) Kessler Psychological Distress Scale (K10)

The K10 is a simple, generic measure of psychological distress employed in the World Mental Health Survey 2000 as well as annual government surveys in Australia and Canada. K10 uses a five-point Likert-type scale for each question that indicates the degree to which symptoms of distress are present among individuals. The 10 responses are added up and the maximum score of 50 indicates severe distress while the minimum score of 10 indicates no distress (Andrews, 2001). K10 has been shown to have good precision in the 90th to 99th percentile

range of the population distribution (standard errors of standardized scores in the range  $0.20 \pm 0.25$ ) as well as consistent psychometric properties (Kessler, 2002).

#### (2) Problem Areas in Diabetes (PAID)

The PAID is a measure of diabetes-specific emotional distress that was developed by the Joslin Diabetes Center, Boston (Polonsky, 1995). This self-administered questionnaire consists of 20 items that cover a range of emotional problems frequently reported in both Type 1 DM (T1DM) and T2DM. Each item is scored 0 to 4 (“Not a problem” to “Serious Problem”). The sum of the 20 items is multiplied by 1.25 to yield a final score of 0–100. The PAID was positively correlated with HbA1c (Polonsky, 1995; Reddy, 2013; Tsujii, Hayashino, Ishii, & Diabetes, 2012) and has the ability to discriminate between those who were insulin treated from those who received oral medications (Welch, 1997).

#### (3) Diabetes Health Profile (DHP-18)

The DHP-18 (Meadows, 2010) is an adaptation of the original Diabetes Health Profile (DHP-1) (Meadows, 1996) for assessing the psychological and behavioral impact of living with diabetes in T2DM patients and contains 18 items (out of the original 32 items) comprising three subscales: psychological distress, barriers to activity and disinhibited eating. Barriers to activity and disinhibited eating are measures of the behavioral impact of DM on individuals. Items use a four-point Likert-type scale ranging from 0 to 3. The subscale scores are subsequently transformed to a common score range of 0 to 100, with a score of 0 representing no dysfunction and 100 representing maximum dysfunction.

#### (4) The Audit of Diabetes-Dependent Quality of Life (ADDQoL)

ADDQoL is a diabetes-specific quality of life instrument, designed to measure individuals’ perceptions of the impact of diabetes (both type 1 and type 2) on their quality of life (QoL) (Bradley, 1999). It contains two overview items and 19 domain specific items. The first overview item assesses QoL in general while the second item assesses diabetes-dependent QoL. For each of the domain-specific items, respondents are asked to provide both impact (range: –3 [greatest negative impact] to +1 [positive impact]) and importance (range: 0 [not at all important] to +3 [very important]) ratings. The impact rating is multiplied by the importance rating to provide a weighted impact (WI) score, ranging from –9 (maximum negative impact of DM) to +3 (maximum positive impact of DM), for each domain. Five of the specific domains (working life, holidays, family life, close personal relationship and sex life) include a preliminary ‘Yes/No’ question to determine if the domains are applicable to the respondents and should be dropped from consideration if the domain is not applicable to them. The average weighted impact (AWI) score which reflects the impact of DM on QoL can be generated by averaging WI scores of all applicable domains (Bradley, 1999). The validity and reliability of ADDQoL were previously demonstrated in Singapore (Wee, 2006).

### 2.3. Biological measurements

Glycated Hemoglobin A1C (HbA1C) was measured in the hospital’s laboratory using high-performance liquid chromatography (HPLC) method. Patients’ height and weight were obtained from the patient’s paper and electronic medical records. Body Mass Index (BMI) was calculated using the formula  $(\text{BMI} = \text{Weight (kg)} / (\text{Height (m)})^2)$ .

## 3. Statistical analyses

Individual items were imputed, summed and transformed as recommended in the DHP-18, PAID, K10 and ADDQoL user manuals (Anon, 2005; Bradley et al., 1999; Meadows, 2010; Polonsky, 1995).

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