

Diabetes-Related Distress and Physical and Psychological Health in Chinese Type 2 Diabetic Patients

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OBJECTIVE—To validate a Chinese version of the Diabetes Distress Scale (CDDS).

RESEARCH DESIGN AND METHODS—The CDDS was derived using forward-backward translation and administered in 189 Chinese type 2 diabetic patients with evaluation of its psychometric properties.

RESULTS—On the basis of principal-component analysis, three factors of the 15-item version of the CDDS (CDDS-15) accounted for 63% of the variance. The correlation coefficient between the original 17-item and 15-item scales was 0.99. The Cronbach α for internal consistency was 0.90, and the test-retest reliability coefficient was 0.74. The CDDS-15 score was significantly associated with glycemic control, obesity, depressive symptoms, and quality of life.

CONCLUSIONS—The CDDS-15 is a valid and reliable instrument to assess diabetes-related distress.

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The Diabetes Distress Scale (DDS) is a 17-item self-administered questionnaire identifying four domains of diabetes-related distress: emotional burden, physician-related distress, regimen-related distress, and interpersonal distress (1). Given the rising burden of diabetes and mood disorders in China (2), we developed and validated a Chinese version of the DDS (CDDS).

RESEARCH DESIGN AND

METHODS—The 17-item CDDS (CDDS-17) was developed by translating the original DDS to Chinese, with back translation to English (Supplemental Data). Between August and December

2009, 193 Chinese type 2 diabetic patients, aged 18–65 years, who underwent comprehensive diabetes assessment sessions at the Prince of Wales Hospital were recruited consecutively. The service included a physical examination, laboratory investigations, and a psychological health assessment using the quality-of-life (EQ-5D) questionnaire (3), the nine-item Patient Health Questionnaire (PHQ-9) (4), and the Center for Epidemiological Studies Depression Scale (CESD) (5). The Summary of Diabetes Self-Care Activities (SDSCA) was used to assess self-care in the previous 1 week (6). Subjects were excluded if they did not understand written Chinese. The first 74 subjects

repeated the questionnaire 4–6 weeks later for test-retest reliability. The study was approved by the clinical research ethics committee.

Statistical analyses were performed using the Statistical Package for Social Science 17.0 (SPSS, Chicago, IL). Exploratory factor analysis was applied to the CDDS-17 to determine its internal structural validity. Factor loadings >0.50 within one dimension supported the factor construct. We computed Cronbach α to determine the internal consistency and bivariate correlations for test-retest reliability. We used Pearson correlation coefficients to examine the associations between CDDS scores and other variables. A P value <0.05 (two-tailed) was considered significant.

RESULTS—A total of 189 patients (55.6% men; [means \pm SD] aged 51 ± 8.9 years and 49.2% insulin-treated) had complete clinical and biochemical data for analysis, with a mean disease duration of 9.4 ± 7.1 years and an HbA_{1c} of $7.5 \pm 1.3\%$.

The exploratory factor analysis of the CDDS-17 yielded four factors. After eliminating questions 12 (“not sticking closely enough to a good meal plan”) and 15 (“not having a doctor who I can see regularly about my diabetes”), which were double-loading items, the remaining 15 items loaded on three factors. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.876, and the Bartlett test of sphericity yielded a significant value <0.001 . Three factors were rotated using a Varimax rotation procedure. The rotated solution yielded three interpretable factors: the emotional burden subscale, the regimen- and social support-related distress subscale, and the physician-related distress subscale. The three-factor model accounted for 62.4% of the scale variance, with item loadings ranging from 0.57 to 0.88. Six items (questions 1, 3, 8, 10, 11, and 14) were loaded on factor 1 (emotional burden subscale), six items (questions 5, 6, 7, 13, 16, and 17) on factor 2 (regimen- and social support-related distress subscale), and three

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Table 1—Correlations between the CDDS-15 scores and items of interest

	Total score	Emotional burden	Regimen- and social support-related distress	Physician-related distress
CDDS-15 score (means \pm SD)	40.6 \pm 13.2	17.5 \pm 6.4	17.2 \pm 6.1	5.9 \pm 3.2
Age	−0.077	−0.057	−0.089	−0.031
Sex	−0.086	−0.119	−0.095	0.064
BMI	0.147*	0.146*	0.124	0.077
Waist circumference	0.174*	0.207*	0.124	0.072
Fasting plasma glucose	0.278†	0.248†	0.261†	0.141
HbA _{1c}	0.185*	0.218†	0.177*	−0.008
CESD Depression Score	0.511†	0.574†	0.362†	0.272†
PHQ-9 Depression Score	0.426†	0.495†	0.288†	0.220†
Quality of life (EQ-5D)	−0.285†	−0.301†	−0.229†	−0.141
Meal planning‡	0.019	0.051	−0.077	0.120
Exercise‡	−0.013	−0.041	−0.180	−0.060
Self-monitoring of blood glucose‡	−0.046	−0.020	−0.076	−0.004
Foot care‡	0.060	0.090	0.000	0.067
Diabetic retinopathy (yes)	−0.56	−0.018	−0.055	−0.090
Coronary heart disease (yes)	−0.88	0.052	−0.099	−0.068
Stroke (yes)	0.051	0.056	0.014	0.073
Use of insulin (yes)	−0.063	−0.140	0.017	−0.011

* $P < 0.05$. † $P < 0.01$. ‡Derived from the SDSCA score: number of days following the recommendations in the past 1 week.

items (questions 2, 4, and 9) on factor 3 (physician-related distress subscale). There were high correlations between the CDDS-17 and CDDS-15 versions ($r = 0.994$, $P < 0.001$).

For internal consistency, the Cronbach α of the CDDS-15 was 0.902. The respective value for the emotional burden subscale was 0.874, the regimen- and social support-related distress subscale was 0.816, and the physician-related distress subscale was 0.851. The test-retest coefficient for CDDS-15 was 0.739, with similar scores between the first and second assessment (40.4 \pm 13.2 versus 40.4 \pm 12.8, $P = 0.971$).

The CDDS-15 score and its subscales were significantly correlated with glycemic (fasting plasma glucose and HbA_{1c}) and obesity (BMI and waist circumference) indices, depression symptoms (CESD and PHQ-9 scores), and quality of life (EQ-5D). There was no association between CDDS-15 and other parameters, including self-care behaviors and treatment modality (Table 1). For every 1-SD decline (13.2 marks) in CDDS-15 score, the multivariate-adjusted odds ratio for attaining an HbA_{1c} goal of $<7\%$ was 0.625 (95% CI 0.439–0.891; $P = 0.009$).

CONCLUSIONS—This is the first study to evaluate the psychometric properties of the DDS in Chinese type 2 diabetic patients. The CDDS-15 showed consistent factor structure, high internal

consistency, good validity, and high test-retest reliability. The factor structure of the CDDS-15 was similar to that of the original DDS-17, despite excluding two double-loaded items (questions 12 and 15) after exploratory factor analysis. Hong Kong has a heavily subsidized health care system, where public hospital clinics provide care to $>90\%$ of patients with chronic diseases such as diabetes (7). Because patients cannot choose their own doctor, question 15 is always a problem in our population. The redundancy of question 12 might be attributed to its similarity with other questions in the regimen- and social support-related distress subscale when translated to Chinese. The new regimen- and social support-related distress subscale combined regimen-related distress and interpersonal distress; furthermore, the CDDS-15 included item 10 in the emotional burden subscale instead of the regimen-related subscale, as in the original English version. This discrepancy might be attributed to cultural differences in perceiving or coping with distress, which might be closely related to social support in our population. Despite these subtle differences, the CDDS-15 had a structure largely similar to the DSS-17 and was able to distinguish and quantify three related domains of diabetes-related distress.

Congruent with the original DDS validation study, the CDDS-15 score was positively associated with depressive symptoms (CESD score). In addition, it

was associated with glycemic and obesity indices. Obese subjects often have sub-optimal quality of life (8,9), probably because of the long-term struggle to lose or maintain body weight. There are close linkages between mental stress and activation of the stress hormonal systems, notably the hypothalamic-pituitary-adrenal axis, which can set up a vicious cycle of stress and obesity (10). Contrary to findings from other cohorts (1,11,12), the CDDS-15 score was not associated with diabetes complications, self-care, and treatment modality, which might be confounded by small sample size or selection bias. Although many of our patients received diabetes education, this might not necessarily be matched by a subjective assessment of adequacy of self-management and related stress. Thus, apart from ethnicity and clinical profiles, heterogeneity in health care settings and cultures may contribute to subtle differences in the factor structures of the DDS, which will need to be validated in different populations before clinical use.

In summary, we have developed and confirmed the validity, consistency, and reliability of the CDDS-15 in Hong Kong Chinese type 2 diabetic patients.

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edited the manuscript. M.W.M.Y. researched data and wrote the manuscript. A.P.S.K. reviewed and edited the manuscript. R.C.W.M. reviewed and edited the manuscript. R.Y.M.W., K.L., W.-Y.S., C.-C.C., and G.T.C.K. contributed to the discussion and reviewed and edited the manuscript. Y.-K.W. and J.C.N.C. conceptualized the study, contributed to the discussion, and reviewed and edited the manuscript. J.C.N.C. finalized the manuscript.

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