Psychometric properties of the Iranian version of the Problem Areas in Diabetes scale (IR-PAID-20)

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Abstract

Background: This study was conducted to determine the psychometric properties of the Iranian version of the Problem Area in Diabetes scale (IR-PAID-20).

Methods: After translation, back-translation and obtaining the confirmation of the experts in the field of diabetes, the Iranian version of PAID was developed. Thereafter, 100 patients with type 2 diabetes who were selected via systematic random sampling method completed the IR-PAID-20. The validity of the scale was evaluated through construct, concurrent and criterion validity and the reliability evaluated by test-retest internal consistency and splitting method.

Results: Internal consistency and test-retest reliability of the IR-PAID-20 was high (Cronbach's alpha 0.94 and 0.88, respectively). Factor analysis resulted in three subdimensions: "Psychological distress in relation to diabetes management", "Depression- related problems" and "Treatment barriers". The results indicated that the correlation between HbA_1C levels and PAID total score and its subscales was not significant; whereas, there was a significant association between the duration of diabetes and the PAID total score, "Psychological distress in relation to diabetes management", and "Depression-related problems" subscales. Findings also supported the concurrent validity of the instrument.

Conclusion: The IR-PAID-20 is a reliable and valid scale to evaluate diabetes-related emotional distress among Iranian population suffering from type2 diabetes; so, it can be applied as an appropriate measure in research and clinical fields.

Keywords: Diabetes, PAID Scale, Psychometric properties

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Introduction

Diabetes is a chronic and intolerable disease with a great impact on the quality life of the patients and their families (1, 2). People with type 2 diabetes have to adhere to many self-care responsibilities, including adjusting lifestyle by exercising, dieting and controlling weight, self-monitoring of blood glucose levels, performing foot care and administrating oral medication and insulin injections, in order to achieve desirable glycemic control (3). Specific aspects of diabetes is believed to be responsible for psychological problems frequently reported in diabetic patients and there is evidence that psychological distress adversely affects self-management behaviours (4–7) and related to the developing late complications (8, 9). Moreover, many studies showed that poor glycemic control is associated with psychological problems such as depression and anxiety (7, 10, 11) and eating disorders (12, 13). All the above mentioned facts, therefore, point out the importance of addressing such issues. An appropriate screening instrument to specifically identify diabetes-related distress can be useful for this purpose. Several scales, commonly used to evaluate the quality of life in diabetic patients, can provide useful information about the most common problems of coping with diabetes. Various scales have been developed to quantify the levels of emotional distress in such patients (14).

The Problem Areas in Diabetes (PAID) scale is a brief self-administered tool for eliciting diabetes-related emotional distress. The questionnaire is useful in identifying diabetes-related distress and assessing the patients' psychological adjustment to the disease (15). PAID has been widely used in different countries and translated into several languages since it was developed by the Joslin Diabetes Center in Boston (16-25). Some studies have demonstrated the efficacy of PAID in screening the clinical and subclinical features of depression in diabetic patients (20). Welch et al. have expressed their strong support for the applicability of the PAID. This comes as the information on the responsiveness could help clinical researchers select the accurate tool and recruit the suitable sample size to ensure adequate statistical power of their study. It can also help them to prioritize the outcomes that they are willing to assess (26).

The purpose of this study was to determine the psychometric properties of the Iranian Version of the Problem Area in Diabetes (PAID) scale (IR-PAID-20).

Methods

Procedure

The procedure consisted of two stages: 1- Preparing the Persian version of PAID; after translating and back-translating the English version of PAID by 3 bilingual translators, the questionnaire was evaluated by two groups of professionals in this field, clinicians and patients. Thereafter, the questionnaire was revised based on the final opinion of the panel. 2- Psychometric evaluations; all the participants signed an informed consent. They were then asked to complete the Persian version of PAID in two stages (prior to the initiation of the study and two months later). At the time of filling the questionnaire, the patients were seated in a comfortable and quiet room. A physician was asked to read the questions and their answers for illiterate patients.

Subjects

The present cross-sectional study was conducted in the diabetes clinic of Endocrine and Metabolism Research Institute, affiliated to Tehran University of Medical Sciences (TUMS). One hundred patients, from among 4500 who had a medical record in the clinic, were selected via random sampling method. The type2 diabetic patients aged over 18 who had not any complications such as unstable coronary artery disease, severe heart failure, stroke with sequel, end-stage renal disease, severe peripheral vascular disease or any severe psychiatric disorder affecting the cognitive ability such as dementia and schizophrenia were enrolled in the study.

Measurements

The PAID scale is a self-administrated questionnaire that consists of 20 statements identified as common emotional problems related to living with diabetes. The questionnaire assesses four domains of diabetes-related quality of life: emotional

distress, treatment barriers, problems related to food, and lack of social support (15, 16). Each item can be rated on a 5-point Likert scale ranging from 0 to 4. The 0–100 total score is achieved by summing the 0–4 responses given to each of the 20 PAID items and then multiplying the result by 1.25. Higher scores indicated greater emotional distress (26). The validity and reliability of the original version of PAID has previously been confirmed (16), and the scale has been shown to have good psychometric properties (21-25). Apart from PAID, we used the Diabetes Empowerment Scale (DES). The twenty eight items of this instrument are categorized in three subscales including: managing the psychosocial aspects of diabetes, assessing dissatisfaction and readiness to change, and setting and achieving diabetes goals (27). The answers to each item ranged from strongly agree (5 points) to strongly disagree (1 point) with higher scores indicating better adjustment to the illness. A self-report questionnaire was used to collect the demographic characteristics (gender, age, diabetes treatment, education, duration of the diabetes) of the participants. Current HbA1c values were also extracted from the patients' medical records which were performed in the same laboratory.

Statistical analysis

The reliability was evaluated through internal consistency (total Cronbach's alpha (α) and alpha for each subscales), test-retest and splitting methods (Spearman-brown coefficient correlation). The validity was evaluated through principal factor analysis (scores test, varimax rotation, keiser-meyer-olkin measure of sampling and Bartlett's test of sphericity), criterion validity (correlation between the PAID total score, the extracted factors and the duration of diabetes calculated by Spearman correlation due to lack of normality and correlation between PAID total score and extracted factors with HbA1c calculated by Pearson correlation) and concurrent validity (correlation between the scores obtained from PAID and the scores obtained from DES). All the analyses were performed using Statistical Package for the Social Sciences (SPSS-16).

Results

Demographic and clinical data

Totally 100 patients (male= 54, female = 46) with type 2 diabetes were recruited. The mean age of the participants was 52.6 (SD=7.1) years. The average duration of being diagnosed with diabetes was 8.64 (SD=5.8) years and their mean HbA_1c value was 6.86% (SD=0.37). Twenty one of the participants were illiterate. Fifty nine subjects used oral agents, 11 were on insulin and 30 received both oral agents and insulin (Table 1).

Table1. Demographic and clinical data (n= 100)

Characteristics	%
Sex	
Men	54
Women	46
Age (years)*	52.65 (7.1)
Duration of diabetes (years)*	8.64 (5.80)
HbA_1c (%)*	6.86 (0.37)
Education	
Illiterate	21
Elementary school	14
High school	47
University	18
Diabetes treatment modality	
Insulin	11
Oral agents	59
Insulin and tablet	30

*Data for the age, duration of diabetes and HbA_1c are Mean (SD).

Reliability

Internal consistency of the IR-PAID-20 was calculated by Cronbach's α. The α-coefficient for IR-PAID-20 total score was 0.89 and 0.84, 0.83 and 0.90 for the three subscales (calculated by factor analysis), respectively. Therefore the internal consistency of the scale was high. The test-retest reliability, evaluated through Pearson coefficient correlation, suggested the total reliability of the scale to be as high as 0.88 (P<0.01). The Spearman-Brown coefficient correlation was calculated for two parts of this scale (Splitting method). The correlation between the forms, the first part α, the second part α, and reliability coefficient was 0.80, 0.86, 0.91 and 0.89, respectively.

Validity

Construct validity: The Keiser-Meyer-Olkin measure of sampling (Kmo=0.88) and Bartlett's test of sphericity (Bts=1284) showed that the sample size was suitable for conducting a factor analysis and the correlation matrix has not occurred by chance. Our factor analysis resulted in 4 factors. The method of factor analysis was least factor load. After an iterative process of factor and item analyses, a three-factor solution was believed to be more suitable (Table 2). The percent of variance for each factor was 46.35, 8.53, and 6.84 respectively that explained approximately 62% of the total variance, and all the three factors were shown to have been values higher than 1.0. , a list of IR-PAID-20 items and its subscales are displayed in Table 3. The mean value for IR-PAID-20, factor 1, factor2 and factor 3 was 35.8 (SD ± 17.65), 9.40 (SD ± 5.10), 11 (SD ± 5.48) and 15.50 (SD ± 9.90), respectively.

Table2. Results of psychometrics indicators of factor analysis of PAID

indicator / factor	Eignvalue	commonalities	percent of variance	cumulative percent of variance	number of questions
first	9.27	0.81	46.35	46.35	5
second	1.70	0.70	8.53	54.89	6
third	1.36	0.61	6.84	61.74	9

Table3. Items of the three subscales of IR-PAID-20

Subscale name	Items
Psychological problems in relation to diabetes management	Feelings of deprivation regarding food and meals? Worrying about low blood sugar reactions? Feeling angry when you think about living with diabetes? Feeling constantly concerned about food and eating? Feeling "burned out" by the constant effort needed to manage diabetes?
Depression- related Problems	Feeling scared when you think about living with diabetes? Feeling depressed when you think about living with diabetes? Not knowing if your mood or feelings are related to your diabetes? Feeling overwhelmed by your diabetes? Worrying about the future and the possibility of serious complications? Feelings of guilt or anxiety when you get off track with your diabetes management?
Treatment Barriers	Not having clear and concrete goals for your diabetes care? Feeling discouraged with your diabetes treatment plan? Uncomfortable social situations related to your diabetes care (e.g., people telling you what to eat)? Not "accepting" your diabetes? Feeling unsatisfied with your diabetes physician? Feeling that diabetes is taking up too much of your mental and physical energy every day? Feeling alone with your diabetes? Feeling that your friends and family are not supportive of your diabetes management efforts? Coping with complications of diabetes?

Criterion validity: In order to assess the criterion validity, the existence of association between HbA1C levels as metabolic control indicator and duration of diabetes with PAID total score and extracted factors was supposed. While assessing the criterion validity, an insignificant correlation was reported between HbA1C levels and PAID total score and extracted factors. The association between the duration of diabetes with PAID total score, and the subscales such as "Psychological distress in relation to diabetes management", and "Depression-related problems," however, was significant. There was also no significant difference in the IR-PAID-20 score (total and sub dimensions) of the two genders (Table 4).

Table4. Association between IR-PAID-20 and diabetes-related data

Factors	duration of diabetes	HbA1C	gender**	
			Male	Female
Psychological distress in relation to diabetes management	0.3*	-0.15	9.77 (5.15)	8.97(5.12)
Depression- related problems	0.23*	-0.13	11.75(5.74)	10.10(5.16)
Treatment barriers	0.17	-0.2	17.01(9.42)	13.78(8.09)
PAID Total score	0.26*	-0.18	38.54(18.83)	32.86 (16.06)

Correlations were performed with Pearson's product moment correlation or Spearman method as appropriate

* $P<0.05$

** Data for male and female IR-PAID-20 score are mean (SD)

Concurrent validity: Pearson correlation, used for assessing the concurrent validity between PAID-20 and DES-28 questionnaires, showed a negative correlation between overall PAID and DES scores (r= -0.21 and P<0.01).

Discussion

This is the first study to evaluate the psychometric attributes of the PAID-20 scale in the Iranian type 2 diabetic population. Considering the psychological problems that these patients might experience, we found IR-PAID-20 to be a useful instrument in assessing the emotional and psychological distress. Our study also reported the validity and reliability of the Iranian version of the scale. The high internal consistency of IR-PAID-20, with overall Cronbach's α coefficient of 0.94, was also reported.

The factor analysis resulted in three factors with Eigenvalue >1.0. The first factor that we have named it "Psychological distress in relation to diabetes management" is includes items which evaluated psychological problems associated with diabetes control and self management. The second factor: "Depression-related problems", is included items related to depression, fear and concern about the future, and finally the third factor: "Treatment barriers", is composed of items that identify problems and barriers to treatment. Considering the fact that depression was reported as a separate factor in our study, it could be concluded that the PAID scale is a valid tool for diagnosing depression. This finding is in line with Hermanns *et al.* study who recommended the PAID questionnaire could be useful when screening diabetic patients for both depression and emotional problems (20).

Our findings about PAID factor structure however is different from some previous studies which had reported the scale to be composed of one (15, 25), two (14, 22) and four (19, 21) factors. Amsberg *et al.* in contrary to our investigation had shown three factors for PAID; the items of these factors, however, are different (23). Thus it seems necessary to re-test the factor analysis in a bigger sample.

Our study also supported the concurrent validity of the scale as there was a negative correlation between IR-PAID-20 and IR-DES-28 scores (r= -0.21 and P<0.01). This finding is consistent with the Icelandic study (22) that demonstrated the association between psychological problems and diabetes empowerment.

Correlation analyses for investigate possible associations between the IR-PAID-20 Scale (total score and subdimensions) and subjects' characteristics (duration of diabetes and HbA$_1$c levels) showed a positive relationship between the duration of diabetes and PAID total scores and extracted factors (Table 4). While this finding was reported in a Brazilian

study, most of the previous studies have reported a different result (19, 21). On the other hand, we failed to find any correlations between HbA$_1$c levels and PAID total scores and extracted factors. Similarly, the results of previous studies, in this regard, are controversial (21, 22). Also Miller and Elasy reported that HbA$_1$cwas positively correlated with only one factor of the PAID (24). Other studies have reported a weak or mild correlation in this regard (19, 23, 25). Lack of any correlation between HbA$_1$c levels and PAID in our study may be due to its small sample or the education that patients had previously received on diabetes control. These factors should be addressed in future studies.

Considering to the PAID scorings ranged (0 to 66), in our study participants demonstrated an average score and this issue indicated that some people really are faced with psychological problems. Although the results indicated that there was no significant statistical difference between male and female IR-PAID-20 score, but the men and women means difference in the PAID total score and third factor score was considerable (Table 4).

In conclusion, the present study confirmed the reliability and validity of the Iranian version of PAID scale (IR-PAID-20) is a useful instrument for assessing the emotional and psychological distress of diabetes and can be applied as an appropriate scale in research and clinical activities. Also IR-PAID-20 questionnaire appears to have the ability of screening certain diabetes-related psychological problems, especially depression, although this issue might need further study.

Acknowledgment

References

1. Cox DJ, Gonder FL. Major developments in diabetes research. *J Consult Clin Psychol* 1992; 4: 628–663.
2. Jacobson AM. The psychological care of patients with insulin-dependent diabetes mellitus. *N Engl J Med* 1996; 334: 1249–1253.
3. Ismail K, Winkley K, Rabe-Hesketh S. Systematic review and meta-analysis of randomised, controlled trials of psychological interventions to improve glycaemic control in patients with type 2 diabetes. *Lancet* 2004; 363(9421): 1589-97.
4. Van Tilburg MA, McCaskill CC, Lane JD, Edwards CL, Bethel A, Fenglos MN *et al.* Depressed mood is a factor in glycaemic control in type 1 diabetes. *Psychosom Med* 2001; 63: 551–555.
5. Lustman PJ, Anderson RJ, Freedland KE, de Groot M, Carney RM. Depression and poor glycaemic control: a meta-analytic review of the literature. *Diabetes Care* 2000; 23: 934–942.
6. Cienchanowski PS, Katon WJ, Russo JE. Depression and diabetes. Impact of depressive symptoms on adherence, function and costs. *Arch Intern Med* 2000; 160: 3278–3285.
7. Anderson RJ, De Groot M, Grigsby AB, McGill JB. Anxiety and poor glycaemic control: a meta analytic review of the literature. *Int J Psychiatry Med* 2002; 32: 235–247.
8. Rubin RR, Peyrot M. Psychosocial problems and interventions. *Diabetes Care* 1992; 15: 1640–1657.
9. Gåfvels C, Lithner F, Börjeson B. Living with diabetes: relationship to gender, duration and complications: a survey in Northern Sweden. *Diabet Med* 1993; 10: 768–773.
10. Calhoun D, Beals J, Carter EA, Mete M, Welty TK, Fabsitz RR, Lee ET, Howard BV. Relationship between glycemic control and depression among American Indians in the Strong Heart Study. *J Diabetes Complications* 2010; 24(4): 217-22.
11. De Groot M, Jacobson A, Samson J, Welch G. Glycemic control and major depression in patients with type 1 and type 2 diabetes mellitus. *J Psychosom Res* 1999; 46: 425–35.
12. Herpetz S, Albus C, Lichtblau K, Kohle K, Mann K, Senf W. Relationship of weight and eating disorders in type 2 diabetic patients: a multicenter study. *Int J Eat Disord* 2000; 28: 68–77.
13. Kenardy J, Mensch M, Bowen K, Pearson S-A. A comparison of eating behaviours in newly diagnosed NIDDM patients and case matched control subjects. *Diabetes Care* 1994; 17: 1197–99.
14. Herschbach P, Duran G, Sabine W, Zettler A, Christoph A, Mittag BM. Psychometric

properties of questionnaire on stress in patients with diabetes—revised (QSD-R), *Health Psychol* 1997; 16: 171–174.

15. Welch GW, Jacobson AM, Polonsky WH. The Problem Areas in Diabetes Scale: an evaluation of its clinical utility. *Diabetes Care* 1997; 20: 760–766.
16. Polonsky WH, Anderson BJ, Lohrer PA, Welch G, Jacobson AM, Aponte JE, Schwartz CE. Assessment of diabetes related distress. *Diabetes Care* 1995; 18: 754–760.
17. Ishii H, Welch GW, Jacobson A, Goto M, Okazaki K, Yamamoto T, Tsujii S. The Japanese version of the Problem Area in Diabetes scale. A clinical and research tool for the assessment of emotional functioning among diabetic patients. Diabetes 48(Suppl. 1): A319, 1999. Abstract 1397.
18. Nichols GA, Hillier TA, Javor K, Brown JB. Predictors of glycemic control in insulin using adults with type 2 diabetes. *Diabetes Care* 2000; 23: 273–277.
19. Snoek FJ, Pouwer F, Welch GW, Polonsky WH. Diabetes-related emotional distress in Dutch and US diabetic patients: cross-cultural validity of the problem areas in diabetes scale. *Diabetes Care* 2000; 23(9): 1305–1309.
20. Hermanns N, Kulzer B, Krichbaum M, Kubiak T, Haak T. How to screen for depression and emotional problems in patients with diabetes: comparison of screening characteristics of depression questionnaires, measurement of diabetes-specific emotional problems and standard clinical assessment. *Diabetologia* 2006; 49: 469–477.
21. Gross CC, Scain SF, Scheffel R, Gross JL, Hutz CS. Brazilian version of the Problem Areas in Diabetes Scale (B-PAID): Validation and identification of individuals at high risk for emotional distress. *Diabetes Research and Clinical Practice* 2007; 76: 455–459.
22. Sigurdardottir A, Benediktsson R. Reliability and validity of the Icelandic version of the problem area in diabetes (PAID) scale. *International Journal of Nursing Studies* 2008; 45: 526–533.
23. Amsberg S, Wredling R, Lins PE, Adamson U, Johansson UB. The psychometric properties of the Swedish version of the Problem Areas in Diabetes Scale (Swe-PAID-20): Scale development. *International Journal of Nursing Studies* 2008; 45: 1319–1328.
24. Miller ST and Elasy TA. Psychometric evaluation of the Problem Areas in Diabetes (PAID) survey in Southern, rural African American women with Type 2 diabetes. *BMC Public Health* 2008; 8:70.
25. Huang MF, Courtney M, Edwards H, Mcdowell J. Validation of the Chinese Version of the Problem Areas in Diabetes (PAID-C) Scale. *Diabetes Car*e 2010; 33(1): 38-40.
26. Welch GW, Weinger K, Anderson B and Polonsky W.H. Responsiveness of the Problem Areas in Diabetes (PAID) questionnaire. *Diabetic Medicine* 2003; 20: 69–72.
27. Anderson RJ, Fitzgerald J, Funnell M, Marrero D. The diabetes empowerment scale: a measure of psychosocial self efficacy. *Diabetes Care* 2000; 23: 739–43.