

Translation, validation and effectiveness of self-care inventory in assessing adherence to diabetes treatment

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Abstract

Objectives: To evaluate the efficacy of an Urdu translation of Self Care Inventory for measuring adherence to diabetes treatment.

Method: The correlational cross-sectional study was conducted in October and November, 2011, and data was collected from outpatient department of public-sector hospitals of Rawalpindi and Islamabad, Pakistan. Patients included had diabetes type1 or type 2, while those with severe diabetic complications, including nephropathy, neuropathy, diabetic foot, and renal disease or any psychiatric comorbidity, were excluded.

Results: Of the 300 patients, 165(55%) were women. The overall age of the sample ranged between 19 and 72 years. The translated version of Self Care Inventory showed Chronbach's alpha ranging from 0.73 to 0.80 for four sub-scales, and 0.78 for the overall measure of adherence. In support of predictive validity, the inventory correlated negatively with fasting blood glucose level ($r = -0.12$ to -0.17 ; $p < 0.05$) and positively with the problem areas in diabetes score ($r = 0.15$ to 0.24 ; $p < 0.01$). Confirmatory factor analysis presented a good fit of the model to the data with all recommended items loading well on respective scales (lambda ranging from 0.42 to 0.86).

Conclusion: The self care inventory is an effective measure for assessing adherence to diabetes treatment. The Urdu version of the inventory appeared to be a valid and reliable instrument and is ready to be used in clinical and research setting.

Keyword: Adherence, Diabetes, Blood glucose levels, Assessment, Validation. (JPMA 66: 853; 2016)

Introduction

Prevention of serious morbidity and mortality associated with chronic diseases has a well-established link with self-care behaviours.¹ Diabetes is among the chronic diseases that need dedication to demanding self-care behaviours across multiple domains, including food choices, physical activity, medications, glucose monitoring and symptom management.² Due to constant demands and unending self-care, diabetes is accompanied by frustrations with the treatment regimen, often resulting in considerable burden and even burnout.³ However, lapses in diabetes self-care may result in severe long-term complications, leading to a decrease in life expectancy⁴ by 03-18 years¹ depending on age at diagnosis.

Diabetes is a self-managed chronic disease and 99% of the treatment regimens rely on self-care behaviours.^{5,6} It is necessary for patients to play an active role in managing their treatment plan as prescribed by their physicians.⁷ Patients with diabetes need to learn several types of self-care activities and adapt these to their daily lives.⁸ The

self-care behaviours contribute to positive health outcome measures, such as blood glucose control, health-related quality of life⁹ and prevention from diabetes-related complications (i.e., retinopathy, nephropathy, renal disease, and diabetic foot).⁶

Most of the methods used to assess self-care behaviours depend on a patient's memory, using time-intensive interviews of recalling behaviours over a specific time period, typically 24 hours to 1 week. Other approaches involve use of patients' reports for frequency of specific self-care behaviours, but such measures may not take into account the differences in patients' perception and treatment prescriptions for diabetes self-care.¹⁰ Although clinicians and researchers need a simple, practical, and comprehensive method to assess to a variety of diabetes treatment regimens, there are very few disease specific easy-to-use instruments with established psychometric properties.¹¹

Self Care Inventory (SCI)¹² is a self-reporting questionnaire assessing patients' frequency of common and critical self-care behaviours. The SCI, unlike other instruments, doesn't presume that all individuals have the same treatment regimen nor is it based on an "ideal" regimen.¹³ Thus the SCI permits variability in treatment plans across individuals, while evaluating individuals' perceptions of

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how well they adhere to their prescribed treatment plan. The global score of self-care behaviour obtained on the SCI makes it a concise and practical tool for outcome research and clinical practice.

The SCI is a 14-item self-reporting inventory that assesses patients' perceptions of their adherence to diabetes self care recommendations over the preceding four weeks. Items are rated on a five-point Likert scale, from (1) "never do it" to 5 "always do this" according to how well patients feel that they followed their doctors' recommendations during the prior month. An additional response option (i.e., "non-applicable") allows for the variability of self-care behaviours across treatment regimes. Four common self-care domains are assessed: Blood Glucose Regulation (BGR); Insulin and Food Regulation (IFG); Use of Exercise; and Emergency Precautions (EP). The SCI has well-established psychometrics properties across cultures^{12,14} and appeared to be a valid and reliable measure of self-care in people with type-1 or type-2 diabetes.^{15,16} Given the effectiveness across treatment regimens and global usefulness of the SCI, there is a strong need to translate and validate the instrument in Urdu to make it available for researchers and practitioners. The present study was planned to translate and validate the SCI into Urdu. Additionally, we aimed at assessing effectiveness of the translated instrument in measuring adherence to diabetes treatment.

Subjects and Methods

The correlational cross-sectional study was conducted in October and November, 2011, and data was collected from outpatient department of public-sector hospitals of Rawalpindi and Islamabad, Pakistan. Permission for data collection was obtained from relevant hospitals' authorities.

Using non-probability purposive sampling technique, patients with diabetes type 1 or type 2 with duration of diabetes no less than one year were included. Patients with any severe diabetes complications (i.e., nephropathy, neuropathy, diabetic foot, and renal disease) or any psychiatric condition were excluded. Additionally, patients with any hearing, and speaking disability and those with a language issue were also excluded. GPower version 3.1 was used to estimate a priori sample size for Confirmatory Factor Analysis with χ^2 test for goodness of fit. Using the factor loading criteria ($\lambda=0.40$) with error probability 0.05 and sample power 0.95, the sample size was calculated. After obtaining informed consent from patients, questionnaires were administered individually by the interviewer. Before administration, the SCI was translated into Urdu language, followed by a committee

approach. The translated scales were then back-translated into English language followed by another committee approach. Along with demographic information, patients' height, weight, and latest blood glucose levels were recorded and patients were administered the Urdu version of SCI and Problem Areas in Diabetes (PAID). It took around 15-20 minutes for each patient to complete the questionnaire.

The 14-item version of SCI was used to assesses patients' perceptions of their adherence to diabetes self-care recommendations over the preceding four weeks. Items were rated on a five-point Likert scale, from 1 ("never do it") to 5 ("always do this") reflecting patients' rating for the degree to which they followed their doctors' recommendations during the prior month. Adherence to treatment was measured in four domains: Three items for BGR (items 1, 2, 6); three items for IFG (items 5, 7, 8); two items for Exercise (items 13, 14); and two items for EP (items 10, 12). The overall adherence score is obtained by computing the average of seven items (items 1, 2, 5, 6, 7, 8, and 13 because proper self-care in these areas should be related with better metabolic control.^{12,17}

The PAID is a 20 item self-reporting measure to measure diabetes-related emotional distress.¹⁸ It assesses the emotional problems patients with diabetes encounter while managing diabetes and its complications. Respondents rate the items on a 5-point Likert scale from 0 ("not a problem") to 4 ("a serious problem"). The overall score is computed by adding the 20 items and then multiplying it by 1.25 to yield a final score between 0 and 100. High scores indicate greater emotional distress regarding diabetes care. Additionally, PAID can be scored in four problem areas: Emotional problems; Treatment problem; Food-related problem; and Social Support-related problem. Urdu version of the PAID has well-established psychometric properties^[4] and was used in the present study. The PAID score was used as a criterion to determine effectiveness of SCI in assessing adherence.

Statistical analyses were conducted to examine the internal consistency of the SCI and its four subscales using Chronbach's alpha reliability statistics. Factorial validity of the scale was tested using structural equation modelling (SEM) with AMOS version 21.

Results

Against a required sample size of 225, we approached 75(33.3%) more to offset any dropouts. With 100% response rate, our final study sample comprised 300 patients. Of them, 165(55%) were women and 135(45%) were men. Overall age range was 19-72 years (Table-1).

Table-1: Sample Descriptions.

		Frequency (f)	Percentage (%)
Gender	Men	135	45
	Women	165	55
Mode of Medication	Oral	119	39.7
	IV	181	60.3
		Mean	S.D
Age		43.30	8.50
Body Mass Index (BMI)		26.26	5.44
Duration of Diabetes		9.03	7.22
BGL		256.83	76.52
PAID		29.35	16.13

IV: Intravenous

BGL: Blood glucose level

PAID: Problem areas in diabetes.

alert identification (ID) (Table-2).

There was significant positive relationship between age and three SCI indicators, including timely administration of insulin ($r=0.19$; $p<0.01$), and eating behaviours (item 8: $r=0.12$, $p<0.05$; item 9: $r=0.20$; $p<0.01$). Similarly, there was significant positive correlation between age and the IFG subscale ($r=0.22$; $p<0.01$). Overall adherence also was positively correlated with age ($r=0.19$; $p<0.01$).

Duration of diabetes was positively correlated with the least common adherence behaviours including ketone testing ($r=0.28$; $p<0.01$), wearing a medical alert ID ($r=0.17$; $p<0.05$), carrying quick-acting sugar ($r=0.20$; $p<0.01$), and exercising behaviours (items 13 and 14: $r=0.13$; $p<0.05$, and $r=0.20$; $p<0.01$). Among the SCI subscales, exercise and EP correlated significantly with duration of diabetes ($r=0.19$, and $r=0.18$; $p<0.01$).

Table-2: Descriptive statistics of items and subscales of Self Care Inventory (SCI) and their correlations with age, duration, BGL, BMI, and PAID scores.

	Alpha	Descriptive					Pearson Bivariate Correlations				
		N	Mean	SD	Skew	Kur	Age	DD	BGL	BMI	PAID
Glucose testing (Item 1)	-	274	2.76	1.36	-1.13	-1.01	.04	.05	-.08	-.05	.17**
Glucose recording (Item 2)	-	278	2.81	1.32	-1.09	-0.90	.03	.06	.03	.02	.15*
Ketone testing (Item 3)	-	250	1.37	0.67	2.19	5.25	.09	.28**	.17**	.17**	.19**
Administering correct insulin dose (Item 4)	-	291	3.34	1.34	-1.03	-0.93	.11	-.01	-.07	.00	-.07
Administering insulin at right time (Item 5)	-	288	3.40	1.34	-0.94	-0.96	.19**	-.05	-.12*	-.02	-.11
Adjusting insulin intake based on blood glucose values (Item 6)	-	269	3.10	1.30	-1.07	-1.01	.11	.00	-.13*	-.05	-.02
Eating the proper foods; sticking to meal plan (Item 7)	-	292	3.03	1.19	-0.76	-0.62	.12*	-.07	-.15*	-.02	-.01
Eating meals on time (Item 8)	-	294	3.18	1.31	-1.08	-0.90	.20**	.00	-.13*	-.01	-.07
Eating regular snacks (Item 9)	-	288	2.82	1.19	-0.78	-0.43	.07	.06	.06	.04	.18**
Carrying quick-acting sugar to treat reactions (Item 10)	-	268	2.74	1.26	-0.96	-0.96	-.03	.20**	.00	.02	.06
Coming in for appointments (Item 11)	-	291	3.04	1.30	-1.03	-0.88	.03	.05	-.02	-.05	.04
Wearing a medic alert ID (Item 12)	-	226	2.65	1.35	-1.04	-1.39	-.02	.17*	.12	-.04	.09
Exercising regularly (Item 13)	-	287	2.82	1.32	-1.16	-0.89	.00	.13*	.10	.02	.23**
Exercising strenuously (Item 14)	-	277	2.51	1.27	-0.76	-0.81	-.09	.20**	.10	.08	.19**
Blood glucose regulation (Item 1+2+6)	.79	237	8.76	3.33	-0.84	-0.37	.09	.03	-.11	-.02	.12
Insulin and food regulation (Item 5+7+8)	.80	275	9.62	3.26	-0.87	-0.53	.22**	-.04	-.17**	.00	-.08
Exercise (Item 13+14)	.78	268	5.27	2.33	-0.86	-0.72	-.04	.19**	.09	.06	.24**
Emergency precautions (Item 10+12)	.73	214	5.33	2.31	-0.98	-0.87	-.06	.18**	.08	-.04	.12
Adherence total (Item 1+2+5+6+7+8+13)	.78	272	21.17	5.88	-0.40	-0.32	.19**	.03	-.10	.00	.07

Skew (Skewness), Kur (Kurtosis) BGL (Blood Glucose Level), BMI (Body Mass Index), PAID (Problem Areas in Diabetes), DD (Duration of Diabetes).

*. Correlation is significant at the .05 level (2-tailed).

**. Correlation is significant at the .01 level (2-tailed).

SCI had good reliability statistics for all the subscales (alpha range: 0.73-0.80) and for overall measure of adherence (alpha=0.78). Insulin/medication-related behaviours were most practised, followed by eating behaviours, and adherence behaviour pertains to appointment-keeping. The least practised adherence behaviours included testing and recording, strenuous exercising and wearing a medical

Regarding associations with metabolic control, correlations between blood glucose level (BGL) and SCI scores showed significant negative correlations for insulin administration/medications (items 5 and 6) and meal plans (items 7 and 8) (r range: -0.12 to -0.15; $p<0.05$). There was a significant negative correlation between the IFG subscale and BGL ($r= -0.17$; $p<0.01$). BGL correlated

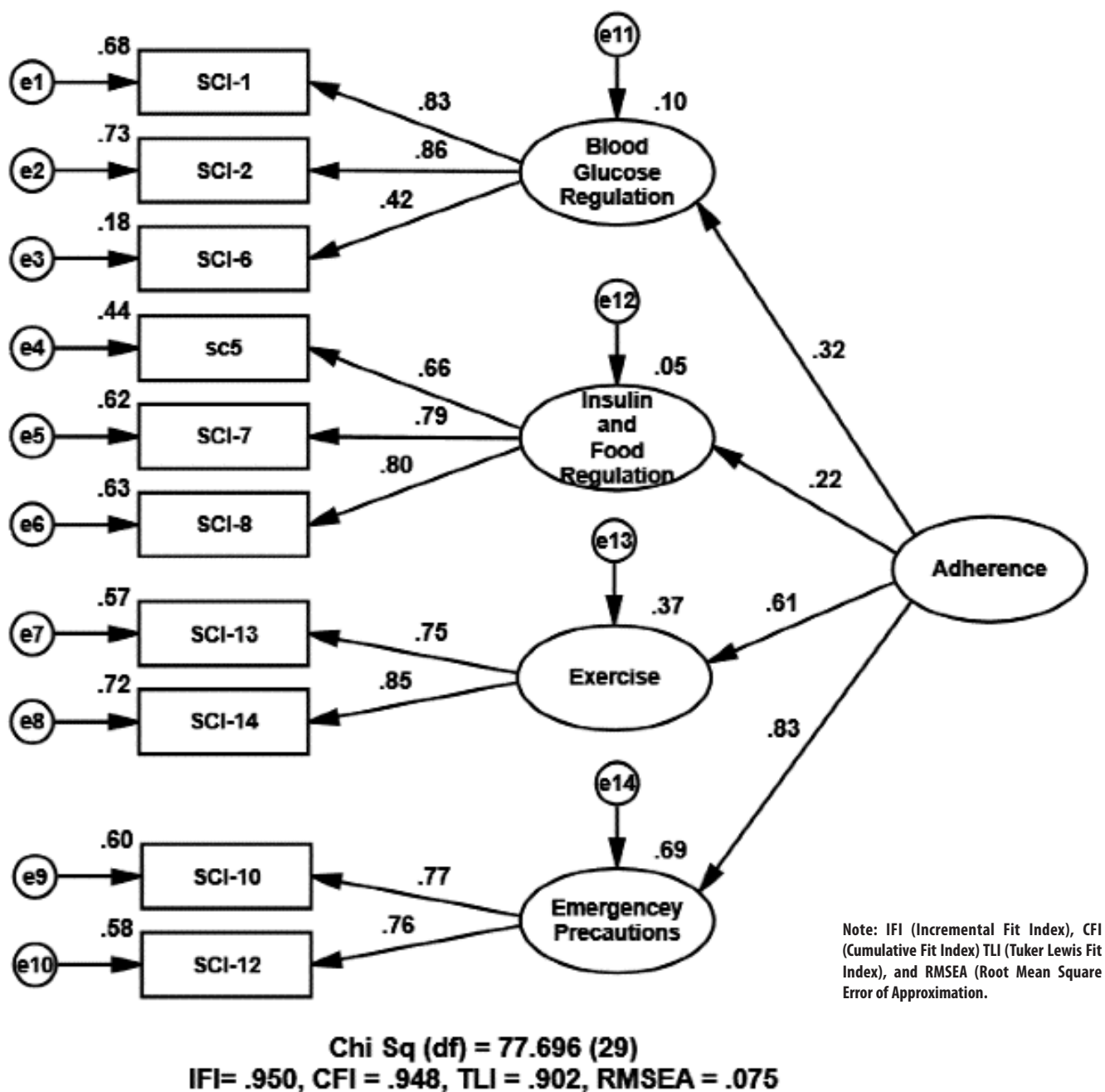


Figure: Confirmatory factor analysis testing factor structure of the Self Care Inventory (SCI).

positively with only one adherence behaviour, that of ketone testing ($r=0.17$; $p<0.01$). No significant correlation appeared between body mass index (BMI) and self-care behaviours measured on the SCI except ketone testing ($r=0.17$; $p<0.01$).

There were significant positive correlations between patients' SCI adherence scores and the PAID. Positive

associations were found for testing and recording (items 1 to 3) (r range = 0.15 to 0.19; $p<0.05$; exercise (items 13, and 14) (r range = 0.19 to 0.23; $p<0.01$; and eating (item 9) ($r=0.18$; $p<0.01$). For the SCI subscales only exercise subscale ($r=0.24$; $p<0.01$) was associated with diabetes problems on the PAID.

To execute the confirmatory factor analysis, a model was

developed using items recommended by the author of SCI.¹⁷ Four latent factors were included to measure total adherence: BGR consisting of three items; IFG consisting of three items; Exercise consisting of two items; and EP consisting of 2 items. A CFA model is considered a good fit if Cumulative Fit Index (CFI), Tucker-Lewis Fit Index (TLI), Incremental Fit Index (IFI) values are greater than 0.90, and Root Mean Square Error of Approximation (RMSEA) is less than 0.08. Confirmatory factor analysis resulted in a good fit of the model to the data with acceptable model fit indices (χ^2 (df) = 77.70 (29), IFI = 0.95, CFI = 0.95, TLI = 0.90, and RMSEA = 0.075). All items loaded well on their respective scales (Figure). All the four subscales had significant contribution to overall adherence (lambda ranging from 0.22 to 0.83).

Discussion

The objective of the study was to determine efficacy of the Urdu-translated version of SCI to measure treatment adherence for patients with diabetes. Originally developed in the USA,^{12,17} and translated and validated in various languages and across cultures,¹⁴⁻¹⁶ the SCI has well-established psychometric properties and can assess adherence to diabetes treatment for both type 1 and type 2 diabetes.¹⁴⁻¹⁶ With its 14 items, the SCI measures adherence in four domains; BGR, IFG, Exercise and EP.¹² Our results regarding the internal consistency of the SCI subscales as well as overall treatment adherence is consistent with literature suggesting good reliability of the SCI¹⁴⁻¹⁶ when computed with recommended items.

Although patient-reported adherence behaviours on the SCI supported earlier literature suggesting that insulin administration (medication),¹⁹ meal planning²⁰ and visiting physicians are among the most pertinent categories of adherence,²¹ our results also suggested culture-specific variations in adherence practices. For example, ketone testing is not very common in diabetes patients¹² and our data similarly reflected that blood glucose testing and recording are also among the most ignored aspects of diabetes adherence in our culture. However, our results suggested cultural variation in two types of adherence behaviours; exercise²² and wearing medical alert ID, which emerged as the least commonly reported self-care behaviours in our patients.

The effectiveness of the SCI adherence behaviours was also evaluated against several criteria, including BGLs, and problem areas in diabetes. Our results supported earlier literature suggesting negative associations between the SCI indicators primarily assessing IFG and BGLs,²² though ketone testing was positively associated with BGLs. It is likely that individuals with persistent high BGLs receive

recommendations from their physician for ketone testing.²³ This is further supported by a positive association between ketone testing and PAID score, reaffirming that patients with increased diabetes-related problems practise ketone testing more frequently than those with fewer problems.

Other than ketone testing, none of the SCI adherence behaviours indicated a shared relationship for both BGL and PAID score. PAID score predominantly appeared to associate with glucose testing and recording and exercise behaviours suggesting that patients with severe diabetes-related problems tend to frequently test and record their blood glucose reading as well as they maintain exercise behaviours.^{24,25} Furthermore, a positive association between carrying quick-acting sugar and PAID suggested a greater tendency of keeping quick-acting sugar for people with severe diabetes-related problems. In general, the positive associations of the SCI indicators of adherence with the PAID score reflecting diabetes problems provided evidence of convergent validity for the SCI, and negative associations between the SCI and patients' BGLs provide evidence of the predictive validity of the SCI for measuring adherence to diabetes treatment.

Along with evaluating the effectiveness of SCI, the study aimed at examining the psychometric properties of the Urdu-translated SCI. Our results from confirmatory factor analysis of the SCI subscales confirmed the factorial validity of the SCI. Results supported the four-factor structure of the translated SCI in the domains of BGR, IFG, Exercise and EP, using the recommended items of the original scale.¹⁷

The study has provided strong evidence for effectiveness of the Urdu-translated version of SCI, but future studies are recommended to validate the translated SCI against a stable measure of diabetes control, such as glycated haemoglobin (HbA1c).

It is recommended that SCI Urdu shall be used in clinical and research setting to assess patients' self-care behaviours. The SCI score may be used by physicians to advise patients for improving particular domains of treatment adherence to avoid diabetes complications.

Conclusion

The Urdu translation of SCI is an effective measure for assessing adherence to diabetes treatment for adult patients with type 1 or type 2 diabetes. The Urdu version of the inventory appears to be a valid and reliable instrument and is ready to be used in clinical and research settings. The SCI score, particularly on IFG, appeared to be a good predictor of diabetes control.

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Conflict of Interest: None.

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