Short Form of the Chinese Version Diabetes Quality of Life for Youth Scale

A psychometric testing in Taiwanese adolescents with type 1 diabetes

RUEY-HSIA WANG, PHD, RN[1]
FU-SUNG LO, MD[2]
BAI-HSIUN CHEN, MD[3]

HSIU-YUEH HSU, DNSC, RN[4]
YANN-JINN LEE, MD, MS[5,6]

OBJECTIVE—To test the psychometric properties of the short form of the Chinese version Diabetes Quality of Life for Youth scale (C-DQOLY-SF).

RESEARCH DESIGN AND METHODS—A 30-item C-DQOLY-SF was administered to 371 adolescents with type 1 diabetes. Exploratory and confirmatory factor analysis, correlation with HbA_{1c}, internal consistency, and test-retest reliability were used to examine the psychometric characteristics of C-DQOLY-SF.

RESULTS—A 25-item questionnaire with three correlated second-order factor structures best fitted data. Scores on the 25-item C-DQOLY-SF significantly correlated with HbA_{1c} values. Cronbach's α and ICCs of each scale and subscale ranged from 0.77 to 0.90 and from 0.70 to 0.92, respectively.

CONCLUSIONS—The C-DQOLY-SF has satisfactory reliability and validity. The C-DQOLY-SF can be conveniently used in clinical settings to assess the quality of life of adolescents with type 1 diabetes.

P ediatric health care providers are challenged to improve quality of life (QOL) in adolescents with type 1 diabetes (1). A 51-item Diabetes Quality of Life for Youth (DQOLY) (2) has been widely used (3,4) to assess the QOL in adolescents with type 1 diabetes. DQOLY is composed of life satisfaction, diabetes impact, and diabetes-related worry scales; however, construct validity had not been tested. For convenient clinical use, a 38-item short form of DQOLY (DQOLY-SF) (5) was adapted from DQOLY. DQOLY-SF includes scales of future worries, parental concern, impact on activities, impact of treatment, symptom impact, and satisfaction. Nevertheless, item of satisfaction scale overlapped with content in the other scales, which is problematic for managing discrepancies between different scales (5). The purpose of this study was to develop and test the psychometric properties of a short form of the Chinese version Diabetes Quality of Life for Youth scale (C-DQOLY-SF).

RESEARCH DESIGN AND METHODS—We selected 30 items from DQOLY-SF and a Chinese version DQOLY based on Taiwanese clinical experience. The preliminary C-DQOLY-SF was composed of life satisfaction, diabetes impact, and diabetes-related worry scales. Items were scored from 5 to 1. Higher scores indicated better QOL. Seven experts examined the 30-item C-DQOLY-SF. The content validity index was 1.0, indicating that C-DQOLY-SF was acceptable for use (6).

A total of 371 adolescents (171 male and 200 female) who were diagnosed with type 1 diabetes for more than 1 year, aged between 9 and 19 years (mean ± SD 14.3 ± 2.4 years), and did not have major cognitive disorders were recruited from five medical centers in southern and northern Taiwan. The institutional review board of each hospital approved the study, and all adolescents and their guardians gave their written informed consent. The 30-item C-DQOLY-SF was administered to these participants for psychometric testing.

Items having an item-total correlation <0.3 or absolute value of skewness or kurtosis >2 were deleted (7). Exploratory factor analysis (EFA) using a principal component method with Promax rotation was used to examine the construct validity of C-DQOLY-SF. Items that double loaded or had factor loadings <0.5 were removed. To test the factor structure produced by EFA, confirmatory factor analysis (CFA) was performed with a structural equation-modeling program by EQS (version 6.1). The correlation between C-DQOLY-SF and the latest HbA_{1c} was examined.

Cronbach's α was calculated to assess internal consistency. The C-DQOLY-SF was administered to 21 participants twice with a 2-week interval. Test-retest reliability was examined by ICC.

RESULTS—Five items were deleted because of absolute value of kurtosis, skewness >2, or factor loadings <0.50 by EFA. After EFA on the retained 25 items, six factors were produced. Furthermore, two subscales were extracted from each scale. Because life satisfaction, diabetes impact, and diabetes-related worry scales are considered independent but correlated (2), a three-correlated second-order factor CFA was performed to test the structure of C-DQOLY-SF produced by the EFA. Each item statistically significantly loaded on its corresponding factor of EFA. Furthermore, each subscale also significantly loaded on its higher second-order factor (scale) (Table 1). The fit indices were $\chi^2 = 583.77$, d.f. = 266; χ^2/d.f. = 2.19, comparative fit index = 0.93, nonnormed

Table 1—*CFA of the 25-item C-DQOLY-SF*

	Factor loadings	
	Item on first-order factor	First-order factor on second-order factor
Life satisfaction		
Satisfaction of treatment		0.67
The amount of time it takes to manage your diabetes	0.84	
The amount of time you spend getting checkups	0.64	
The amount of time it takes to determine your blood glucose	0.82	
Your current medical treatment	0.64	
The flexibility you have with your diet	0.65	
Satisfaction of school life		0.85
Performance in school	0.76	
How your classmates treat you	0.71	
Your attendance at school	0.70	
Diabetes impact		
Impact of symptoms and activities		0.84
Feel pain associated with the treatment of your diabetes	0.56	
Feel physically ill	0.61	
Diabetes interferes with your family life	0.66	
Have a bad night's sleep	0.64	
Diabetes interferes with your exercising	0.62	
Diabetes interrupts your leisure-time activities	0.68	
Parental concern		0.42
Your parents are too protective of you	0.77	
Your parents worry too much about your diabetes	0.83	
Your parents act like diabetes is their disease, not yours	0.63	
Diabetes-related worry		
Worry about the future		0.66
Whether you will get married	0.93	
Whether you will have children	0.94	
Whether you will not get a job you want	0.76	
Whether you will pass out	0.68	
Worry about social activities		0.94
Whether someone will not go out with you because you have diabetes	0.80	
Teachers treat you differently because of your diabetes	0.71	
Diabetes will interfere with things that you do in school (sports, music, drama)	0.74	
You are behind in terms of dating, going to parties, and keeping up with your friends	0.75	

P < 0.05 for all factor loadings.

fit index = 0.92, root mean square error of approximation = 0.06 (90% CI 0.05–0.06). The three-correlated second-order factor CFA was supported (8). The three second-order factors were also significantly intercorrelated; the correlation coefficients were 0.66, 0.49, and 0.88.

Scores of diabetes life satisfaction (*r* = −0.11; *P* = 0.03), diabetes impact (*r* = −0.13; *P* = 0.01), and diabetes-related worry scales (*r* = −0.14; *P* < 0.01) significantly negatively correlated with HbA$_{1c}$.

Cronbach's α and ICCs of each scale and subscale ranged from 0.77 to 0.90 and from 0.70 to 0.92, respectively.

CONCLUSIONS—The C-DQOLY-SF included three scales, which supported the factor structure of DQOLY (2). Furthermore, two distinct subscales were extracted from each scale. It indicated that each subscale can be examined individually to represent specific subdomains or summed together to represent their specific domain of QOL (9). Health care providers can use C-DQOLY-SF to assess specific QOL and provide adequate intervention.

In DQOLY-SF, items of life satisfaction and satisfaction to treatment were combined to one satisfaction scale. Regarding the items of diabetes-related worry, only items of future worries were retained. In C-DQOLY-SF, satisfaction scale included subscales of satisfaction of school life and satisfaction of treatment. Furthermore, the diabetes-related worry scale included subscales of worry about the future and worry about social activities. C-DQOLY-SF could be used to assess the satisfaction and diabetes-related worry QOL more comprehensively and specifically than DQOLY-SF. Parental concern scale is a unique subscale in both DQOLY-SF and C-DQOLY-SF. Parent concern is important for QOL of adolescents with type 1 diabetes.

Significant correlation between scores of each scale and HbA$_{1c}$ is consistent with previous studies (5,10). The C-DQOLY-SF had satisfactory concurrent validity. QOL is in conjunction with clinical outcome, which can provide health care providers with more information to educate adolescents with type 1 diabetes.

Cronbach's α and the test-retest reliability of each scale and their subscales all exceeded the recommended standard of 0.70 (11). The C-DQOLY-SF has satisfactory reliability.

The C-DQOLY-SF is noticeably shorter and is better constructed than the DQOLY and DQOLY-SF. The C-DQOLY-SF can be used in clinical settings to assess the QOL of adolescents with type 1 diabetes.

References
1. Naughton MJ, Ruggiero AM, Lawrence JM, et al.; SEARCH for Diabetes in Youth Study Group. Health-related quality of life of children and adolescents with type 1 or type 2 diabetes mellitus: SEARCH for Diabetes in Youth Study. Arch Pediatr Adolesc Med 2008;162:649–657
2. Ingersoll GM, Marrero DG. A modified quality-of-life measure for youths: psychometric properties. Diabetes Educ 1991;17: 114–118
3. Al-Akour N, Khader YS, Shatnawi NJ. Quality of life and associated factors among Jordanian adolescents with type 1 diabetes mellitus. J Diabetes Complications 2010;24:43–47
4. Graue M, Wentzel-Larsen T, Hanestad BR, Båtsvik B, Søvik O. Measuring self-reported, health-related, quality of life in adolescents with type 1 diabetes using both generic and disease-specific instruments. Acta Paediatr 2003;92:1190–1196
5. Skinner TC, Hoey H, McGee HM, Skovlund SE; Hvidøre Study Group on Childhood Diabetes. A short form of the Diabetes Quality of Life for Youth questionnaire: exploratory and confirmatory analysis in a sample of 2,077 young people with type 1 diabetes mellitus. Diabetologia 2006;49:621–628
6. Waltz CF, Strickland OL, Lenz ER. *Measurement in Nursing and Health Research.* 3rd ed. New York, Springer, 2005
7. Pesudovs K, Burr JM, Harley C, Elliott DB. The development, assessment, and selection of questionnaires. Optom Vis Sci 2007;84: 663–674
8. Joreskog KG, Sorbom D. *LISREL 8: User's Reference Guide.* Chicago, Scientific Software International, 1996
9. Noar SM. The role of structural equation modeling in scale development. Struct Equ Modeling 2003;10:622–647
10. Varni JW, Burwinkle TM, Jacobs JR, Gottschalk M, Kaufman F, Jones KL. The PedsQL in type 1 and type 2 diabetes: reliability and validity of the Pediatric Quality of Life Inventory Generic Core Scales and type 1 Diabetes Module. Diabetes Care 2003;26:631–637
11. Rosner B. *Fundamentals of Biostatistics.* 6th ed. Toronto, Canada, Thomson, 2006