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Article

Psychometric Properties of the 19-Item Audit of Diabetes Dependent Quality of Life (ADDQoL-19) Questionnaire in Adults with Uncontrolled Type 2 Diabetes Mellitus in Eket, Nigeria

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Abstract: Purpose: We undertook to assess the validity and reliability of the 19-Item Audit of Diabetes Dependent Quality of Life (ADDQoL-19) questionnaire in patients with uncontrolled type 2 diabetes mellitus (T2DM) in Eket, South-South Nigeria. Methods: A total of 153 patients were recruited from the outpatient clinics of two secondary and two primary healthcare facilities in Eket between February and September, 2025. The ADDQoL-19 questionnaire was administered to each patient through self-administration method. Exploratory factor analysis was conducted with Varimax rotation. Reliability analysis was performed using Cronbach's alpha (α) coefficient of internal consistency reliability. Results: 62.7% of patients were females. The mean age, HBA1c, weight, and BMI of the participants were 50 ± 15 years, 7.9 ± 1.5%, 60.8 ± 12.3 Kg and 23.83 ± 5.74 Kg/m2 respectively. Cronbach's alpha coefficient was 0.857. Exploratory factor analysis identified 5 components with eigenvalues greater than 1. A total of 16 domains of ADDQoL-19 loaded highly (> 0.40) on a single factor using a forced one-factor solution (range from 0.457 to 0.698). Conclusion: The ADDQoL-19 questionnaire maintained its original psychometric properties and achieved adequate reliability and validity. It is therefore suitable in determining quality of life (QoL) among patients with uncontrolled T2DM in the study population.

Keywords: Type 2 diabetes mellitus; Quality of life; ADDQoL-19, Reliability and Validity; Psychometrics; Nigeria.

Introduction

Diabetes mellitus (DM) is one of the most prevalent chronic non-communicable diseases worldwide and a major contributor to premature mortality, disability, and healthcare expenditure [1]. An estimated 588.7 million adults aged 20-79 years were living with diabetes in 2024, with the number projected to increase to 643 million by 2030 and 783 million by 2045 [2]. More recent estimates suggest that the global diabetes burden continues to rise, particularly in low- and middle-income countries, where healthcare systems often face substantial resource constraints.

Type 2 diabetes mellitus (T2DM) accounts for approximately 90-95% of all diabetes cases and remains the predominant form of the disease globally [3]. In sub-Saharan Africa, the diabetes burden is increasing at one of the fastest rates worldwide. Nigeria, the most populous country in Africa, has

experienced a marked increase in diabetes prevalence, rising from 2.2% in the 1992 National Non-Communicable Disease Survey [4] to 5.77% among adults aged 20–69 years, with a prevalence of 9.8% reported in the South-South geopolitical zone [5].

Quality of life (QoL) has emerged as a critical outcome in diabetes care because the disease imposes lifelong demands that affect multiple dimensions of daily living. It is defined as an individual's perception of their position in life within the context of their culture and value systems and in relation to their goals, expectations, standards, and concerns [6]. This multidimensional construct encompasses physical health, psychological well-being, social relationships, functional status, and environmental influences. Studies indicate that approximately 40-60% of individuals with T2DM report impaired HRQoL [7-8].

The increasing emphasis on patient-reported outcomes has stimulated the development of numerous QoL instruments. Generic instruments such as the WHOQOL-BREF enable comparisons across populations and disease groups [9-10]. However, generic measures may lack sensitivity to issues uniquely experienced by individuals with diabetes. Consequently, diabetes-specific instruments have been developed, including the Audit of Diabetes-Dependent Quality of Life (ADDQoL) [11].

The ADDQoL is one of the most extensively used measures of diabetes-specific QoL. The 19-item version (ADDQoL-19) evaluates the perceived impact of diabetes across important life domains while simultaneously incorporating the importance individuals attach to each domain. It has been translated and validated in numerous populations and is increasingly employed in clinical research, epidemiological studies, and healthcare evaluation [12-13].

Despite its widespread use, psychometric evidence supporting the application of the ADDQoL-19 cannot be assumed to generalize across cultures and populations. Measurement instruments are influenced by language, cultural norms, healthcare experiences, educational attainment, and contextual interpretations of health and well-being. Contemporary psychometric standards recommend rigorous evaluation of reliability, validity, and dimensionality to ensure that patient-reported outcome measures function as intended. Recent psychometric literature further emphasizes the importance of measurement invariance, cross-cultural adaptation, and structural validity when evaluating patient-reported outcome measures for use in diverse populations [14].

Establishing the reliability, validity, and factor structure of the instrument among adults with T2DM in Eket, Nigeria, will provide evidence regarding its suitability for assessing diabetes-dependent quality of life in this population. We undertook to evaluate the psychometric properties of the 19-item Audit of Diabetes-Dependent Quality of Life Questionnaire (ADDQoL-19) among adults with uncontrolled T2DM in Eket, Nigeria, by examining its reliability, construct validity, and underlying factor structure.

Methodology

Study Setting

The study protocol was approved by the Health Research Ethics Committee of the Akwa Ibom State Ministry of Health with assigned number AKHREC/15/08/25/346. Patients were recruited from two secondary and two primary healthcare facilities located in Eket, Akwa Ibom State, South-South geopolitical zone of Nigeria.

Study Population

Patients attending the outpatient clinics of the healthcare facilities were administered the ADDQoL-19 questionnaire from February to September, 2025 if they met the inclusion criteria: had a confirmed diagnosis of T2DM, not less than 18 years, glycosylated haemoglobin of 6.5% and above, and on a stable antidiabetic therapy for at least 3 months. T2DM patients who had severe diabetes complications, cognitive impairment or psychiatric illness affecting participation, and were pregnant or breast-feeding were excluded from the study. A total of 153 patients were purposively recruited for the study and a self-administration method was used in administering the questionnaire to each patient. Patients who required assistance received standardized clarifications from trained research assistants using a predefined clarification guide. Clarifications explained item wordings and response

options without involving interpretation of questions or direction of patient responses. Verbal consent to fill the ADDQoL-19 questionnaire was obtained from each patient and socio-demographic data were also collected in addition to the ADDQoL-19 responses.

The Study Instrument

The study instrument used was the Audit of Diabetes Dependent Quality of Life, 19 item version (ADDQoL-19) questionnaire [11, 15]. ADDQoL-19 is a diabetes-specific instrument used for evaluating QoL in both T1DM and T2DM, which has been linguistically validated in many countries including China [16], Malaysia [17], Norway [18], Singapore [15], Lithuania [12] and Portugal [13].

The ADDQoL-19 questionnaire comprises two overview items alongside 19 domains. The two overview items determine the general quality of life (General QoL) and diabetes-dependent quality of life (Diabetes-dependent QoL). The General QoL overview item measures participants' current perception of their overall QoL on a scale ranging from +3 (excellent) to -3 (extremely poor). Conversely, the Diabetes-dependent QoL item asks participants to indicate how their QoL would differ if they did not have DM, using a scale from -3 (very much better) to +1 (worse).

Each of 19 domains is divided into two components. In part (a), participants assess the impact of diabetes on the specific life domain using a scale from -3 (maximum negative impact) to +1 (positive impact). In part (b), they rate the importance of each domain on a scale from 3 (very important) to 0 (not at all important). The impact score is then multiplied by the corresponding importance rating to determine the weighted impact score for the domain, with possible values ranging from -9 to +3.

To obtain the Average Weighted Impact (AWI) score for each participant, the weighted impact scores across applicable domains are summed up and divided by the number of applicable domains. Certain domains such as working life, holidays, family life, close personal relationships, and sex life, allow a "not applicable" (N/A) response. Such responses are excluded from participants' scoring during analysis. Where one or both components of a domain are missing, a weighted impact score may still be computed; however, the AWI is only calculated when not more than 6 responses are missing. The general structure of ADDQOL-19 questionnaire is presented in Table 1.

The ADDQoL was used with consent and license from the author, Prof Clare Bradley [11] (Health Psychology Research Ltd, 188 High Street, Egham, Surrey, TW20 9ED, U.K.), marked with the number CB1473. The time needed for the completion of the questionnaire is about 20 to 30 minutes.

Data Analysis

Collected data were analysed using the IBM SPSS Statistics [19]. Principal Components Analysis (PCA) was carried out with Varimax rotation. An unforced solution was initially done to see how many components appear and the nature of the components. Then, a forced one-factor solution was performed to see if all domains load on a single factor. Linearity between all domains was evaluated using a correlation matrix and sampling adequacy was evaluated using Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy for the overall data set, the KMO measure for each individual variable and Bartlett's test of sphericity. A domain was considered to load highly on any component if it had a factor loading of above 0.4.

Reliability analysis was performed using *Cronbach's alpha* (α) coefficient of internal consistency reliability. This was performed to determine if each domain contributed to the scale in the same manner. *Cronbach's alpha* coefficient of more than 0.90 was considered excellent, between 0.80 to 0.89, good, 0.70 to 0.79, acceptable, 0.6 to 0.69, questionable, 0.5 to 0.59, poor and less than 0.59, unacceptable.

Table 1. General structure of ADDQoL-19 Questionnaire.

Category	Variables	Question number
Overview items	General present quality of life	I
	Diabetes-dependent quality of life	II
Diabetes specific questions	Impact of diabetes on a particular life domain	A
	Importance of life domain	B
Life domains	Leisure	1
	Work*	2
	Journeys	3
	Holiday*	4
	Physicality	5
	Family life*	6
	Friendships and social life	7
	Close personal relationship*	8
	Sex life*	9
	Physical appearance	10
	Self-confidence	11
	Motivation	12
	People's reactions	13
	Feelings about the future	14
	Financial situation	15
	Living conditions	16
	Dependence on others	17
	Freedom to eat	18
	Freedom to drink	19

*has a "not applicable" (N/A) option

Results

The participants' ages ranged from 24 to 80 years, with a mean age of 50 ± 15 years. The mean HBA1c level was 7.9% ± 1.5%, and females constituted 62.7% of the study participants. The distribution of participants' socio-demographic and clinical characteristics across study groups is presented in Table 2.

The highest unweighted negative impact was recorded against "freedom to eat" (-1.75 ± 0.87) while the least unweighted negative impact was on "friendship and social life" (-0.78 ± 0.92). Similarly, the participants attributed highest level of importance on "family life" (2.71±0.66) and the least level of importance to "journeys" (1.77 ± 0.94). The weighted impact (WI) scores show that "financial situation" and "dependence on others" were the greatest and the least impacted domains respectively (-4.35 ± 2.67 and -1.82 ± 2.05 respectively). The mean baseline AWI was -2.9 ± 1.3 (Table 3).

For the assessment of scale structure and reliability, 62 cases were excluded, leaving 91 out of 153 cases for analysis after removing responses marked as not applicable (N/A). The calculated *Cronbach's alpha* (α) coefficient was 0.857. When each of the 19 domains was individually removed, the *Cronbach's alpha* values ranged from 0.840 (upon removal of the "physicality domain") to 0.862 (when the "feelings about the future" domain was excluded), as shown in Table 4.

An exploratory factor analysis conducted without a predetermined structure using *Varimax* orthogonal rotation identified five components with eigenvalues exceeding 1. Examination of the correlation matrix showed that each domain had at least one correlation coefficient above 0.3. The overall KMO measure of sampling adequacy was 0.829, with all individual KMO values exceeding 0.7. Additionally, Bartlett's test of sphericity was statistically significant ($p < .001$). Five domains loaded highly on component 1, six domains loaded highly on component 2, two domains loaded highly on component 3, two domains loaded highly on component 4 and four domains loaded highly on component 5 (with factor loadings > 0.40). A five-factor solution explained 60.9% of variance (14.9%,

14.8%, 10.9%, 10.2% and 10.1% respectively). Details of the factor loadings for the unforced solution are presented in Supplementary Table S1.

Using a forced one-factor solution, 16 domains demonstrated strong loadings on a single factor, with loading coefficients exceeding 0.40 (ranging from 0.457 to 0.698). The extracted component had an eigenvalue of 5.792 and accounted for 30.48% of the total variance. The domains "feelings about the future" (0.351), "holidays" (0.328), and "reactions of other people" (0.327) showed weaker loadings on the factor (Table 5). Irrespective of this, removing these domains resulted in only slight improvements in internal consistency, with *Cronbach's alpha* increasing from 0.857 to 0.858 and 0.862 following the removal of "reactions of other people" and "feelings about the future" respectively. As a result, all domains were retained and included in the single AWI scale, in line with the original English version of the ADDQoL-19.

Table 2. The Distributions of the Socio-Demographic and Clinical Characteristics of Patients (n = 153).

	Mean (SD)	**p value**
HbA1c (%)	7.9 (1.5)	0.372
Weight (Kg)	60.8 (12.3)	0.546
BMI (Kg/m2)	23.83 (5.74)	0.939
	n (percent)	
Gender		0.839
Male	57 (37.3)	
Female	96 (62.7)	
Age (years)		0.407
18 – 40	50 (32.7)	
41 – 60	69 (45.1)	
>60	34 (22.2)	
Marital status		0.155
Single	9 (5.9)	
Married	107 (69.9)	
Separated	3 (2.0)	
Widowed	31 (20.3)	
Divorced	3 (2.0)	
Education level		0.205
None	8 (5.2)	
Primary	56 (36.6)	
Secondary	69 (45.1)	
Tertiary	18 (11.8)	
Vocational/Technical	2 (1.3)	
Facility recruited		0.021
Primary facility	60 (39.2)	
Secondary facility	93 (60.8)	

Table 3. Distributions of Responses for Impact and Importance Ratings and Weighted Impact Scores.

Domain	**Number N/A**	**Mean (SD)**		
		Impact	**Importance**	**Weighted impact**
Leisure		-1.02 (0.95)	2.12 (0.79)	-2.33 (2.39)
Work	17	-1.39 (0.93)	2.60 (0.68)	-3.72 (2.67)
Journeys		-0.97 (1.00)	1.77 (0.94)	-2.02 (2.34)
Holidays	32	-1.17 (0.82)	1.93 (0.78)	-2.44 (1.97)
Physicality		-1.29 (1.00)	2.27 (0.78)	-3.08 (2.77)

Family life	1	-0.97 (1.05)	2.71 (0.66)	-2.84 (3.05)
Friendship and social life		-0.78 (0.92)	2.10 (0.84)	-1.84 (2.38)
Personal relationship	23	-0.95 (0.90)	2.43 (0.69)	-2.30 (2.22)
Sex life	26	-1.58 (1.00)	2.57 (0.62)	-4.13 (2.99)
Physical appearance		-1.43 (1.00)	2.33 (0.57)	-3.43 (2.67)
Self confidence		-1.10 (0.94)	2.17 (0.68)	-2.52 (2.45)
Motivation		-0.96 (0.90)	2.10 (0.64)	-2.20 (2.21)
Reactions of other people		-1.02 (0.82)	1.87 (0.71)	-1.97 (1.76)
Feelings about the future		-1.45 (0.97)	2.31 (0.74)	-3.49 (2.62)
Financial situation		-1.63 (0.94)	2.63 (0.50)	-4.35 (2.67)
Living conditions		-1.59 (0.93)	2.57 (0.58)	-4.18 (2.59)
Dependence on others		-0.89 (0.89)	1.80 (0.79)	-1.82 (2.05)
Freedom to eat		-1.75 (0.87)	2.34 (0.60)	-4.22 (2.59)
Freedom to drink		-1.31 (0.88)	1.99 (0.88)	-2.75 (2.27)

N/A = Not Applicable

Table 4. The Cronbach's Alpha with each of the Domains Deleted.

Domain	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's alpha if item deleted (Overall α = 0.857)
Leisure	0.539	0.584	0.846
Work	0.572	0.488	0.844
Journeys	0.579	0.532	0.845
Holidays	0.264	0.281	0.856
Physicality	0.659	0.585	0.840
Family life	0.466	0.482	0.850
Friendships and social life	0.487	0.565	0.848
Personal relationship	0.444	0.391	0.850
Sex life	0.490	0.450	0.848
Physical appearance	0.562	0.462	0.845
Self confidence	0.512	0.550	0.847
Motivation	0.338	0.477	0.854
Reactions of other people	0.198	0.344	0.858
Feelings about the future	0.165	0.362	0.862
Financial situation	0.446	0.411	0.850
Living conditions	0.430	0.465	0.851
Dependence on others	0.460	0.407	0.850
Freedom to eat	0.481	0.551	0.848
Freedom to drink	0.429	0.581	0.851

Table 5. Forced One-Factor Principal Component Analysis of the ADDQoL Domains (n = 153).

ADDQoL Domain	Factor Loading	Communality (h^2)
Physicality	0.698	0.594
Self-confidence	0.663	0.628
Physical appearance	0.656	0.548
Journeys	0.646	0.634
Work	0.637	0.489
Leisure	0.617	0.651
Sex life	0.616	0.562
Friendships and social life	0.601	0.683
Personal relationship	0.566	0.550

Freedom to eat	0.553	0.682
Family life	0.534	0.663
Motivation	0.525	0.641
Dependence on others	0.524	0.523
Financial situation	0.495	0.672
Living conditions	0.486	0.650
Freedom to drink	0.457	0.796
Feelings about the future	0.351	0.628
Holidays	0.328	0.460
Reactions of other people	0.327	0.511

Discussion

The assessment of the psychometric properties and reliability of the research instrument showed that the ADDQoL questionnaire demonstrated good psychometric properties and was an appropriate tool for measuring the QoL of the participants. This justified the calculation of the AWI for each participant using the 19-domain questionnaire. The internal consistency estimates for the instrument indicated very good results, with the *Cronbach's alpha* coefficient of 0.857 similar to the reported value of 0.85 for the original English version of the ADDQoL developed by Bradley *et al*. Similar values of *Cronbach's alpha* have been reported in Norway (0.88) [18], Portugal (0.89) [13] and China (0.81) [20]. Higher *Cronbach's alpha* coefficients ranging from 0.93 to 0.945 were reported in Slovakia [21], Singapore [22], and Malaysia [17].

The value of KMO coefficient was higher than 0.8 and was within the classification of "meritorious" according to Kaiser [23]. Hence, the sample was adequate for factor analysis. The statistical significance in Bartlett's Test of Sphericity ($p < 0.001$) also confirmed that the data was suitable for factor analysis. The complex structure of domain loadings following an unforced factor analysis made it difficult to interpret the rotated solution. The five-factor solution may, therefore, not generalize to other samples.

Exactly 16 domains loaded highly on one factor (> 0.40), following a forced-one-factor PCA. High loading of 17 domains on one factor has been reported in Portugal [13] and 18 domains loaded highly on one factor in Poland [24] and Lithuania [12]. When domains that did not load highly on one factor were deleted from the scale, the *Cronbach's alpha* increased slightly. Communalities were generally acceptable (0.460-0.796), indicating adequate representation of the domains by the retained component. Overall, the findings support the conceptualization of the instrument as measuring a predominantly single underlying construct of diabetes-specific QoL. These further confirm the assumptions of the authors of the ADDQoL questionnaire that all the questions have been formulated correctly [11]. It is difficult to create sub-scales from the scale when every question carries important information in the overall scale. Reduction of questions in the questionnaire would lead to a significant loss of information carried by them.

Generally, diabetes has a negative impact on the QoL of the participants. This study revealed that people with diabetes had worse General QoL (-0.02) when compared to those in Australia [25], Norway [17] and Great Britain [26]. A greater negative impact (-1.12) on Diabetes-dependent QoL was recorded when compared to the study in Australia [25] but was lower when compared to the other afore-mentioned studies in Norway and Great Britain.

Diabetes had a negative impact on all domains in this study, in addition to the General QoL and the Diabetes-dependent QoL overview items. The greatest diabetes negative weighted impact was recorded for "financial situation" followed by "freedom to eat", "living condition" and "sex life". "Financial situation" was also the domain with the greatest negative impact in a study in China [18], followed by "family life", "self-confidence" and "freedom to eat". The top four domains with the greatest negative weighted impact in Norway were "freedom to eat", "feelings about the future", "freedom to drink" and "work" [18], in Slovenia were "freedom to eat", "feelings about the future", "physicality" and "journeys" [27] and were "feelings about the future", "family life", "self-confidence" and "freedom to eat" in Taiwan [28]. A recurrent domain with negative weighted impact in all studies

is "freedom to eat", which is indicative of the influence of dietary restrictions on QoL, given that being overweight and obese have great associations with T2DM. The least negative weighted impact of diabetes on QoL was recorded for "dependence on others", followed by "friendship and social life" and "reactions of other people". Although the greatest negative unweighted impact of diabetes was on "freedom to eat", the domain with the highest importance score was "family life". This is similar to the results in studies conducted in Singapore [29], Slovakia [21] and Greece [30].

The differences observed in the domains with the greatest and lowest impact of diabetes on QoL recorded across different studies could be as a result of different socio-demographic characteristics of the participants such as cultural diversity, economic factors and accessibility to quality healthcare delivery system.

The domain with the most N/A response was "holidays", followed by "sex life". This could be explained. Participants were drawn from a population of people whose means of livelihood were largely medium and small businesses, subsistent farming and fishing. Hence, the participants have busy lifestyles and hardly embark on holiday trips. Similarly, a reasonable number of participants, especially the older participants were not comfortable discussing their sex lives.

Limitations

This study has a number of limitations. First, participants were recruited from a single community and were limited to adults with uncontrolled T2DM, which may restrict the generalizability of the findings to other diabetic populations. Second, the cross-sectional design precluded assessment of responsiveness and longitudinal stability of the ADDQoL. Third, the questionnaire was self-administered and data was subject to recall and social desirability biases.

Conclusion

This study shows that the ADDQoL-19 questionnaire maintained its original psychometric properties and achieved adequate reliability and validity. The instrument is therefore suitable in determining QoL among patients with uncontrolled T2DM in the study population.

REFERENCES

[1] F. J. Pasquel, M. C. Lansang, K. Dhatariya, and G. E. Umpierrez, "Management of diabetes and hyperglycaemia in the hospital," *Lancet Diabetes Endocrinol.*, vol. 9, pp. 174–188, 2021, doi: 10.1016/S2213-8587(20)30381-8.

[2] International Diabetes Federation, *IDF Diabetes Atlas*, 11th ed. Brussels, Belgium: International Diabetes Federation, 2025. [Online]. Available: https://diabetesatlas.org/. Accessed: Sep. 27, 2025.

[3] A. Iqbal and S. R. Heller, "The role of structured education in the management of hypoglycaemia," *Diabetologia*, vol. 61, pp. 751–760, 2018, doi: 10.1007/s00125-018-4545-9.

[4] O. O. Akinkugbe, Ed., *Non-Communicable Disease in Nigeria: Final Report of a National Survey*. Lagos, Nigeria: Federal Ministry of Health and Social Services, 1997, pp. 64–90.

[5] A. E. Uloko *et al*., "Prevalence and risk factors for diabetes mellitus in Nigeria: A systematic review and meta-analysis," *Diabetes Ther.*, vol. 9, pp. 1307–1316, 2018, doi: 10.1007/s13300-018-0441-1.

[6] World Health Organization, "The World Health Organization quality of life assessment (WHOQOL): Position paper from the World Health Organization," *Soc. Sci. Med.*, vol. 41, no. 10, pp. 1403–1409, 1995, doi: 10.1016/0277-9536(95)00112-K.

[7] D. J. Wexler *et al*., "Correlates of health-related quality of life in type 2 diabetes," *Diabetologia*, vol. 49, no. 7, pp. 1489–1497, 2006, doi: 10.1007/s00125-006-0249-9.

[8] S. Thapa, P. Pyakurel, D. D. Baral, and N. Jha, "Health-related quality of life among people living with type 2 diabetes: A community-based cross-sectional study in rural Nepal," *BMC Public Health*, vol. 19, Art. no. 1171, 2019.

[9] L. Pilv *et al*., "Development and validation of the short version of the Diabetes Obstacles Questionnaire (DOQ-30) in six European countries," *Eur. J. Gen. Pract.*, vol. 22, no. 1, pp. 16–22, 2016, doi: 10.3109/13814788.2015.1093619.

[10] N. P. F. Pequeno, N. L. A. Cabral, D. M. Marchioni, S. C. V. C. Lima, and C. O. Lyra, "Quality of life assessment instruments for adults: A systematic review of population-based studies," *Health Qual. Life Outcomes*, vol. 18, no. 1, Art. no. 208, 2020, doi: 10.1186/s12955-020-01347-7.

[11] C. Bradley, C. Todd, T. Gorton, E. Symonds, A. Martin, and R. Plowright, "The development of an individualized questionnaire measure of perceived impact of diabetes on quality of life: The ADDQoL," *Qual. Life Res.*, vol. 8, pp. 79–91, 1999, doi: 10.1023/A:1026485130100.

[12] Z. Visockiene, L. Narkauskaite-Nedzinskiene, R. Puronaite, and A. Mikaliukstiene, "Validation of the Lithuanian version of the 19-item Audit of Diabetes-Dependent Quality of Life questionnaire in patients with diabetes," *Health Qual. Life Outcomes*, vol. 16, Art. no. 206, 2018, doi: 10.1186/s12955-018-1020-7.

[13] F. A. Costa, J. P. Guerreiro, and C. Duggan, "An audit of diabetes-dependent quality of life for Portugal: Exploring validity and reliability," *Pharm. Pract. (Granada)*, vol. 4, pp. 123–128, 2006.

[14] C. A. C. Prinsen *et al*., "COSMIN guideline for systematic reviews of patient-reported outcome measures," *Qual. Life Res.*, vol. 27, no. 5, pp. 1147–1157, 2018, doi: 10.1007/s11136-018-1798-3.

[15] H. L. Wee, C. E. Tan, S. Y. Goh, and S. C. Li, "Usefulness of the Audit of Diabetes-Dependent Quality-of-Life questionnaire in patients with diabetes in a multi-ethnic Asian country," *Pharmacoeconomics*, vol. 24, no. 7, pp. 673–682, 2006, doi: 10.2165/00019053-200624070-00006.

[16] D. Kong, Y. Ding, X. Zuo, W. Su, L. Xiu, M. Lin, S. Rao, and S. Yu, "Adaptation of the Audit of Diabetes-Dependent Quality of Life questionnaire to people with diabetes in China," *Diabetes Res. Clin. Pract.*, vol. 94, pp. 45–52, 2011, doi: 10.1016/j.diabres.2011.06.019.

[17] Z. Jannoo, B. W. Yap, K. I. Musa, M. A. Lazim, and M. A. Hassali, "An audit of diabetes-dependent quality of life in patients with type 2 diabetes mellitus in Malaysia," *Qual. Life Res.*, vol. 24, no. 9, pp. 2297–2302, 2015, doi: 10.1007/s11136-015-0969-8.

[18] M. M. Iversen, B. Espehaug, B. Rokne, A. Haugstvedt, and M. Graue, "Psychometric properties of the Norwegian version of the Audit of Diabetes-Dependent Quality of Life," *Qual. Life Res.*, vol. 22, pp. 2809–2812, 2013, doi: 10.1007/s11136-013-0419-2.

[19] IBM Corp., *IBM SPSS Statistics*, ver. 31.0.1, computer software. Armonk, NY, USA: IBM Corp., 2024.

[20] C. S. Fung, E. Y. Wan, C. L. Yu, and C. K. Wong, "Validity and reliability of the 19-item Audit of Diabetes-Dependent Quality of Life questionnaire in Chinese patients with type 2 diabetes mellitus in primary care," *Qual. Life Res.*, vol. 25, no. 9, pp. 2373–2378, 2016, doi: 10.1007/s11136-016-1263-0.

[21] E. Holmanova and K. Ziakova, "Audit Diabetes-Dependent Quality of Life questionnaire: Usefulness in diabetes self-management education in the Slovak population," *J. Clin. Nurs.*, vol. 18, no. 9, pp. 1276–1286, 2009, doi: 10.1111/j.1365-2702.2008.02602.x.

[22] S. S. Soon *et al*., "Audit of Diabetes-Dependent Quality of Life Chinese version for Singapore questionnaire: Reliability and validity among Singaporeans with type 2 diabetes mellitus," *Appl. Health Econ. Health Policy*, vol. 8, no. 4, pp. 239–249, 2010, doi: 10.2165/11313920-000000000-00000.

[23] H. F. Kaiser, "An index of factorial simplicity," *Psychometrika*, vol. 39, pp. 32–36, 1974.

[24] E. Bak, Z. Nowak-Kapusta, D. Dobrzyn-Matusiak, E. Marcisz-Dyla, C. Marcisz, and S. A. Krzeminska, "An assessment of diabetes-dependent quality of life in women and men in Poland with type 1 and type 2 diabetes," *Ann. Agric. Environ. Med.*, vol. 26, no. 3, pp. 429–438, 2019, doi: 10.26444/aaem/99959.

[25] R. Ostini, J. Dower, and M. Donald, "The Audit of Diabetes-Dependent Quality of Life 19: Feasibility, reliability and validity in a population-based sample of Australian adults," *Qual. Life Res.*, vol. 21, no. 8, pp. 1471–1477, 2012, doi: 10.1007/s11136-011-0043-0.

[26] J. Speight, A. J. Sinclair, J. L. Browne, A. Woodcock, and C. Bradley, "Assessing the impact of diabetes on the quality of life of older adults living in a care home: Validation of the ADDQoL Senior," *Diabet. Med.*, vol. 30, no. 1, pp. 74–80, 2013, doi: 10.1111/j.1464-5491.2012.03748.x.

[27] E. Turk, V. Prevolnik Rupel, A. Tapajner, S. Leyshon, and A. Isola, "An audit of diabetes-dependent quality of life in older patients with type 2 diabetes mellitus in Slovenia," *Value Health Reg. Issues*, vol. 2, no. 2, pp. 248–253, 2013, doi: 10.1016/j.vhri.2013.05.001.

[28] H. F. Wang and M. C. Yeh, "The quality of life of adults with type 2 diabetes in a hospital care clinic in Taiwan," *Qual. Life Res.*, vol. 22, no. 3, pp. 577–584, 2013, doi: 10.1007/s11136-012-0178-7.

[29] Y. T. Shim, J. Lee, M. P. Toh, W. E. Tang, and Y. Ko, "Health-related quality of life and glycaemic control in patients with type 2 diabetes mellitus in Singapore," *Diabet. Med.*, vol. 29, no. 8, pp. e241–e248, 2012, doi: 10.1111/j.1464-5491.2012.03689.x.

[30] A. K. Papazafiropoulou *et al.*, "Diabetes-dependent quality of life and affecting factors in patients with type 2 diabetes mellitus in Greece," *BMC Res. Notes*, vol. 8, Art. no. 786, 2015, doi: 10.1186/s13104-015-1782-8.